

Appendices for **OCTA M2**
Natural Community Conservation Plan/ Habitat Conservation Plan

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Appendix A

Acronyms and Glossary

Acronyms and Glossary

Acronyms

°	degrees
ATV	all-terrain vehicle
BA	biological assessment
Basin Plans	Regional Water Quality Plans
BMPs	best management practices
BO	biological opinion
Board	OCTA Board of Directors
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CBI	Conservation Biology Institute
CEC	California Energy Commission
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act of 1970
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNF	Cleveland National Forest
CWA	Clean Water Act
EA	environmental assessment
Eagle Act	Eagle Protection Act
EAP	Early Action Plan
EIR/EIS	environmental impact report/environmental impact statement
EIS	environmental impact statement
EMP	Environmental Mitigation Program
EOC	Environmental Oversight Committee
EPA	U.S. Environmental Protection Agency
ESA	Federal Endangered Species Act
EVeg	USFS Existing Vegetation dataset
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FR	Federal Register
GIS	geographic information system
GSRDs	Gross Solids Removal Devices
HCP	Habitat Conservation Plan
HMMP	Habitat Mitigation and Monitoring Plan
HRMP	Habitat Reserve Management Program
HRP	Habitat Restoration Plan

I-	Interstate
IA	Implementing Agreement
IPM	integrated pest management
IRC	Irvine Ranch Conservancy
LCF	Laguna Canyon Foundation
LSAA	Lake or Streambed Alteration Agreement
M2	renewal of Measure M
M2 NCCP/HCP	M2 Natural Community Conservation Plan/Habitat Conservation Plan
MBTA	Migratory Bird Treaty Act
MEP	maximum extent practicable
MOUs	Memoranda of Understanding
MRPP	Mitigation and Resource Protection Program
MSAA	master streambed alteration agreement
MSHCP	Multi Species Habitat Conservation Plan
msl	above mean sea level
NCCP	Natural Community Conservation Plan
NCCPA	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NLSA	Notification of Lake or Streambed Alteration
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NROC	Nature Reserve of Orange County
NWF	National Wildlife Refuge
NWPs	nationwide permits
OCTA	Orange County Transportation Authority
OI	Openness Indices
PAD	protected area database
Permittee	Orange County Transportation Authority
Plan	M2 Natural Community Conservation Plan/Habitat Conservation Plan
PMMP	Preserve Management and Monitoring Program
Porter Cologne	Porter-Cologne Water Quality Control Act
PPP	Public Participation Plan
Preserve System	NCCP/HCP Preserves
RHA	Rivers and Harbor Act
RMPs	resource management plans
RWQCBs	Regional Water Quality Control Board
SB	Senate Bill
SMART	Specific, Measurable, Achievable, Relevant, Timely
SR-	State Route
State Parks	California Department of Parks and Recreation
State Water Board	State Water Resources Control Board
Streambed Program	Streambed Protection Mitigation Program
SWMP	Storm Water Management Plan

SWPPP	Storm Water Pollution Prevention Plan
T2020 Committee	Transportation 2020 Committee
TAIC	Technology Associates International Corporation
TCA	Transportation Corridors Agency
TPL	Trust for Public Land
TWC	The Wildlands Conservancy
UCI	University of California Irvine
USACE	U.S. Army Corps of Engineers
USC	U.S. Government Code
USDA	United States Department of Agriculture
USFS	USDA Forest Service
USFWS	U.S. Fish and Wildlife Service
VMT	vehicle miles traveled
WDR	Waste Discharge Requirement
WHR	Wildlife Habitat Relationship
WMAs	Watershed Management Areas
WoUS	Waters of the United States
WUI	Wildland Urban Interface

Glossary

Adaptive management. A method for examining alternative strategies for meeting measurable biological goals and objectives, and then if necessary, adjusting future conservation management actions according to what is learned (see also Chapter 7, "Management and Monitoring,").

Anadromous fish. Fish that spend part of their life cycle in the ocean and part in fresh water. The National Marine Fisheries Service (NMFS) has jurisdiction over anadromous fish that spend the majority of their life cycle in the ocean.

Anthropogenic. Caused or produced through human agency.

Baseline. The baseline is the existing environmental state, which includes past and present impacts as well as the anticipated impacts of all permitted projects in the inventory area.

Biological opinion. The document stating the opinion of the U.S. Fish and Wildlife Service and/or the National Oceanic and Atmospheric Administration's National Marine Fisheries Service as to whether or not a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. A Biological Opinion (BO) is one of the decision documents of a consultation under Section 7 of the federal Endangered Species Act (ESA).

Biodiversity. The variety of organisms considered at all levels, from genetic variants of a single species through arrays of species to arrays of genera, families, and higher taxonomic levels; includes the variety of ecosystems.

Buffer areas. Buffer areas are designated zones of agricultural lands, grassland, or other habitat types adjacent to Preserves that are intended to prevent or reduce the undesired intrusion of biota, harmful materials, or disturbances into the Preserve, as well as the movement of covered wildlife species from Preserve areas into adjoining areas.

Certificate of Inclusion. For projects in which Caltrans is the Construction Lead, OCTA will issue a Certificate of Inclusion that will describe the authorized take and required avoidance and minimization measures.

Changed Circumstances. Changed Circumstances are defined under the U.S. Fish and Wildlife Service (USFWS) "No Surprises" rule as "changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the USFWS and that can be planned for." Changed Circumstances for the M2 NCCP/HCP include the following reasonably foreseeable events: flood; fire; extended period of reduced precipitation; invasion by exotic species or disease; toxic spills, vandalism and other illegal human activity; and listing of non-Covered Species

Conservation. According to the ESA (Section 3[3]), the terms *conserve*, *conserving*, and *conservation* are defined as the methods and procedures necessary to bring any endangered or threatened species to the point at which the measures provided under the Act are no longer necessary. Such methods and procedures include, but are not limited to, activities associated with resource management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transportation. The Natural Community Conservation Planning Act (NCCPA) defines *conserve*, *conserving*, and *conservation* as "the use of methods and procedures within the Plan area that are necessary to bring any Covered Species to the point at which the measures provided are not necessary, and for Covered Species that are not listed, to maintain or enhance the condition of a species so that listing will not become necessary."

Conservation measure. A management action that, when implemented, will partially or wholly achieve Plan objectives for Covered Species, vegetation communities, biodiversity, or ecosystem function.

Conserved habitat. Species habitat that is protected, enhanced, and/or restored under the NCCP/HCP.

Construction Lead. Under the M2 program, either OCTA or Caltrans will function as the Construction Lead. Under the normal design, bid, build process, Caltrans is anticipated to be the Construction Lead. In certain instances, OCTA may be the Construction Lead for select M2 freeway improvement projects. It is anticipated Caltrans will be the Construction Lead for the majority of the M2 freeway improvement projects. OCTA will work closely with Caltrans during the construction phase to ensure that the measures outlined in the Plan are implemented.

Construction monitoring. Monitoring by biologists of construction activities to ensure that conservation measures are implemented and impacts on biological resources are avoided or minimized in accordance with M2 Natural Community Conservation Plan/Habitat Conservation Plan (Plan) requirements.

Cover (e.g., canopy cover, areal cover). The area of ground covered by vegetation of particular species or vegetation type, generally expressed as a percentage.

Covered Activities. Covered Activities includes that actions for which take authorization will be obtained. This includes coverage for two major categories of Covered Activities, (1) Covered freeway improvement projects proposed by OCTA along 13 freeway segments; and (2) Covered Preserve management activities within the OCTA acquired Preserves associated with the potential for a small amount of take of Covered Species to occur in the Preserves as a result of ongoing habitat management, restoration, and monitoring activities by Preserve Managers.

Covered freeway improvement projects. Covered freeway improvement projects are defined to include all habitat or ground-disturbing impacts resulting from the M2 transportation planning and project implementation process.

Covered Species. Covered Species means those species which the Plan addresses in a manner intended to meet all of the criteria for issuing a permit under the NCCPA and an incidental take permit under the ESA.

Critical habitat. An area designated as critical habitat by the UUSFWS pursuant to the ESA. Critical habitat areas are specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described and designated in the Federal Register.

Cumulative impacts/effects. Cumulative impacts/effects result from the proposed actions' incremental impact when viewed together with past, present, and reasonably foreseeable future actions.

Direct effects. Direct effects are defined as activities or projects that remove or alter land cover types, or Covered Species habitat, populations, or occurrences (or portions of thereof). Direct effects are caused by the project and occur at the time and place of project implementation (e.g., ground disturbance, inundation). Direct effects can be either permanent or temporary (see definitions of permanent and temporary effects).

Dominance. The extent to which a given species predominates a community by virtue of its size, abundance, or coverage.

Ecosystem. A community of organisms and their physical environment interacting as an ecological unit.

Ecosystem function. The sum total of processes operating at the ecosystem level, such as the cycling of matter, energy, and nutrients.

Ecosystem restoration. The reestablishment of ecological functions within an area that historically supported those functions.

Effects. Effects are those actions affecting biological resources, specifically undeveloped land cover types and Covered Species, in the Permit Area. Effects can be direct or indirect; they can also be cumulative.

Effectiveness monitoring. The "Monitoring Biologist" is responsible for effectiveness monitoring, which assesses and tracks the biological success of the Plan's conservation strategy. Periodic biological surveys of the Preserves will be completed to compare with baseline surveys. Each Preserve will be evaluated to determine if potential habitat exists for Covered Species and which species surveys are appropriate for each Preserve

Endangered species. A species that is at risk of extinction throughout all or a significant portion of its range.

Environmental gradient. A shift in physical and ecological parameters, as characterized by transition zones between land-cover types and natural communities or topographic gradients across a landscape.

Environmental Oversight Committee. The Environmental Oversight Committee (EOC) was formed in October 2007, following approval by the Board of Directors. The EOC makes recommendations on the allocation of environmental freeway mitigation funds and monitors the execution of the M2 NCCP/HCP between the Orange County Transportation Authority (OCTA) and state and federal resource agencies. Comprised of 12 members, the EOC has been meeting on a monthly basis to advance implementation of key M2 projects, including the freeway mitigation program. The EOC has been responsible for the oversight and review of the five-year M2 Early Action Plan (EAP) to evaluate, select and fund Preserve acquisitions and restoration projects.

Ephemeral stream. Stream that flows only in response to rain events and receives no groundwater input.

Extinct Species. A species no longer in existence.

Federally Listed Species. Federally Listed Species means species that are listed as threatened or endangered species under the ESA.

Fully Protected Species. California fully protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Fully protected species are described in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code.

Geographic Information System. Computer-based mapping technology that manipulates geographic data in digital layers and enables one to conduct a wide array of environmental analyses.

Goal. A broad, guiding principle that identifies an expected outcome of the Conservation Plan. Conservation strategy goals describe the desired future condition for each Covered Species with full implementation of the Plan.

Habitat. The environmental conditions that support occupancy of a given organism in a specified area. In scientific and lay publications, habitat is defined in many different ways and for many different purposes. For the purpose of the Plan, habitat is defined as the specific places where the environmental conditions (i.e., physical and biological conditions) required to support occupancy by individuals or populations of a given species are present. Habitat may be occupied (individuals or population of the species are, or have recently been, present) or unoccupied (see *unoccupied habitat* below).

Habitat creation. The establishment of a vegetation community in an area that did not previously support it. For example, stock ponds can be created in areas that previously did not support them by grading and installing a check dam.

Habitat enhancement. The improvement of an existing degraded vegetation community. Enhancement involves improving one or more ecological factors, such as species richness, species diversity, overall vegetative cover, or wildlife value. Enhancement activities typically occur on substrates that are largely intact.

Habitat-limited. A habitat-limited species is one whose abundance, distribution, or reproduction is limited by the availability or quality of suitable habitat. See definition of *suitable habitat* below.

Habitat quality. The ability of the environment to provide conditions that support the persistence of individuals and populations. The precise meaning of quality varies by species and depends on the subject species' specific needs in the context of a particular area. High-quality habitat for some species comprises only foraging and resting elements; for others it comprises foraging, resting, and nesting elements; for still others it may encompass all elements needed for the species to complete its lifecycle. Low-quality habitat would include only the minimal elements that support occurrence of the species. High-quality habitat tends to support larger numbers of species than low-quality habitat.

Habitat quantity. The area of the environment that supports or could support occupancy of a given organism.

Habitat replacement. To replace habitat is to mitigate habitat loss by enhancing or restoring habitat equivalent to or greater than the habitat lost.

Habitat restoration. Restoration is the establishment of a vegetation community in an area that historically supported it, but no longer supports it because of the loss of one or more required ecological factors. Restoration may involve altering the substrate to improve a site's ability to support the historic vegetation community.

Harass. An intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (Code of Federal Regulations (CFR), title 50, section 17.3).

Harm. An act that actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3).

Hydrology. The movement of surface and subsurface water flows in a given area. The hydrology of an area is intimately connected with its precipitation, soils, and topography.

Incidental take. Any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (50 CFR 17.3).

Indirect effects. Indirect effects are those effects that occur at the time of the proposed action but beyond the footprint of a project or activity (i.e., beyond the area of land cover disturbance). While more difficult to detect and track, indirect effects can undermine species viability or habitat quality, especially if multiple indirect or direct effects work cumulatively to impair the species or to degrade the habitat.

In-kind/like-value creation. Establishing the same vegetative community that would provide the same ecological values over time as the vegetation community affected. For example, creating an artificial vernal pool that supports species similar to those found in an affected vernal pool would be in-kind/like-value creation.

Intermittent stream. Stream that is supplied by both rainfall runoff and groundwater; intermittent streams tend to be seasonal, flowing during the rainy season and into the late spring or early summer.

Jurisdictional wetlands and waters. This term is used in the Plan to refer to state and federally regulated wetlands and other water bodies that cannot be filled or altered without permits from the U.S. Army Corps of Engineers (USACE) under Section 404 of the federal Clean Water Act (CWA), the State Water Board or the Regional Water Quality Control Boards (RWQCBs) under either Section 401 of the CWA or the Porter-Cologne Act, or the CDFW under Fish and Game Code Section 1602 as of the date the Plan takes effect.

Known occurrence. Confirmed sightings of a species in a specific area.

Land-cover type. The dominant feature of the land surface discernible from aerial photographs and defined by vegetation, water, or human uses.

Land Management Entity. After performance criteria are met, any long-term management of restoration projects will be the responsibility of the underlying Land Management Entity. The Land Management Entity will manage the restoration project location for biological values as part of their overall management activities and responsibilities. OCTA will continue to have access to restoration project locations to conduct assessments and qualitative monitoring of restoration project success over time to gain insights and knowledge of restoration strategies.

Land-use designation. The designation, by parcel, in an adopted city or county General Plan of the allowable uses.

Loss of habitat. Loss of habitat is a reduction in habitat quality or quantity that results from an adverse change in an environmental condition. Environmental conditions may include cover, substrate, channel type, interacting species, river area, reservoir area, water quality, and groundwater depth.

M2. M2, or Renewed Measure M, means the Orange County Renewed Measure M Transportation Ordinance and Investment Plan, approved by Orange County voters in November 2006. The Renewed Measure M is an extension of a ½-cent transportation sales tax, beginning in 2011 through 2041, for transportation improvements throughout Orange County.

Monitoring Biologist. Accredited biologist responsible for periodic monitoring of the status of natural communities and Covered Species within the Preserves (see Chapter 7, "Management and Monitoring," for further details regarding the Monitoring Biologist's responsibilities and roles).

Natural community. A natural community is a distinct and recurring assemblage of populations of plants and animals that are associated with each other, their physical environment, and the natural processes that affect them.

NCCP/HCP Administrator. The NCCP/HCP Administrator's role is to oversee and coordinate plan implementation (see Chapter 8, "Plan Implementation," for a full discussion of the administrator's responsibilities.

No-take species. Species for which take is not authorized under this NCCP/HCP. In order to comply with the terms of the Plan, applicants for coverage under the Plan must avoid all direct and indirect impacts on no-take species.

Ordinary high water mark. A line on the shore established by the fluctuations of water and indicated by physical characteristics, such as a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; or the presence of litter and debris.

Participating Special Entity. Caltrans will implement freeway improvement projects as a Participating Special Entity and OCTA will issue a Certificate of Inclusion that will describe the authorized take and required avoidance and minimization measures.

Perennial stream. Year-round stream that is supplied by both rainfall runoff and groundwater, as well as by substantial dry-season inputs.

Performance indicator. The environmental variables that are quantitatively measured over time to determine if enhanced/created/restored natural communities have successfully met NCCP/HCP biological goals and objectives.

Performance objective. In monitoring, the optimal desired value for each performance indicator. Performance objectives establish a higher threshold for each indicator than that established for performance standards. Funding, design, and management objectives for enhanced/created/restored natural communities are established at levels that are designed to ensure that the performance objectives are achieved. Failure to meet a performance objective would not constitute a changed circumstance or require remedial measures.

Performance period. In monitoring, the time over which performance standards must be met.

Performance standard. In monitoring, a minimum requirement necessary to achieve biological goals and objectives. Failure to achieve a performance standard could constitute a changed circumstance and require that remedial measures be implemented.

Permanent effects. Permanent effects are direct effects that permanently remove or alter a land cover, or that affect a land cover for more than one year (e.g., road widening into a grassland habitat).

Permit Area. The Permit Area is the area in which the OCTA is requesting authorization from CDFW and USFWS for projects and activities that may result in take of Covered Species (i.e., Covered Activities).

Permittees. Those entities requesting a Section 10(a)(1)(B) incidental take permit from USFWS and a take permit under the NCCPA from CDFW for the species and activities covered in the accompanying NCCP/HCP. OCTA will be the sole permittee under this Plan.

Plan Area. The Plan Area is defined as the area in which impacts would be evaluated and conservation would occur. The Plan Area includes the entirety of Orange County, totaling approximately 511,476 acres, located south of Los Angeles County, north of San Diego County, and west of Riverside County to the Pacific Ocean.

Planning surveys. Surveys conducted by applicants for NCCP/HCP coverage and used in the project-planning process to identify constraints and determine which NCCP/HCP conservation measures are applicable. Planning surveys also include surveys conducted by the Implementing Entity on potential Preserve lands to evaluate whether these lands will meet Plan requirements.

Population. A group of individuals of the same species inhabiting a given geographic area, among which mature individuals reproduce or are likely to reproduce. Ecological interactions and genetic exchange are more likely among individuals within a population than among individuals of separate populations of the same species.

Practicable. Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose (Federal Register (FR), volume 45, page 85344, December 24, 1980: U.S. Environmental Protection Agency (EPA), Part 40 CFR 230.3, Definitions).

Preconstruction surveys. Surveys conducted by applicants for NCCP/HCP coverage for certain biological resources immediately prior to construction to ensure that species and habitat avoidance and minimization measures can be effectively implemented during construction or implementation of Covered Activities.

Predicted Suitable Habitat. See species distribution model(ing).

Preserves. Preserves are discrete areas of conserved habitats managed as single units under the NCCP/HCP.

Preserve management. This level of management focuses on activities that protect Covered Species and natural communities, and provide compatible recreational opportunities for the public. Preserve management includes all actions established under "property management," as well as monitoring and management of the overall condition of a Preserve, invasive species, erosion, sedimentation, trails and public use facilities, and occasionally restoration.

Preserve System. All NCCP/HCP Preserves considered collectively.

Property management. This is the most basic level of management in a Preserve, and includes establishing and maintaining property boundaries with fencing and gates; posting signs that indicate Preserve rules, restrictions, and regulations; and controlling public access, trash collection, and enforcement as-needed.

Protect habitat. To maintain the existing or enhanced extent of species habitat through acquisition, easements, or other practicable processes for bringing unprotected sites under protected status.

Range. The geographic area a species is known or believed to occupy.

Recovery. The process by which the decline of an endangered or threatened species is arrested or reversed or threats to its survival neutralized so that its long-term survival in nature can be ensured. Recovery entails actions to achieve the conservation and survival of a species including actions to prevent any further erosion of a population's viability and genetic integrity, as well as actions to restore or establish environmental conditions that enable a species to persist (i.e., the long-term occurrence of a species through the full range of environmental variation).

Recovery Plan. A document published by USFWS that lists the status of a listed species and the actions necessary to remove the species from the endangered species list.

Regional monitoring. Regional monitoring consists of monitoring vegetation communities, wildlife movement, and species population trends across the Plan Area. OCTA will contribute to regional monitoring by using standardized methods and coordinated scheduling of the collection of data in coordination with other regional entities and the Wildlife Agencies to facilitate the integration and evaluation of data for the region.

Renewed Measure M. Renewed Measure M, or M2, means the Orange County Renewed Measure M Transportation Ordinance and Investment Plan, approved by Orange County voters in November 2006. The Renewed Measure M is an extension of a ½-cent transportation sales tax, beginning in 2011 through 2041, for transportation improvements throughout Orange County.

Restoration Project Entity. The Restoration Project Entity is responsible for implementing the restoration projects as they are described in the approved restoration plans. The Restoration Project Entity is responsible for completing all appropriate regulatory permitting and environmental documentation required to complete the project and will abide by all required avoidance and minimization requirements and best management practices. The Restoration Project Entity will complete monitoring of the project to ensure performance criteria are met.

Riparian habitat. Vegetation associated with river, stream, or lake banks and floodplains.

Science Advisors. OCTA felt strongly that independent scientific input early in the planning process was critical to the success of the Plan. In early 2011, the Science Advisors were invited to provide independent scientific input for development of the NCCP/HCP. The Science Advisors were chosen based on their knowledge of the county's ecology, including their technical expertise as it relates to the species and habitats addressed in the Plan.

Signature. Characteristic value, color, or texture on an aerial photograph that correlates to a particular land-cover type.

Specially Protected Mammal Species. Specially Protected Mammal Species means any species identified in California Fish and Game Code section 4800. One Specially Protected Mammal Species, the mountain lion, is included on the Covered Species list.

Species distribution model(ing). Species distribution models are numerical tools that combine observations of species occurrence or abundance with environmental estimates, in order to gain ecological and evolutionary insights and to predict distributions across landscapes.

Species management. This level of management includes all activities identified for "property management" and "Preserve management," as well as species-specific and habitat-specific monitoring and management. Examples include focused species surveys, species/habitat-specific protection measures (e.g., fencing and manual weed removal in a rare plant area), and habitat enhancement projects (e.g., restoration of California gnatcatcher habitat).

Succession. The change in the composition and structure of a biological community over time. Successional patterns often shift dramatically following a major disturbance (e.g., fire, flood, anthropogenic clearing of land).

Suitable habitat. Habitat that exhibits the characteristics necessary to support a given species.

Take. According to the ESA (Section 3[18]), *take* means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. According to the CESA (Section 86 of the California Fish and Game Code), *take* means to hunt, pursue, catch, capture, or kill.

Temporary effects. Temporary effects are direct effects that alter land cover for less than 1 year and that allow the disturbed area to recover to pre-project or ecologically improved conditions within 1 year (e.g., construction staging areas, temporary access roads) of completing construction.

Threatened species. A species that is likely to become "endangered" in the foreseeable future.

Unforeseen Circumstances. Unforeseen Circumstances (defined in 50 CFR 17.3) refers to changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the Wildlife Agencies at the time of the conservation plan's negotiation and development and that result in a substantial and adverse change in the status of the Covered Species. Unforeseen Circumstances include future unanticipated conditions, which are either not defined as Changed Circumstances or which exceed the definitions developed for Changed Circumstances particularly in terms or severity or extent (e.g., flood or fire affecting species continued existence).

Unoccupied habitat. Habitat that exhibits all the constituent elements necessary for a species, but where surveys have determined that the species is not currently present. The lack of individuals or populations in the habitat is assumed to be the result of reduced numbers or distribution of the species such that some habitat areas are unused. It is expected that these areas would be used if species numbers or distribution were greater. See also definition of *suitable habitat*.

Vegetation community. A natural or artificial terrestrial community defined by the dominant vegetation and the vegetation structure. This term is used synonymously with the regulatory term *natural community* under the Natural Community Conservation Planning Act of 2002.

Wildlife Agencies. The California Department of Fish and Wildlife (CDFW) and U.S. Fish and Wildlife Service (USFWS) are collectively referred to as the Wildlife Agencies.

Wildlife corridor. A wildlife or habitat corridor is a strip of land that aids in the movement of species between disconnected areas of their natural habitat.

Wildland Urban Interface (WUI). The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

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Appendix B

Implementing Agreement

IMPLEMENTING AGREEMENT

for the

ORANGE COUNTY TRANSPORTATION AUTHORITY NATURAL COMMUNITY CONSERVATION PLAN (NCCP) / HABITAT CONSERVATION PLAN (HCP)

by and among

THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

THE UNITED STATES FISH AND WILDLIFE SERVICE,

THE ORANGE COUNTY TRANSPORTATION AUTHORITY,

AND

THE CALIFORNIA DEPARTMENT OF TRANSPORTATION

FINAL

2016

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Table of Contents

1.0 PARTIES TO THIS AGREEMENT 1
2.0 RECITALS AND PURPOSES OF THE AGREEMENT 1
2.1 Recitals 1
2.2 Purposes 2
3.0 DEFINITIONS 2
4.0 CONSERVATION STRATEGY 9
4.1 Avoidance and Minimization of Impacts 10
4.2 Land Acquisition and Assembly of Preserve Areas 10
4.3 Land Acquired Through Partnerships with Other Agencies and Organizations 11
4.4 Credit for Lands Acquired and Restoration Projects Funded Before Issuance of the Permits 11
5.0 PRESERVE AREA MANAGEMENT 13
5.1 Resource Management Plans 13
5.2 Recreation Uses 13
6.0 COVERED ACTIVITIES 14
6.1 Freeway Capital Improvement Projects 14
6.2 Future Minor Freeway Capital Improvement Projects 18
6.3 Preserve Management, Restoration, and Monitoring Activities 19
7.0 TAKE AUTHORIZATIONS FOR PERMITTEE 19
7.1 Extension of Take Authorizations to the Participating Special Entity 20
7.2 Take Authorizations for Non-Listed Covered Species 20
7.2.1 ESA Section 10 20
7.2.2 NCCPA 21
7.3 Take Authorizations for Migratory Bird Species 21
7.4 No Take Above Levels Authorized 21
7.5 No Take Authorization for Fully Protected Species 22
7.6 No Take Authorization for Specially Protected Mammal Species 22
8.0 OBLIGATIONS OF THE PARTIES 22
8.1 Obligations of Permittee 22
8.1.1 Role of Permittee 23
8.1.2 Coordination between Permittee and other Regional Conservation Plans 23
8.2 Obligations of the Participating Special Entity 23
8.2.1 Role of Participating Special Entity 24
8.2.2 Remedies and Enforcement by Permittee Against the Participating Special Entity 24
8.3 Obligations of the Service 25
8.3.1 Permit Issuance, Implementation and Monitoring 25
8.3.2 Consultation with Public Agencies 25
8.3.3 Future Environmental Review Under NEPA 25
8.4 Obligations of CDFW 26

8.4.1 CEQA 26
9.0 MONITORING AND ADAPTIVE MANAGEMENT **27**
9.1 Preserve Management and Monitoring 27
9.2 Permittee-initiated Adaptive Management 27
9.3 Wildlife Agency-initiated Adaptive Management 28
9.4 Reductions in Mitigation 28
9.5 No Increase in Take 28
10.0 REPORTING **28**
10.1 Annual Report 28
10.1.1 Other Reports 29
10.1.2 Certification of Reports 30
10.1.3 Monitoring Results 30
10.2 Monitoring by the Wildlife Agencies 30
11.0 CHANGED CIRCUMSTANCES **30**
11.1 Response to Changed Circumstances 31
11.1.1 Wildlife Agency-initiated Response to Changed Circumstances 31
12.0 FUNDING **31**
12.1 Funding Endowments for Long-Term Management and Monitoring of Preserves 32
12.2 Effect of Inadequate Funding 33
13.0 REGULATORY ASSURANCES **34**
13.1 Assurances Under the ESA 34
13.2 Assurances Under the NCCPA 34
13.2.1 Permittee 34
13.3 Process to Respond to Unforeseen Circumstances 35
13.4 Interim Obligations Upon a Finding of Unforeseen Circumstances 36
14.0 TERM **36**
14.1 Effective Date 36
14.2 Initial Term 36
14.3 Extension of the Permits 36
15.0 AMENDMENTS AND PERMIT AMENDMENTS **36**
15.1 Minor Amendments to the Plan 36
15.1.1 Minor Amendments 36
15.1.2 Major Amendments 38
15.2 Amendment to this Agreement 39
16.0 ENFORCEMENT OF PERMIT AND DISPUTE RESOLUTION **39**
16.1 General Authorities and Legal Rights under Federal Permit 39
16.1.1 Permit Suspension 40
16.1.2 Reinstatement of Suspended Permit 40
16.1.3 Surrender or Revocation of the Federal Permit 40
16.2 State Permit 41
16.2.1 Suspension or Revocation of the State Permit 41
16.2.2 Rough Proportionality 41
16.2.3 Approval, Adoption or Amendment of Future Plans or Projects by Permittee 42
16.2.4 Reinstatement of Suspended Permit 42

16.2.5 Obligations in the Event of Suspension or Revocation 43
16.3 Dispute Resolution 43
16.3.1 Dispute Resolution Process 43
17.0 MISCELLANEOUS PROVISIONS 44
17.1 Incorporation of the Plan 44
17.2 Relationship to CESA, the NCCPA, the ESA, and Other Authorities 44
17.3 Changes in Environmental Laws 45
17.4 References to Regulations 45
17.5 Applicable Laws 45
17.6 Governing Law 45
17.7 Independent State and Federal Permits 45
17.8 Availability of Funds 45
17.9 Duplicate Originals 46
17.10 No Third-Party Beneficiaries 46
17.11 Agreement is not an Enforceable Contract as between Service and Permittee 46
17.12 Defense 47
17.13 Successors and Transferees 47
17.14 Notices 47
17.15 Calendar Days 48
17.16 Response Times 48
18.0 MISCELLANEOUS PROVISIONS BETWEEN PERMITTEE AND CDFW 49
18.1 Entire Agreement 49
18.2 Severability 49
18.3 No Partnership 49
18.4 Elected Officials Not to Benefit 49

Exhibits

Exhibit A Plan Area
Exhibit B Covered Species
Exhibit C Certificate of Inclusion under the State Permit
Exhibit D Certificate of Inclusion under the Federal Permit

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1.0 PARTIES TO THIS AGREEMENT

The Parties to this Implementing Agreement (Agreement) are the Orange County Transportation Authority (OCTA or Permittee), the California Department of Fish and Wildlife (CDFW) and the United States Fish and Wildlife Service (Service). The Service and CDFW are herein collectively referred to as the Wildlife Agencies.

2.0 RECITALS AND PURPOSES OF THE AGREEMENT

2.1 Recitals

(a) The Service is a federal agency within the United States Department of the Interior charged with responsibility for administering the federal Endangered Species Act (ESA) and providing for the conservation of federally listed species and their habitat. The Service is authorized to issue a Take permit under Section 10(a) of ESA for the incidental Take of federally listed animal species provided that the applicant for such a permit submits a Habitat Conservation Plan (HCP) that meets permit issuance criteria set forth in Section 10 of the ESA.

(b) CDFW is a state agency within the California Natural Resources Agency charged with responsibility for administering the California Endangered Species Act (CESA) and the Natural Community Conservation Planning Act (NCCPA). CDFW is authorized to issue permits under Section 2835 of the Fish and Game Code to authorize the Take of any species, whether or not it is listed as an endangered, threatened or candidate species under state law, where the conservation and management of the species is provided for in a Natural Community Conservation Plan (NCCP) approved by CDFW. CDFW enters into this Agreement pursuant to the NCCPA.

(c) The OCTA is the sponsor of the NCCP/HCP or Plan. OCTA has undertaken a collaborative, systematic approach to protecting ecologically significant resources, including candidate, threatened and endangered species and their habitats in the Plan Area, and to ensuring that the Covered Activities comply with applicable federal and state laws.

(d) Caltrans is a department of the California State Transportation Agency established under the provisions of the California Government Code Sections 14000 *et seq*. Caltrans is the owner and operator of the state highway system. It is the lead agency for construction and rehabilitation projects undertaken on the state highway system. Caltrans is expected to act as Construction Lead on behalf of OCTA for certain freeway capital improvement projects. Caltrans will implement freeway improvement projects as a Participating Special Entity and OCTA will issue a Certificate of Inclusion to Caltrans on a project-by-project basis that will describe the authorized Take and required avoidance and minimization measures.

(e) The Plan Area set forth in Exhibit A, defined below, and as described in the Plan Section 1.2.2.1, has been determined to provide habitat for the Listed Species and Unlisted Species set forth in Exhibit B;

(f) In 2009, OCTA, Caltrans, the Service, and CDFW entered into a Planning Agreement that identified goals, objectives, guidelines, criteria and procedures for the preparation of a joint NCCP and HCP. For purposes of the NCCPA, the Plan and this Agreement have been prepared according to the Planning Agreement.

(g) OCTA has developed a series of measures, described in Chapter 5 of the Plan, to minimize and mitigate to the maximum extent practicable the effects of Take of Covered Species as a result of the Covered Activities, and to adequately provide for the conservation and management of the Covered Species and their habitat.

(h) OCTA is making substantial commitments of land, natural resources, financial resources, and human resources to provide for the conservation and management of the Covered Species, their habitats and other natural communities to obtain Take authorizations and regulatory assurances from the Wildlife Agencies.

2.2 Purposes

The purpose of this Agreement is to clarify the provisions of the Plan and the processes the Parties intend to follow to ensure successful implementation of the Plan in accordance with the State and Federal Permits and applicable law.

3.0 DEFINITIONS

Terms used in this Agreement and specifically defined in CESA, the NCCPA, the ESA, or in regulations adopted pursuant to those statutes shall have the same meaning when utilized in this Agreement, unless this Agreement expressly provides otherwise.

3.1 Agreement

"Agreement" means this Implementing Agreement, which incorporates the NCCP/HCP and the Permits by reference.

3.2 Annual Report

"Annual Report" means the Annual Report prepared by the Permittee, as provided in Section 9.1.

3.3 Authorized Take

"Authorized Take" means the extent of Take of Covered Species authorized by the Federal and State Permits.

3.4 CDFW

"CDFW" means the California Department of Fish and Wildlife, a department of the California Natural Resources Agency.

3.5 CEQA

"CEQA" means the California Environmental Quality Act (Pub. Resources Code §21000 *et seq*.) and all rules, regulations and guidelines promulgated pursuant to that Act.

3.6 CESA

"CESA" means the California Endangered Species Act (Fish & Game Code, §2050 *et seq*.) and all rules, regulations and guidelines promulgated pursuant to that Act.

3.7 Changed Circumstances

"Changed Circumstances" for purposes of the Federal Permit, means changes in circumstances affecting a species or the geographic area covered by the Plan that can reasonably be anticipated by Permittee and the Service, and that can be planned for in the Plan (50 C.F.R. § 17.3). Changed Circumstances and planned responses to those circumstances are described in Section 8.6.2 of the Plan. Under California law, "Changed Circumstances" are defined to mean reasonably foreseeable circumstances that could affect a Covered Species or the geographic area covered by the NCCP (California Fish and Game Code § 2805 (c)).

3.8 Conservation Easement

"Conservation Easement" means a conservation easement as that term is used in California Civil Code Section 815 *et seq*. and is described by California Civil Code Section 815.1 as any limitation in a deed, will, or other instrument in the form of an easement, restriction, covenant, or condition, which is or has been executed by or on behalf of the owner of the land subject to such easement and is binding upon successive owners of such land, the purpose of which is to retain land predominantly in its natural, scenic, historical, agricultural, forested, or open-space condition.

3.8 Conservation Measure

"Conservation Measure" means each action detailed in Chapter 5 of the Plan that is a component of the Conservation Strategy.

3.9 Construction Lead

"Construction Lead" means the agency that will have primary responsibility for implementing construction activities.

3.10 Covered Activities

"Covered Activities" means the freeway capital improvement projects and the conservation activities described in Chapter 3 of the Plan that may result in Take of Covered Species authorized under the Permits.

3.11 Covered Species

"Covered Species" means those species listed in Exhibit B to this agreement, each of which the Plan addresses in a manner intended to meet all of the criteria for issuing a permit under the NCCPA and an Incidental Take permit under the ESA.

3.12 Effective Date

"Effective Date" means the date following execution of this Agreement by all Parties on which the State Permit and Federal Permit are issued.

3.13 Early Action Plan

"Early Action Plan" means a Plan that the OCTA Board of Directors approved on August 13, 2007 (five-year Measure M2 Early Action Plan) to advance the implementation of several key Measure M2 projects, including providing funding for the Plan, acquisition of Preserves, funding of restoration projects, and related activities.

3.14 ESA

"ESA" means the Federal Endangered Species Act of 1973, as amended (16 U.S.C § 1531 *et seq*.) and all rules, regulations and guidelines promulgated pursuant to that Act.

3.15 Federally Listed Species

"Federally Listed Species" means the Covered Species that are listed as threatened or endangered species under the ESA as of the Effective Date, and the Covered Species that are listed as threatened or endangered pursuant to the ESA during the term of the Plan as of the date of such listing.

3.16 Federal Permit

"Federal Permit" means the federal incidental Take permit issued by the Service to Permittee pursuant to Section 10(a)(1)(B) of the ESA.

3.17 Fully Protected Species

"Fully Protected Species" means any species identified in California Fish and Game Code Sections 3511 (birds), 4700 (mammals), 5050 (amphibians and reptiles) or 5515 (fish). No Fully Protected Species are Covered Species under this Plan.

3.18 HCP

"HCP" means the habitat conservation plan prepared by Permittee for the Plan Area.

3.19 Listed Species

"Listed Species" means a species (including a subspecies, or a distinct population segment of a species) that is listed as an endangered or threatened species under the ESA or as an endangered, threatened or candidate species under CESA.

3.20 Migratory Bird Treaty Act

"Migratory Bird Treaty Act" means the federal Migratory Bird Treaty Act (16 U.S.C. §703 *et seq*.) and all rules, regulations and guidelines promulgated pursuant to that Act.

3.21 NCCP

"NCCP" means a natural community conservation plan prepared according to the California Natural Community Conservation Planning Act.

3.22 NCCPA

"NCCPA" means the California Natural Community Conservation Planning Act (Fish & Game Code, §2800 *et seq.*), as amended on January 1, 2012, and all rules, regulations and guidelines promulgated pursuant to that Act.

3.23 NCCP Permit or State Permit

"NCCP Permit" or "State Permit" means the Permit issued in accordance with this Agreement by CDFW under Section 2835 of the California Fish and Game Code to permit the Take of Covered Species.

3.24 NEPA

"NEPA" means the National Environmental Policy Act (42 U.S.C. § 4321 *et seq.*) and all rules, regulations and guidelines promulgated pursuant to that Act.

3.25 No Surprises Assurances

"No Surprises Assurances" with regard to the Federal Permit means the regulations at 17.3, 17.22(b)(5), and 17.32(b)(5) that govern the ability of the Service to require conservation and mitigation measures beyond those provided in the Plan in the event of an Unforeseen Circumstance where Permittee is properly implementing the terms of the Plan and Federal Permit. With regard to the NCCP Permit, No Surprises Assurances means that if there are Unforeseen Circumstances CDFW will not require additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources for the life of the NCCP Permit without the consent of Permittee, provided Permittee is implementing the Plan, the Permits, and this Agreement, unless CDFW determines that continued implementation of the Plan would jeopardize the continued existence of a Covered Species (California Fish and Game Code § 2820 (f)).

3.26 Non-listed Species

"Non-listed Species" means a species (including a subspecies, or a distinct population segment of a species) that is not listed as endangered or threatened under the ESA or CESA.

3.27 Participating Special Entity

"Participating Special Entity" means Caltrans.

3.28 Party or Parties

"Party" and "Parties" mean the signatories to this Agreement, individually and collectively.

3.29 Permit Area

"Permit Area" means the portion of the Plan Area within which the Permittee is seeking authorization from the Wildlife Agencies for the Take of Covered Species resulting from Covered Activities. The Permit Area includes those lands in the Plan Area that are defined by either of the following parameters: (1) the lands along existing freeways (I-5, I-405, SR-22, SR-55, SR-57, SR-91) on which M2 freeway capital improvement projects will be conducted (Exhibit A); or (2) the boundary of any land protected and managed under the Plan (i.e., Preserves).

3.30 Permits

"Permits" means the Federal HCP Permit and the NCCP Permit.

3.31 Permittee

"Permittee" means OCTA.

3.32 Plan Area

"Plan Area" means the area covered by the NCCP/HCP. The Plan Area is described in Chapter 1 of the NCCP/HCP and depicted in Exhibit A of this Agreement.

3.33 Planning Agreement

"Planning Agreement" means the Planning Agreement regarding the OCTA NCCP/HCP executed in 2009 and amended in 2014 by OCTA, Caltrans, the Service, and CDFW.

3.34 Renewed Measure M or M2

"Renewed Measure M" or "M2" means the Orange County Renewed Measure M Transportation Ordinance and Investment Plan, approved by Orange County voters in November 2006. The Renewed Measure M is an extension of a ½-cent transportation sales tax, beginning in 2011 through 2041, for transportation improvements throughout Orange County.

3.35 Preserve or Preserve Area

"Preserve" or "Preserve Area" means the land dedicated in perpetuity through fee title, conservation easement or equivalent legal protection mechanism to meet the preservation, conservation, enhancement and restoration objectives of the Conservation Strategy of the Plan.

3.36 Rough Proportionality

"Rough Proportionality" means implementation of mitigation and Conservation Measures under the Plan that is roughly proportional in time and extent to the impact on habitat or Covered Species authorized under the Plan and Permits.

3.37 Specially Protected Mammal Species

"Specially Protected Mammal Species" means any species identified in California Fish and Game Code Section 4800. One Specially Protected Mammal Species, the mountain lion, is a Covered Species under the Federal HCP Permit.

3.38 Take and Taking

"Take" and "Taking" have the same meaning provided by the ESA and its implementing regulations with regard to activities subject to the ESA, and also have the same meaning provided in Section 86 of the California Fish and Game Code with regard to activities subject to CESA and NCCPA. "Take" under the ESA does not apply to plant species, and Take of plant species is not prohibited under the ESA; however, the plant species identified in Exhibit B are listed on the Federal Permit as Covered Species in recognition of the conservation measures provided for them under the Plan and receive "No Surprises" regulatory assurances under the Federal Permit. For the purposes of this Agreement, Take includes impacts to covered plant species. For purposes of state law, Take shall have the same meaning provided in Section 86 of the California Fish and Game Code.

3.39 Unforeseen Circumstances

"Unforeseen Circumstances" as defined at 50 C.F.R. § 17.3 means, with regard to the Federal Permit, changes in circumstances affecting a species or geographic area covered by the Plan that could not reasonably have been anticipated by Permittee and the Service at the time of the Plan's negotiation and development, and that result in a substantial and adverse change in the status of the Covered Species. Under the State Permit "Unforeseen Circumstances" as defined at Fish and Game Code Section 2805, subdivision (k), means changes affecting one or more species, habitat, natural community, or the geographic area covered by a conservation plan that could not reasonably have been anticipated at the time of plan development, and that result in a substantial adverse change in the status of one or more Covered Species.

3.40 Unlisted Species

"Unlisted Species" means a species (including a subspecies, or a distinct population segment of a vertebrate species) that is not listed as endangered or threatened under CESA or the ESA.

4.0 CONSERVATION STRATEGY

Chapter 5 of the Plan presents the Conservation Strategy. The Conservation Strategy identifies the Take mitigation and minimization requirements for the Covered Activities intended to ensure that these activities are in compliance with the ESA, NCCPA, and CEQA, and other applicable environmental regulations. The Conservation Strategy includes specific and measurable biological goals and objectives that will be met through the acquisition of a Preserve Area that provides for the protection of habitat, natural communities, and species diversity on a landscape level. The Conservation Strategy also includes project-specific conservation measures to avoid, minimize, and mitigate impacts of the Covered Activities on Covered Species and their habitats. The creation and protection of the Preserve Area together with these conservation measures are intended to provide for the conservation of the Covered Species by (1) helping to maintain the ecological integrity of large habitat blocks, ecosystem functions, and biological diversity in the Plan Area; (2) providing linkages between natural communities, including Covered Species habitat, in the Plan Area; (3) providing large habitat blocks that support sustainable populations of Covered Species; (4) incorporating lands that represent a range of environmental gradients and habitat diversity to provide for shifting species, including

Covered Species, distributions due to Changed Circumstances; and (5) providing lands that support the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the Covered Species habitat areas within the Plan Area. Lastly, the Conservation Strategy provides for the establishment of a monitoring and adaptive management program to ensure that management of the Preserve Area can evolve as new data and information become available. The Plan outlines the requirements of the Permittee for implementation of the Conservation Strategy.

4.1 Avoidance and Minimization of Impacts

The conservation strategy includes measures to avoid and minimize Take of Covered Species and to conserve natural communities and Covered Species at the landscape, habitat, and species level. Avoidance and minimization measures include species surveys and specific conditions on Covered Activities, as detailed in Chapter 5 of the Plan. Permittee shall implement, or ensure the implementation of, all applicable avoidance and minimization measures as required by the Plan.

4.2 Land Acquisition and Assembly of Preserve Areas

Permittee may acquire lands for the Preserve Area by fee title or by Conservation Easement. All fee title acquisitions will be held in fee by a Wildlife Agency or be protected by a Conservation Easement in favor of an entity approved in writing by the Wildlife Agencies that ensures that the acquired lands are protected in perpetuity as open space for Covered Species and their habitats. If Permittee acquires Preserve land by Conservation Easement, the terms of the Conservation Easements must be approved in writing by the Wildlife Agencies and identify the Wildlife Agencies as third party beneficiaries with a right of access to the easement areas and the right to enforce the terms of the Conservation Easement. All Conservation Easements shall be recorded in perpetuity pursuant to Civil Code Section 815 *et seq*. and shall be subject to the Preserve Area commitments of the Plan.

Although not required by the Plan, this Agreement, or the Permits, OCTA may elect to acquire additional lands for the Preserve Area in the future. If OCTA elects to add additional lands to the Preserve, the identification, selection, and acquisition of the future Preserve(s) will be completed following the Environmental Oversight Committee (EOC) Preserve selection process. The Wildlife Agencies will have the opportunity to review and approve the selection of future Preserves. Any future Preserves and Conservation Easements put in place and recorded on such lands must have the approval of the Wildlife Agencies.

4.3 Land Acquired Through Partnerships with Other Agencies and Organizations

Permittee may enter into agreements and other partnerships involving land acquisitions within the Plan Area with other land management agencies and organizations where those acquisitions meet the goals and objectives of the Plan. However, such acquisitions will be formally credited towards the obligations set forth in the Plan only where the Wildlife Agencies approve the acquisition and concur that the acquisition (a) contributes to meeting the goals and objectives of the Plan, (b) contains a Conservation Easement that meets the requirements of Section 4.2 (unless owned in fee by the Wildlife Agencies), and (c) will be managed in perpetuity pursuant to a Resource Management Plan (RMP).

4.4 Credit for Lands Acquired and Restoration Projects Funded Before Issuance of the Permits

The Plan's Preserve Area includes lands acquired before issuance of the Permits that shall be credited towards the land commitments and obligations of the Plan once Permittee records a Conservation Easement. The lands shall be formally credited towards the Plan as follows:

Preserve Area		
Preserve	Total Acres [1]	Acres of Natural Habitat
Aliso	151.1	146.9
Ferber Ranch	395.7	380.4
Hafen	48.0	47.9
Hayashi	298.8	293.6
MacPherson	203.5	200.0
O'Neill Oaks	116.1	112.4
Saddle Creek South [2]	82.8	51.3
Total	**1,296.0**	**1,232.5**

[1] These acreages are approximate based on the best currently available survey data. Final acreages are not expected to vary significantly, but may be adjusted slightly in the future when more accurate data is available.

[2] Saddle Creek South Preserve was purchased, in part, with funding provided by the National Fish and Wildlife Foundation. OCTA receives a percentage of the available credits based on the percentage of the total cost of acquiring and managing the Preserve contributed by OCTA (75.36%).

The Plan provides for credits for restoration projects funded during preparation of the Plan on lands permanently protected through conservation easements, restrictive covenants, deed restrictions, or equivalent title restrictions approved by the Wildlife Agencies. The

Wildlife Agencies, in their sole discretion, may approve habitat restoration projects on United States Forest Service lands focused on improving conditions for arroyo chub to support sustainable populations in occupied areas, provided that the United States Forest Service provides adequate assurances of durability and addresses other relevant Wildlife Agency concerns. Credits under the Plan for the following restoration projects shall be available to Permittee once the Wildlife Agencies have concurred that the project has met the performance criteria established in the Wildlife Agency approved restoration plan, as follows:

- **Agua Chinon/Bee Flat – Irvine Ranch Conservancy**. 90.1 acres of restoration consisting of chaparral, grassland, coastal sage scrub, elderberry scrub, oak woodland, and riparian (mulefat scrub/elderberry shrubland).
- **Big Bend – Laguna Canyon Foundation**. 3.7 acres of restoration consisting of coastal sage scrub and riparian woodland to enhance wildlife connectivity.
- **City Parcel – City of San Juan Capistrano**. 53 acres of restoration consisting of riparian and coastal sage scrub within Trabuco Creek Wildlife Linkage.
- **Fairview Park – City of Costa Mesa**. 23 acres of restoration consisting of wetlands, grasslands, coastal sage scrub, and riparian.
- **UC Irvine Ecological Preserve – Nature Reserve of Orange County**. 8.5 acres of restoration consisting of cactus scrub.
- **Aliso Creek – Laguna Canyon Foundation**. 55 acres of restoration consisting of riparian and transitional habitat.
- **Chino Hills State Park – California Department of Parks and Recreation**. 13.5 acres of riparian restoration and 6.0 acres of cactus scrub restoration.
- **Harriett Weider Regional Park – Bolsa Chica Conservancy**. 8.2 acres of restoration consisting of grassland, coastal sage scrub, and riparian habitat.
- **Lower Silverado Canyon – Irvine Ranch Conservancy**. 28.4 acres of restoration consisting of riparian and coastal sage scrub habitat.
- **North Coal Canyon – California Department of Parks and Recreation**. 5.5 acres of restoration consisting of coastal sage scrub habitat within a key wildlife connectivity linkage area.
- **West Loma – Irvine Ranch Conservancy**. 62.47 acres of restoration consisting of coastal sage scrub and riparian habitat.

Conservation actions involving restoration projects include an estimate of conserved habitats based on conceptual restoration design plans. The final acreage of restored habitat may be refined during final restoration design and during implementation. Satisfaction of mitigation obligations will be achieved once the Wildlife Agencies concur in writing that the restoration project meets the restoration design success criteria.

Permittee has committed to funding additional restoration projects following the EOC restoration project selection process. The Plan identifies requirements for future restoration to ensure that the Plan provides conservation for all Covered Species.

5.0 PRESERVE AREA MANAGEMENT

Permittee shall remain solely responsible for ensuring the management of the Preserve in perpetuity in accordance with Wildlife Agency-approved RMPs, as those plans may be revised over time, and for the timeliness and quality of all requirements of preserve management. Management activities on all Preserve Area lands that are identified as obligations of the Plan are considered Covered Activities. Permittee may contract with another entity for management planning and plan preparation, and subsequently contract with a designated land manager to perform the various implementation tasks. The Preserve manager(s), which must be approved by the Wildlife Agencies, may be a land use agency(ies), non-profit organization(s), for-profit land management company(ies), or other qualified entity(ies). The Preserve manager will carry out the preserve management responsibilities described in Chapter 7 of the Plan.

5.1 Resource Management Plans

Within two years of the dedication of any parcel of land to the Preserve Area, as evidenced by recordation of a Conservation Easement or fee title held by a Wildlife Agency, Permittee shall ensure that an RMP for each parcel is finalized pursuant to Section 7.2 of the Plan after receiving written concurrence from the Wildlife Agencies. During the preparation of RMPs, Permittee shall be responsible for ensuring the land is managed in accordance with the Plan to maintain and improve Covered Species habitat using the best available information and management methods in practice within the Plan Area until the RMP is completed. The RMPs will be reviewed every five years and updated as necessary.

5.2 Recreation Uses

The Parties acknowledge that providing low-intensity recreational opportunities on Preserve Area lands may be acceptable, subject to appropriate constraints to protect Covered Species and natural communities. Permittee may integrate recreation planning goals and objectives (Section 7.2.5, “Preserve Management Guidelines”, of the Plan) into the RMPs to the extent consistent with the Plan’s biological goals and objectives and the requirements of this Agreement and the Permits, and subject to the prior written concurrence of the Wildlife Agencies. Permittee recognizes that recreation opportunities, and thus any recreation planning goals and objectives, are secondary to the need to protect biological resources committed for conservation under the Plan. Permittee shall manage all recreational uses allowed under the RMPs to ensure such uses are consistent with the RMP. In the event that recreationists fail to follow rules for access/conduct/site use resulting in habitat damage and/or disturbance to wildlife beyond that contemplated in the Plan, Permittee may need to curtail uses or eliminate public access on a temporary or permanent basis as necessary to achieve compliance with the RMPs.

6.0 COVERED ACTIVITIES

This section describes the Covered Activities within the Permit Area for which the Plan will provide compensation, avoidance, and minimization of impacts for Covered Species. These are the Covered Activities for which Take authorization will be obtained. As stated in Section 5.6 of the Plan, avoidance and minimization measures are requirements that will be evaluated and implemented on a project-by-project basis for each Covered Activity. These include measures to avoid sensitive biological resources and species specific minimization measures. The Plan includes coverage for two major categories of Covered Activities:

- Freeway capital improvement projects proposed by OCTA along 13 highway segments as described in Section 6.1 and additional future minor freeway capital improvement projects funded by M2 and described in Section 6.2.
- Preserve Management, Restoration, and Monitoring Activities as described in Section 6.3.

6.1 Freeway Capital Improvement Projects

Freeway capital improvement projects covered by the NCCP/HCP include the thirteen freeway capital improvement projects proposed by Permittee through its M2 transportation planning and project implementation process. These proposed projects are designed to reduce congestion, increase capacity, and improve traffic flow of Orange County's important transportation infrastructure. The freeway improvement projects are, in all instances, along existing freeways and will include lane additions, interchange improvements, and associated facility upgrades. Freeway capital improvement projects do not include the construction of new freeways.

There are 13 discrete proposed freeway segments in which freeway capital improvement projects have been identified for coverage under the Plan, which are described in greater detail below.

1) **Project A: Santa Ana Freeway (Interstate 5) Improvements between Costa Mesa Freeway (State Route 55) and "Orange Crush" Area (State Route 57)**
The objective of Project A is to increase freeway capacity and reduce congestion on the Santa Ana Freeway (I-5). Project A would affect two segments: Segment 1, extending from SR-55 to SR-57, and Segment 2, located at the I-5/SR-55 interchange. These Improvements would add capacity on I-5 between SR-55 and SR-57 and relieve congestion at the I-5/SR-57 interchange, an area known as the "Orange Crush." Construction would take place within the existing right-of-way. Interchange improvements would occur between the Fourth Street and Newport

Boulevard ramps on I-5, between Fourth Street and Edinger Avenue on SR 55 as it crosses SR-55 and SR-57. Project-specific improvements are subject to approved plans developed in coordination with local jurisdictions and affected communities.

2) **Project B: I-5 Improvements from SR-55 to El Toro "Y" Area**
The objective of Project B is to increase freeway capacity and reduce congestion on I-5 between SR-55 and I-405, an area known as the El Toro "Y." These improvements would consist of construction of new lanes and improvements to existing interchanges. Project B construction would take place within the existing right-of-way. Specific improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities.

3) **Project C: North and South Portions of I-5 Improvements between El Toro Interchange and Avenida Pico**
The objective of Project C is to increase freeway capacity and reduce freeway congestion on I-5 south of the El Toro "Y". It is also intended to improve and update key interchanges on I-5 to relieve street congestion around older interchanges and on ramps.

The north portion of Project C (Segment 1) would improve I-5 south of the El Toro "Y" by constructing new lanes from the vicinity of the El Toro interchange in Lake Forest to the vicinity of SR-73 in Mission Viejo. The south portion of Project C (Segment 2) involves improvements similar to those proposed for the north portion between Pacific Coast Highway and Avenida Pico to reduce freeway congestion in San Clemente.

Project C also involves major improvements to local interchanges. Project C, Segment 2 includes the I-5/Avenida Pico interchange. Project C, Segment 1 includes the I-5/Avery Parkway interchange and the I-5/La Paz Road interchange. Project C construction takes place within the existing right-of-way. Specific improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities.

4) **Project D: I-5 Local Interchange Upgrades**
Project D updates and improves the following key interchanges on I-5:

- I-5/Avenida Pico Interchange—integrated into Project C, Segment 2
- I-5/Ortega Highway Interchange
- I-5/Avery Parkway Interchange—integrated into Project C, Segment 1

- I-5/La Paz Road Interchange—integrated into Project C, Segment 1
- I-5/El Toro Interchange

These interchanges occur in southern Orange County, in the vicinity of Mission Viejo, Laguna Niguel, San Juan Capistrano and San Clemente. Improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities.

5) **Project E: Garden Grove Freeway (SR-22) Access Improvements**
Project E improves interchanges along SR-22 at Euclid Street, Brookhurst Street, and Harbor Boulevard in order to reduce freeway and surface street congestion near these interchanges. Specific improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities.

6) **Project F: SR-55 Improvements**
The objective of Project F is to increase freeway capacity and reduce congestion through the addition of new lanes to SR-55 between the Garden Grove Freeway (SR-22) and the San Diego Freeway (I-405). The south portion of Project F (Segment 1) is between I-405 and I-5. The north portion of Project F (Segment 2) is between I-5 and SR-22. These improvements include merging lanes between interchanges to smooth traffic flow. Project F would also provide freeway operational improvements for the portion of SR-55 between SR-91 and SR-22.

7) **Project G: SR-57 between Orangewood Avenue and Lambert Road Northbound—General-Purpose Lane Improvements**
The objective of Project G is to increase freeway capacity and reduce congestion associated with SR-57. This project is composed of several segments.

- Segment 1a: Construction of a northbound lane between Orangewood Avenue and Katella Street.
- Segment 1b: Construction of a northbound lane between Katella Street and Lincoln Avenue.
- Segment 2a: Construction of a northbound lane between Orangethorpe Avenue and Yorba Linda Boulevard.
- Segment 2b: Construction of a northbound lane between Yorba Linda Boulevard and Lambert Road.
- Segment 3: Improvements to the Lambert Interchange

- Segment 4: Construction of a northbound truck climbing lane between Lambert Road and Tonner Canyon Road.

The improvements are designed and coordinated specifically to reduce congestion at the SR-57/SR-91 interchange. All improvements associated with Project G generally would occur within the existing right-of way. Specific improvements are subject to approved plans developed in coordination with local jurisdictions and affected communities.

8) **Project H: Project H: Riverside Freeway (SR-91) from SR-57 to I-5 Westbound—General-Purpose Lane Improvements**
Project H adds capacity in the westbound direction on State Route 91 to smooth traffic flow and relieve congestion in the SR-57/SR-91 interchange. It also provides operational improvements at on- and off-ramps to SR-91 between I-5 and SR-57. These improvements generally occur within the existing right-of-way. Specific improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities.

9) **Project I: SR-91 Improvements from SR-57 to SR-55 Interchange**
Project I would add freeway capacity to SR-91 between SR-57 and SR-55. Project I (Segment 1) includes improvements to the SR-91/SR-55 and SR-91/SR-57 interchange complexes and nearby local interchanges at Tustin Avenue and Lakeview Avenue.

Project construction generally would occur within the existing right-of-way. Specific improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities.

10) **Project J: SR-91 Improvements from SR-55 to the Orange County/Riverside County Line**
Project J would improve SR-91 from SR-55 to the Orange County/Riverside County boundary. The project would provide up to four new lanes of capacity between SR-241 and the Riverside County line by adding reversible lanes, building elevated sections, and improving connections to SR-241. These projects would be constructed in conjunction with similar coordinated improvements in Riverside County extending to I-15.

Improvements in Riverside County are paid for from other sources. Specific improvements are subject to approved plans and are developed in cooperation with local jurisdictions and affected communities.

11) **Project K: San Diego Freeway (I-405) Widening Project from SR-55 to San Gabriel River Freeway (I-605)**
Project K would increase freeway capacity and reduce congestion associated with I-405. The proposed project would add new lanes to the San Diego Freeway between I-605 and SR-55, generally within the existing right-of-way. The project would update interchanges and widen all local overcrossings according to city and regional master plans.

The proposed improvements are coordinated with other planned I-405 improvements, including improvements to the I-405/SR-22/I-605 interchange area to the north and I-405/SR-73 improvements to the south. The improvements adhere to the recommendation of the I-405 major investment study, adopted by the OCTA in October 2005, and are developed in coordination with local jurisdictions and affected communities.

12) **Project L: Project L: I-405 Improvements between SR-55 and I-5**
Project L would increase freeway capacity and reduce congestion associated with I-405. The proposed project would add new lanes to I-405 from SR-55 to I-5. The project would ease chokepoints at interchanges and add merging lanes near on- and off-ramps such Irvine Center Drive and SR-133, and to improve overall freeway operations in the I-405/I-5 El Toro "Y" area. Project L, Segment 2 includes improvements at the Lake Forest Interchange on the I-5.

Project L is constructed generally within the existing right-of-way. Specific improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities.

13) **Project M: I-605 Freeway Access Improvements**
Project M would improve freeway access and arterial connection to I-605 serving the communities of Los Alamitos and Cypress. The project is coordinated with other planned improvements along SR-22 and I-405. Specific improvements are subject to approved plans developed in cooperation with local jurisdictions and affected communities. This improvement connects to interchange improvements at I-405 and SR-22 as well as new freeway lanes between I-405 and I-605. This project is integrated with Project K.

6.2 Future Minor Freeway Capital Improvement Projects

In addition to the thirteen freeway capital improvement projects outlined above, additional future minor freeway capital improvement projects are eligible for coverage under the Plan as Covered Activities provided that the projects meet the guidelines for Covered Activities as described in Chapter 3 of the Plan, meet all HCP and NCCP Permit requirements, including those outlined in Chapter 3 of the Plan, occur within the Permit Area, and do not result in exceedance of the acreage impact caps established for the Plan, additional Take of Covered Species, or greater or significantly different impacts to the environment than analyzed in the NEPA/CEQA document for the NCCP/HCP, as determined by the Wildlife Agencies.

6.3 Preserve Management, Restoration, and Monitoring Activities

Preserve Management, Restoration and Monitoring Activities are the long-term habitat management activities associated with Preserves, described in Chapter 3 of the Plan, that may result in Take of Covered Species during the term of the Plan and for which Take coverage is provided under the Take authorizations. These Covered Activities include the following categories:

- Management and recreational facilities;
- Management activities;
- Habitat enhancement, restoration, and creation, including the collection of seed if performed, or directly overseen, by an experienced restoration specialist;
- Species surveys, monitoring, and research; and
- Responses to Changed Circumstances.

Public access and passive recreation that is consistent with the Plan and RMPs will be a compatible use that does not require coverage under the Permit because it is not anticipated to result in Take of Covered Species.

7.0 TAKE AUTHORIZATIONS FOR PERMITTEE

Following execution of this Agreement by all Parties and a determination that all applicable legal requirements have been met, the Service will issue a Federal Permit under Section 10(a)(1)(B) of the ESA to Permittee that authorizes the incidental Take of Covered Species resulting from Covered Activities, and CDFW will issue an NCCP Permit under Section 2835 of the California Fish and Game Code to Permittee that authorizes the Take of Covered Species resulting from Covered Activities. This Agreement will take effect with regard to the Federal Permit and NCCP Permit, respectively, upon issuance of each Permit.

Authorized Take under the Permits will cover the Permittee, the Participating Special Entity to the extent provided under Section 7.1, and entities and persons who are under the direct control of Permittee for purposes of implementing the Covered Activities under the Permits, including all of its respective officers, directors, employees, agents, subsidiaries, member agencies, and contractors, as applicable, who engage in any Covered Activity and implementation of the Plan.

7.1 Extension of Take Authorizations to the Participating Special Entity

For any Covered Activity for which the Participating Special Entity assumes the role of Construction Lead, the Participating Special Entity shall sign a Certificate of Inclusion under the Federal Permit and a Certificate of Inclusion under the State Permit for that Covered Activity in substantially the same form as Exhibits C and D, respectively. Revisions to the template Certificates of Inclusion must be approved in writing by the Wildlife Agencies. The Permittee shall then issue to the Participating Special Entity the Certificates of Inclusion, which specifically describe the Authorized Take under the Federal and State Permits, respectively, and required avoidance and minimization measures and extend Take authorization under the Permits to the Participating Special Entity. Permittee represents that it has legal control over the Participating Special Entity for the purposes of implementing the terms and conditions of this Agreement, the Plan and the Permits and acknowledges that it is responsible for ensuring compliance by the Participating Special Entity with all applicable terms and conditions of this Agreement, the Plan and the Permits and is liable for any non-compliance by the Participating Special Entity with such terms and conditions. Upon Permittee's issuance of the Certificates of Inclusion to the Participating Special Entity, the Participating Special Entity may Take the Covered Species while carrying out the Covered Activity in the Permit Area in accordance with the terms and conditions of this Agreement, the Plan and the Permits. The Take authorization issued to the Participating Special Entity applies to all of its elected officials, officers, directors, employees, agents, subsidiaries, contractors, and subcontractors. The Participating Special Entity shall comply fully with the applicable terms and conditions of the Agreement, the Plan and the Permits and shall ensure that its elected officials, officers, directors, employees, agents, subsidiaries, contractors, and subcontractors comply with the applicable terms and conditions of the Agreement, Plan, and Permits. The Participating Special Entity shall be liable for any non-compliance with such terms and conditions, including non-compliance by its elected officials, officers, directors, employees, agents, subsidiaries, contractors, and subcontractors. Nothing in this Agreement or the Certificates of Inclusion shall limit CDFW's ability under the NCCPA to enforce the terms and conditions of this Agreement, the Plan and the NCCP Permit against the Permittee or the Participating Special Entity.

7.2 Take Authorizations for Non-Listed Covered Species

7.2.1 ESA Section 10

The Federal Permit will identify all Covered Species. The Federal Permit will Take effect for listed Covered Species at the time the Federal Permit is issued and, subject to compliance with the terms of the Federal Permit, will Take effect for an unlisted Covered Species upon the listing of such species. Any reference in this Agreement or the Plan to Incidental Take of Covered Species shall, for the purpose of Covered plant species refer to loss or impacts to Covered plant Species identified in the Permit.

7.2.2 NCCPA

Under the NCCPA, Take of unlisted species may be authorized under a Section 2835 permit. The State Permit authorizes the Take of all Covered Species as of the Effective Date, regardless of whether they have been listed under state law.

7.3 Take Authorizations for Migratory Bird Species

The Federal Permit to be issued in reliance on the Plan and this Agreement also constitutes a Special Purpose Permit under 50 Code of Federal Regulations Section 21.27 for the Take of Covered Species listed under the Migratory Bird Treaty Act (16 U.S.C. § 703 *et seq*. (MBTA)) that are also listed under the ESA as threatened or endangered. The Take of any of these birds as the result of a Covered Activity carried out in accordance with the Plan and the Federal Permit will not constitute a violation of the MBTA. The Special Purpose Permit will be valid for three years and will be renewed pursuant to the MBTA provided Permittee is in compliance with the Federal Permit. Each renewal of the Special Purpose Permit shall be for the maximum period of time allowed under 50 C.F.R. § 21.27 or its successor at the time of renewal, provided the Federal Permit remains in effect for such period. The Federal Permit shall also constitute a Special Purpose Permit for each of the unlisted MBTA Covered Species that may become listed under the ESA during the term of the Permit, concurrent with the listing of the species.

7.4 No Take Above Levels Authorized

The amount of Take for each Covered Species, including Take resulting from habitat modification authorized under the Permits, is defined in Chapter 6 of the Plan and in the Permits. Modifications to the Plan through adaptive management or other provisions of the Plan that would result in an increase in the Take of Covered Species beyond that analyzed under the original Plan and provided in the Permits are not authorized. Any such modification must be reviewed and approved as an NCCP/HCP and permit amendment. See Section 15.2 of this Agreement and Section 8.5 of the Plan.

Section 2820(b)(3) of the California Fish and Game Code requires that the Agreement include a provision specifying the actions CDFW shall Take if the level of Take exceeds that authorized by the Permit. For purposes of the NCCP Permit, if CDFW determines, after conferring with Permittee, that Take is occurring above levels authorized by the NCCP Permit, CDFW, at its discretion, may suspend or revoke the State Permit, in whole or in part, pursuant to the procedures in Section 16.2 of this Agreement. CDFW will work with Permittee to obviate the need for Permit revocation or suspension as stated in Section 8.7.2.6 of the Plan.

7.5 No Take Authorization for Fully Protected Species

No Fully Protected Species (as defined under Section 3.17) are included in the list of Covered Species, although six Fully Protected Species are expected to occur in the Plan Area. Take of these species is not proposed by Permittee nor authorized under the NCCP Permit, and CDFW acknowledges and agrees that the measures set forth in the Plan for the Covered Activities are intended to avoid causing the Take of any Fully Protected Species.

7.6 No Take Authorization for Specially Protected Mammal Species

One Specially Protected Mammal Species, mountain lion, is included in the list of Covered Species for the Federal HCP Permit. Take of this species is not proposed by Permittee, nor authorized under the NCCP Permit, and CDFW acknowledges and agrees that the measures set forth in the NCCP/HCP for the Covered Activities are intended to avoid causing the Take of this Specially Protected Mammal Species under state law.

8.0 OBLIGATIONS OF THE PARTIES

8.1 Obligations of Permittee

Permittee will fully and faithfully perform all obligations assigned to it under the Plan, this Agreement and the Permits, including overseeing and managing implementation of the Plan and compliance with all take avoidance, minimization, and mitigation measures, all responses to Changed Circumstances, all monitoring and reporting requirements, and funding of the Plan. Permittee shall undertake all necessary actions to enforce the terms of the Plan, this Agreement and the Permits as to itself and all entities and persons under its direct control to which it extends Take authorization, including, upon issuance of a Certificate of Inclusion, the Participating Special Entity. Any non-compliance by Permittee or an entity or person under its direct control for purposes of the Permits, including the Participating Special Entity, may be deemed by the Service or CDFW as a violation by Permittee of the Federal Permit or State Permit, respectively. In particular, covered freeway capital improvement projects will be implemented by Permittee, in coordination with the Participating Special Entity and contractors, in conformance with the Plan, this Agreement, and the Permits. Preserve Management Covered Activities will be implemented by Permittee and its management entities in conformance with the Plan, this Agreement, and the Permits.

8.1.1 Role of Permittee

Permittee's responsibilities for implementing the Plan include, but are not limited to:

- Overseeing the assembly and management of the Preserve Area as further described in the Plan and summarized in Sections 4 and 5 of this Agreement;
- Funding and overseeing Plan implementation, including all Take minimization, mitigation and other conservation measures applicable to Covered Activities both within and outside of the Preserve Area;
- Ensuring compliance by the Participating Special Entity with the Plan, the Agreement, and the Permits;
- Ensuring mitigation and conservation measures are being implemented roughly proportional in time and extent to the impact of Authorized Take, as provided in Section 16.2.2 of this Agreement;
- Providing technical support and advice to Preserve Managers about what Plan measures apply to Covered Activities and how they should be applied, including, but not limited to, avoidance and minimization measures;
- Promoting coordination among Preserve Managers to ensure that the Plan is implemented consistently and effectively;
- Preparing or ensuring the preparation of RMPs, as further described in Section 5.1 of this Agreement and Section 7.2 of the Plan;
- Monitoring, adaptive management and Changed Circumstances;
- Information management; and
- Preparing the Annual Report.

8.1.2 Coordination between Permittee and other Regional Conservation Plans

The Plan Area adjoins or overlaps with 2 other regional HCPs, the County of Orange Central and Coastal Subregion NCCP/HCP, and the Southern Orange County HCP. The Conservation Strategy for the Plan is designed to enhance the overall level of conservation in Orange County by building on existing conserved lands and providing increased connectivity between existing conserved lands and thus is consistent with overlapping and adjoining plans.

8.2 Obligations of the Participating Special Entity

It is expected that the Participating Special Entity will assume the role of Construction Lead on behalf of the Permittee for a number of freeway capital improvement projects that are Covered Activities. The Participating Special Entity will not assume any obligations for Covered Activities in Preserve Areas. For all Covered Activities for which the Participating Special Entity assumes the role of Construction Lead, the Participating

Special Entity will execute Certificates of Inclusion under the Federal and State Permits. The Participating Special Entity will fully and faithfully perform all obligations assigned to it under the Plan, this Agreement, the Certificates of Inclusion, and the Permits, specifically including the implementation of all applicable avoidance and minimization measures.

8.2.1 Role of Participating Special Entity

The responsibilities of the Participating Special Entity for implementing the Plan when it acts as Construction Lead include:

- Ensuring all applicable avoidance and minimization measures are implemented, including; (1) the aquatic resources and species policy; ; (2) covered plant species policy; (3) wildlife crossing policy; (4) nesting birds policy; (5) wildfire protection techniques; (6) stormwater and water quality BMPs; (7) streambed and wetland and riparian habitat avoidance and minimization measures and (8) standard avoidance and minimization measures BMPs;
- Ensuring funding for implementation of applicable avoidance and minimization measures;
- Reporting to the Permittee regarding implementation of the Covered Activity, including avoidance and minimization measures.

The Participating Special Entity has no obligations regarding implementation of the following Plan components:

- Mitigation measures, including measures related to assembly and management of the Preserve Area;
- Preparing RMPs
- Monitoring, Adaptive Management, and Changed Circumstances;
- Preparing the Annual Report.

8.2.2 Remedies and Enforcement by Permittee Against the Participating Special Entity

If the Participating Special Entity fails to comply with applicable terms of this Agreement, the Plan, the Certificates of Inclusion, or the Permits, the Permittee may withdraw the Certificates of Inclusion and terminate any Take Authorization extended to the Participating Special Entity. Nothing in this Agreement shall limit the remedies otherwise available to OCTA in equity and in law to enforce compliance.

8.3 Obligations of the Service

8.3.1 Permit Issuance, Implementation and Monitoring

Following execution of this Agreement by each Party and satisfaction of all other applicable legal requirements, the Service will issue Permittee a Federal Permit authorizing incidental Take by Permittee of each listed animal Covered Species resulting from Covered Activities within the Plan Area. The Permit will be conditioned on compliance with all terms and conditions of the Permit, including the Plan, this Agreement and applicable law. The Service shall cooperate and provide to the extent appropriated funds are available for that purpose, technical assistance to Permittee in implementing the Federal Permit. The Service will use its reasonable efforts to expeditiously review all conservation easements or equivalent legal mechanisms proposed to conserve lands dedicated to the Preserve Area and all RMPs submitted to it for review and approval under the Plan. The Service shall also monitor Permittee’s implementation of the Plan, this Agreement and the Federal Permit to ensure compliance.

8.3.2 Consultation with Public Agencies

To the maximum extent allowable, in any consultation on any Covered Activity involving Permittee under Section 7 of the ESA, the Service shall ensure that the biological opinion issued in connection with the proposed action is consistent with the biological opinion issued for issuance of the Section 10 Permit for the Plan, provided that the Covered Activity as proposed in the consultation is consistent, and will be implemented in accordance with the Plan, this Agreement and the Federal Permit. Any reasonable and prudent measures and terms and conditions in the biological opinion on the proposed action shall, to the maximum extent appropriate and allowable under Section 7 and its implementing regulations, be consistent with and not be in excess of those measures required of the Permittee under the Plan, this Agreement and the Federal Permit.

8.3.3 Future Environmental Review Under NEPA

In the event that the Service participates as a lead or cooperating agency under NEPA with respect to the implementation of a Covered Activity, the Service, to the maximum extent consistent with the requirements of NEPA and other applicable federal law, will utilize the NEPA document prepared for the Plan and Federal Permit.

8.4 Obligations of CDFW

8.4.1 CEQA

8.4.1.1 Agencies Responsible for CEQA Analysis

Permittee served as lead CEQA agency and CDFW has served as a responsible agency under CEQA regarding the development of the joint EIR/EIS for the Plan. Prior to or concurrent with the Effective Date, Permittee and CDFW each evaluated the Plan pursuant to CEQA and issued findings addressing whether the implementation of the Plan would cause significant adverse impacts to the environment.

8.4.1.2 Future Environmental Review Under CEQA

Unless otherwise required by CEQA or other applicable law, the Permittee and CDFW shall rely on and use relevant portions of the EIS/EIR and the CEQA findings when conducting future environmental review of Covered Activities. In the event that CDFW participates as a lead, responsible, or trustee agency under CEQA with respect to the implementation of a Covered Activity, CDFW will not require, recommend, or request the imposition of any additional or more stringent minimization or mitigation measures directed at the protection or conservation of Covered Species or their habitats. As a responsible or trustee agency under CEQA, CDFW will further notify the lead CEQA agency that any avoidance, minimization, and mitigation measures otherwise required for any impact to or Take of any Covered Species or habitat resulting from Covered Activities will be satisfied through the implementation of the Plan.

8.4.1.3 Lake and Streambed Alteration Agreements for Covered Activities

CDFW acknowledges and agrees that the Plan, this Agreement, and the NCCP Permit shall be deemed to provide an equivalent level of protection for wildlife, habitat, or other biological resources as the measures that would otherwise be required or recommended to address the impacts of Covered Activities on Covered Species pursuant to Fish & Game Code §§ 1600–1616.

In any future notification provided to CDFW under Section 1602 related to a Covered Activity, CDFW will ensure that any Streambed Alteration Agreement issued in response to the notification is consistent with the Plan (including the Streambed Program in Appendix E), this Agreement, and the NCCP Permit. Unless otherwise required by law or regulation, CDFW will not require through the Streambed Alteration Agreement additional land, water or other natural resources, or financial compensation or additional restrictions on the use of land, water, or other natural resources to address impacts of Covered Activities on Covered Species beyond the measures provided for under the Plan, this Agreement, and the NCCP Permit.

9.0 MONITORING AND ADAPTIVE MANAGEMENT

9.1 Preserve Management and Monitoring

Permittee will implement the Preserve Management and Monitoring Program as described in Section 7.2 of the Plan. The Permittee will conduct three main types of monitoring: compliance monitoring, effectiveness monitoring, and targeted studies. The Permittee will provide the results of all monitoring in its Annual Report. Compliance monitoring, also known as implementation monitoring, will track the status of Plan implementation and verify that the Permittee is meeting the terms and conditions of the Permits. Effectiveness monitoring assesses the biological success of the Plan. Specifically, it evaluates the implementation and success of the conservation strategy described in Chapter 5 of the Plan. Targeted studies will identify the best methodologies for monitoring, provide information about the efficacy of Preserve Area management techniques, and resolve critical uncertainties in order to improve Preserve Area management.

9.2 Permittee-initiated Adaptive Management

Permittee will implement and periodically evaluate the adaptive management provisions described in Section 7.2.7 of the Plan when changes in management practices are necessary to achieve the Plan's biological goals and objectives, or to respond to monitoring results or new scientific information. The overarching purpose of the monitoring and adaptive management program is to inform and refine Plan implementation so that it may achieve the goals and objectives of the Conservation Strategy as defined in Chapter 5 of the Plan. The Permittee will implement adaptive management by using information gathered from the monitoring program to inform and refine the future management of the Preserve Area as defined in Chapter 7 of the Plan. Permittee will be responsible for implementing the adaptive management program and will consider the recommendations of the Wildlife Agencies, science advisors, other land management agencies, and the public, as provided in this Section and as further described in Chapter 7 of the Plan. Permittee will notify and obtain concurrence of the Wildlife Agencies for any proposed adaptive management actions to be taken pursuant to this section. In addition, any major changes in the adaptive management program will require the approval of the Wildlife Agencies prior to implementation, including, but not limited to, any proposed actions that would be inconsistent with the Plan or detrimental to a Covered Species, introducing new and untested management techniques, discontinuing and replacing ineffective management techniques that are recommended in the Conservation Strategy, or applying management techniques on a much larger or smaller scale than envisioned in the Plan.

9.3 Wildlife Agency-initiated Adaptive Management

If either Wildlife Agency determines that one or more of the adaptive management provisions in the Plan have been triggered and Permittee has not changed its management practices in accordance with Section 7.2.7 of the Plan, then the Service or CDFW will notify Permittee and direct Permittee to make the required changes. Within 30 days of receiving such notice, Permittee will make the required changes and report to the Wildlife Agencies on its actions. Such changes are provided for in the Plan, and hence do not constitute Unforeseen Circumstances or required amendment of the Permits or Plans, except as provided in this section.

9.4 Reductions in Mitigation

Permittee will not implement adaptive management changes that may result in less mitigation than provided for Covered Species under the original terms of the Plan, unless the Wildlife Agencies first provide written approval. Permittee may propose any such adaptive management changes by notice to the Wildlife Agencies, specifying the adaptive management modifications proposed, the basis for them, including supporting data, and the anticipated effects on Covered Species, and other environmental impacts. Within 120 days of receiving such notice, the Wildlife Agencies will either: (1) approve the proposed adaptive management changes, (2) approve them as modified by the Wildlife Agencies, or (3) notify Permittee that the proposed changes constitute Permit amendments that must be reviewed under Section 15.2 of this Agreement.

9.5 No Increase in Take

Permittee is not authorized to implement adaptive management modifications that would result in change in the nature of Take or an increase in the amount or level of Take of Covered Species beyond that analyzed in connection with the original Plan and any amendments thereto. Any such modification must be reviewed as a Permit amendment under Section 15.2 of this Agreement.

10.0 REPORTING

10.1 Annual Report

Permittee will prepare an Annual Report on Plan implementation as further described in Section 8.4 of the Plan. The Annual Report will summarize actions taken to implement the Plan for the period January 1 through December 31. The Annual Report will include the following:

- Description and location of Covered Activities completed, including a summary of avoidance and minimization measures undertaken for each Covered Activity and any on-site restoration that is required to offset temporary impacts.
- Summary of total acres of natural habitat types impacted by Covered Activities and an accounting of the Plan-to-date habitat types impacts in comparison with the impact caps approved by the Plan.
- For covered plant species only, accounting in ledger-type format of credits and debits as described at 5.6.2.2 of the Plan.
- Summary of any impacts exceeding 0.10 acre to natural habitat resulting from Preserve management Covered Activities and an accounting of Plan-to-date natural habitat impacts in comparison with the thirteen-acre cap approved by the Plan.
- Summary of the status of Preserve management and monitoring activities, effectiveness monitoring, any actions taken through and results of adaptive management and any responses to Changed Circumstances;
- Summary of the status of Permittee-funded restoration projects, including the results of monitoring activities and any remedial actions taken to achieve success criteria.
- Summary of land added to the Preserve System.
- Summary of Plan funding, including endowment budgets. This will include the amount of earnings, amount spent or obligated, and annual inflation adjustments.
- Any revisions and amendments to the Plan, Agreement or Permits.

Permittee will provide a copy of the Annual Report to all Parties by March 15 of the year following the Reporting Period. The Annual Report shall be presented at an OCTA public workshop or meeting and copies of the Annual Report shall be made available to the public.

10.1.1 Other Reports

Permittee will provide, within 30 days of being requested by the Service or CDFW, any additional information in its possession or control related to implementation of the Plan for the purpose of assessing whether the terms and conditions of the Federal or State Permit, including the Plan, are being fully implemented.

10.1.2 Certification of Reports

All reports will include the following certification from a responsible official of Permittee who supervised or directed preparation of the report:

> I certify under penalty of law, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate and complete.

10.1.3 Monitoring Results

As provided in Section 9.1, the Permittee will provide the results of compliance monitoring, effectiveness monitoring, and targeted studies in the Annual Report. To fulfill the compliance monitoring obligation as stated in Sections 7.1 and 8.4 of the Plan, Permittee will summarize the amount of Take on an annual basis and provide this information in the Annual Report. Permittee will provide a summary for each year and a cumulative summary for all years of total acres of natural habitat types affected by Covered Activities in comparison with the impact cap approved by the Plan. The Parties will use the results of the Permittee's monitoring to ensure that the Plan is being properly implemented and to measure the Permittee's progress toward the successful implementation of the Plan's Conservation Strategy (Chapters 5 and 7).

10.2 Monitoring by the Wildlife Agencies

The Wildlife Agencies may conduct inspections and monitoring of the site of any Covered Activity and of any land within the Preserve system, and may inspect any data or records required by this Agreement, the Plan or the Permits, in accordance with applicable law and regulations in order to monitor compliance with the Permits.

11.0 CHANGED CIRCUMSTANCES

Section 8.6.2 of the Plan identifies changes in the circumstances affecting the Plan's Preserve Areas or Covered Species that reasonably can be anticipated and planned for and describes the responses to such changes that will be carried out by Permittee.

11.1 Response to Changed Circumstances

Permittee will give notice to the Wildlife Agencies within seven days after learning that any of the Changed Circumstances listed in Section 8.6.2 of the Plan has occurred. As soon as practicable thereafter, but no later than 30 days after learning of the Changed Circumstances, Permittee will undertake the response described in Section 8.6.2 of the Plan and will report to the Wildlife Agencies on its actions. Permittee will make such modifications without awaiting notice from the Wildlife Agencies.

11.1.1 Wildlife Agency-initiated Response to Changed Circumstances

If either Wildlife Agency determines that Changed Circumstances have occurred and that Permittee has not responded in accordance with Section 8.6.2 of the Plan, one or both of the Wildlife Agencies will so notify Permittee and will direct Permittee to make the required changes. Within 30 days of receiving such notice, Permittee will make the required changes and report to the Wildlife Agencies on its actions. Such changes are provided for in the Plan, and hence do not constitute Unforeseen Circumstances or require amendment of the Plan or Permits.

12.0 FUNDING

Permittee warrants that it has and will expend such funds as may be necessary to fulfill its obligations under the Plan and Permits. Permittee shall ensure that all required mitigation, conservation, monitoring, reporting, and adaptive management measures are adequately funded during the term of this Agreement, and that management, maintenance, monitoring, reporting, and adaptive management activities on Preserve Area lands are adequately funded in perpetuity. Section 8.3 of the Plan describes the Permittee's funding capacity and the funding process under Renewed Measure M and demonstrates that Permittee will ensure adequate funding to implement the Plan. For the initial years of Plan implementation, during which time the non-wasting endowment is being fully funded over a period of up to fifteen years, OCTA will fully fund Plan implementation, including Preserve management and monitoring, using annual appropriations from the M2 EMP revenue stream.

Permittee will promptly notify the Wildlife Agencies of any material change in the Permittee's financial ability to fulfill its obligations under the Plan and this Agreement. In addition to providing any such notice, Permittee will also include in its Annual Report to the Wildlife Agencies reasonably available financial information to demonstrate the Permittee's ability to fulfill its funding obligations.

12.1 Funding Endowments for Long-Term Management and Monitoring of Preserves

Within six months of issuance of the State Permit, OCTA will ensure that one or more permanent, non-wasting endowments are established, after the review and approval of the Wildlife Agencies, to fund in perpetuity Preserve Management, Restoration, and Monitoring Activities as described in Section 6.3, and for no other purpose. OCTA may hold and manage any of the endowments under Government Code Section 65968(b)(1) associated with a Preserve property that it holds, or, with the approval of the Wildlife Agencies, it may select a third party entity or entities qualified to hold and manage any of the endowments pursuant to Government Code Sections 65965 through 65968 .

OCTA may also be qualified to hold and manage any of the endowments under Government Code Section 65968(b)(2) based on the arrangements for the endowment detailed below, including, but not limited to, OCTA's qualifications, capitalization rate, return objectives, and the spending rule and disbursement policies. If OCTA chooses to retain responsibility for management of a portion of the Preserve and the associated endowment, it has a track record of managing endowment funds, including those for transit and commuter rail operations, and has a fully functioning treasury with appropriate investment policies and fund management experience. OCTA's management of the endowment will follow the safeguards and audit features applied to the M2 program including, but not limited to the following:

- All spending will be subject to an annual independent audit.
- Spending decisions will be annually reviewed and certified by an independent Taxpayer Oversight Committee.
- The endowment will be subject to public review at least every 10 years and an assessment of progress in delivery, public support, and changed circumstances. Any significant proposed changes to the endowment will be approved by the Taxpayer Oversight Committee (TOC) and OCTA Board. The Wildlife Agencies will be consulted on changes to the endowment prior to its presentation to the TOC and OCTA Board.
- All entities receiving funds will report annually on expenditures and progress in implementing projects.
- At any time, at its discretion, the Taxpayer Oversight Committee may conduct independent reviews or audits of the spending of endowment funds.

OCTA's endowment will be governed by the Uniform Prudent Management of Institutional Funds Act. OCTA's endowment funds are held in separate and distinct funds. Each fund is legally protected from the other funds. OCTA utilizes fund accounting for the recording of these assets. Furthermore, the EOC was established pursuant to the M2 Ordinance No. 3 to make recommendations to the OCTA Board on the allocation of net revenues for the EMP. Changes to the use of M2 funds related to the EMP will also require recommendations by the EOC.

The estimated endowment amount(s) will be based on an effective spending rate of 2.5% of average endowment value over a specified period. The final endowment funding requirements will be based on a Property Analysis Report (PAR) or PAR-like analysis that will be completed by OCTA within seven years of Plan approval. This analysis will itemize and define the long-term obligations at each Preserve using Preserve-specific information developed for the Preserve RMPs. The final endowment funding level will be based upon actual negotiated long-term management contracts for each individual Preserve. OCTA will coordinate with the Wildlife Agencies and obtain the Wildlife Agencies' review and approval of the PAR analysis and determination of the permanent endowment funding requirements.

Permittee will accumulate funding for the endowment(s) using the ongoing revenue generated for the M2 EMP and will fully fund the endowment no later than 15 years following Permit issuance in accordance with Section 8.3.3 of the Plan. An initial estimate of the endowment funding requirements is included in Table 8-2 of the Plan. The capitalization rate for the endowment is 2.5 % and the return objective is the median return that is achieved by comparable non-profit organizations.

After the endowment is fully funded, OCTA shall disburse to the designated land manager(s) from the endowment annual, advance payments that the land manager(s) shall use to pay the costs of Preserve Management, Restoration, and Monitoring Activities as described in Section 6.3 to be performed by the Land Manager throughout the forthcoming calendar year. OCTA will require land manager(s) to submit payment requests between July 1 and September 30, and will disburse endowment payments in December for Preserve Management, Restoration, and Monitoring Activities for the next calendar year.

The Parties agree that the detailed accounting of the estimated costs associated with the various components of the Plan, as set out in Chapter 8 and Tables 8-1 and 8-2, reflects best efforts to determine the level of funding necessary to implement the Plan. The Parties further agree that the process provided under the Plan and summarized under this Section 12.1 ensures that the endowment to be established is adequate, and that a schedule for fully funding the endowment has been established as stated in Government Code Section 65966(o). Therefore, California Government Code Sections 65966(b)-(e) do not apply to the endowment(s) under this Plan.

Where Permittee has funded an endowment to fully satisfy certain conservation obligations under the Plan and the endowment has been reviewed and approved in writing as adequate by the Wildlife Agencies, funding is deemed adequate to carry out such obligations, and the Wildlife Agencies shall not require additional funds or resources from the Permittee.

12.2 Effect of Inadequate Funding

If funding becomes inadequate to implement the Plan, the Wildlife Agencies will assess the impact of the funding deficiency on the scope and validity of the Permits. Except in cases of withdrawal by Permittee or permit revocation by the Wildlife Agencies, the Parties agree to meet and confer to develop a strategy to address the funding shortfall, and to undertake all practicable efforts to maintain the level of conservation and Take authorization afforded by the Permits consistent with protection of the Covered Species and their habitats until the funding situation can be remedied.

If circumstances warrant suspension or revocation of the Federal Permit or State Permit, in whole or in part, the applicable Wildlife Agency(ies) shall use its reasonable efforts to meet and confer with the Permittee within thirty days of such determination to identify potential actions, if any, that may be available to forestall the suspension or revocation of a Permit(s).

13.0 REGULATORY ASSURANCES

13.1 Assurances Under the ESA

Upon issuance of the Federal Permit, Permittee shall receive regulatory assurances pursuant to the No Surprises Rule at 50 C.F.R. Sections 17.22(b)(5) and 17.32(b)(5). Pursuant to the No Surprises Rule, as long as Permittee has complied with its obligations under the Plan, this Agreement and the Federal Permit with regard to the Covered Species and Covered Activities, the Service shall not require the Permittee to provide conservation and mitigation measures to respond to Unforeseen Circumstances that involve the commitment of additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources otherwise available for economic development or use under the original terms of the Plan and Federal Permit without the consent of Permittee.

13.2 Assurances Under the NCCPA

13.2.1 Permittee

Under the NCCPA, CDFW provides assurances to permittees commensurate with the long-term conservation assurances and associated implementation measures that will be implemented under a plan (Fish & Game Code § 2820(f)). In its determination of the level and duration of the assurances to be afforded a permittee, CDFW takes into account the conditions specific to the plan, including such factors as:

- The level of knowledge of the status of covered species and natural communities;
- The adequacy of analysis of the impact of Take on covered species;
- The use of the best available science to make assessments of the impacts of Take, reliability of mitigation strategies, and appropriateness of monitoring techniques;
- The appropriateness of the size and duration of the plan with respect to quality and amount of data;

- The sufficiency of mechanisms for long-term funding of all components of the plan and contingencies;
- The degree of coordination and accessibility of centralized data for analysis and evaluation of the effectiveness of the plan;
- The degree to which a thorough range of foreseeable circumstances are considered and provided for under the adaptive management program; and
- The size and duration of the plan.

As long as the Permittee is properly implementing this Agreement, the OCTA NCCP/HCP, and the State Permit, CDFW will not seek to impose on the Permittee, for purposes of compliance with the NCCPA, any avoidance, minimization, mitigation, or conservation measures or requirements regarding the impacts of Covered Activities on Covered Species within the Plan Area beyond those required by this Agreement, the OCTA NCCP/HCP, and the State Permit. The assurances provided to the entities receiving permits under the NCCPA will ensure that if there are Unforeseen Circumstances, no additional financial obligations or restrictions on the use of resources will be required of the Permittees without their consent, unless CDFW determines that the Plan is not being implemented consistent with the substantive terms of this Agreement, the Plan, and the State Permit. Specifically, the NCCPA directs that,

> [i]f there are Unforeseen Circumstances, additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources shall not be required without the consent of plan participants for a period of time specified in the implementation agreement, unless CDFW determines that the plan is not being implemented consistent with the substantive terms of the implementation agreement (Fish & Game Code § 2820(f)(2)).

The NCCPA requires that CDFW suspend or revoke a permit, in whole or in part, if the continued Take of a Covered Species would jeopardize its continued existence.

13.3 Process to Respond to Unforeseen Circumstances

If the Service believes that an Unforeseen Circumstance exists, it shall provide written notice of its proposed finding of Unforeseen Circumstances to Permittee. The Service shall clearly document the basis for the proposed finding regarding the existence of Unforeseen Circumstances pursuant to the requirements of 50 C.F.R. Sections 17.22(b)(5)(iii)(C) and 17.32(b)(5)(iii)(C). Within fifteen (15) days of receiving such notice, the Permittee and the Service shall meet or confer to consider the facts cited in the notice and potential changes to the Plan. Pursuant to 50 C.F.R. Sections 17.22(b)(5)(iii)(C) and 17.32(b)(5)(iii)(C), the Service shall make an Unforeseen Circumstances finding based on the best scientific evidence available, after considering any responses submitted by the Permittee pursuant to this section, and the Service shall have the burden of demonstrating that Unforeseen Circumstances exist.

13.4 Interim Obligations Upon a Finding of Unforeseen Circumstances

If either Wildlife Agency finds that an Unforeseen Circumstance has occurred with regard to a Covered Species and that additional measures may be required for the Covered Species as a result, during the period necessary to determine the nature, scope and location of any additional measures, the Permittee will avoid causing an appreciable reduction in the likelihood of the survival and recovery of the affected species. The Permittee will not be responsible for implementing any additional measures contrary to the regulatory assurances provided under the No Surprises Rule or the NCCPA unless the Permittee consents to do so.

14.0 TERM

14.1 Effective Date

This Agreement shall be effective with regard to the Federal Permit and State Permit, respectively, on the date, following execution of the Agreement by all Parties, on which the Permit is issued.

14.2 Initial Term

This Agreement, the Plan, and the Federal and State Permits, respectively, will remain in effect for an initial term of 40 years from issuance of the original Permits or until termination of the affected Permit, whichever occurs sooner.

14.3 Extension of the Permits

Upon agreement of the Parties and compliance with all applicable laws, the Permits may be renewed in accordance with regulations of the Wildlife Agencies in force on the date of such renewal.

15.0 AMENDMENTS AND PERMIT AMENDMENTS

15.1 Minor Amendments to the Plan

15.1.1 Minor Amendments

The Permittee, may, under certain circumstances, request an amendment to the Plan without amending the Permits, provided such amendments are minor in nature, the effects on the Covered Species involved and the levels of Take resulting from the amendment are not greater than those described in the Plan and provided for by the Permits, and the action is otherwise consistent with the Plan, this Agreement, and the Permits and will not result in new or greater environmental effects beyond those analyzed under NEPA and CEQA for the Plan as originally approved. Minor Amendments will not alter the terms of the HCP Permit or NCCPA Permit.

Examples of actions that may require Minor Amendments to the Plan include, but are not limited to:

- Change in location of a covered freeway improvement project provided that the revised project location is within the Permit Area, changes do not exceed the caps for impacts on habitat types, result in an increased level of Take for Covered Species, or result in new environmental impacts that were not addressed in the Plan and the Environmental Impact Report/Environmental Impact Statement for the Plan. OCTA will be required to address the project changes and demonstrate that the changes are consistent with these criteria.
- Addition of a covered minor freeway capital improvement project as described in Section 6.2. These potential additional projects must be consistent with the scope of the covered freeway projects, occur within the Permit Area, and cannot exceed the acreage impact caps established for the Plan. These projects also cannot result in additional Take of Covered Species, or be significantly different or have greater impacts to the environment than what was analyzed within the Environmental Impact Report/Environmental Impact Statement for the Plan, as determined by the Wildlife Agencies.
- Change to cap of 500 individuals of each covered plant species to no more than 1,000 individuals if OCTA can demonstrate to the Wildlife Agencies that mitigation achieved through the Plan conservation actions or through project-specific biological superior alternative(s) provides a biological benefit that is greater than the anticipated impacts. The relative biological benefit of impacts and conservation/restoration will depend not only on the number of individuals impacted or conserved, but also on factors such as long-term sustainability of the occurrences, importance for maintaining connectivity and contiguity between other occurrences in the area, and other factors that may make the occurrences in question biologically valuable or unique.

OCTA will submit in writing to the Wildlife Agencies a description of the proposed Minor Amendment in the form of an addendum with the following subject items addressed:

- An explanation why the Minor Amendment is necessary or desirable.
- An explanation of why OCTA believes the effects of the proposal are not significantly different from those described in the original Plan and would not result in greater impacts on the environment, including the Covered Species and their habitats, or levels of Take beyond those analyzed in connection with the Plan and the Permits.
- An analysis of the environmental impacts of the proposed change.

OCTA may propose a Minor Amendment to the Plan by providing a written submission to the Wildlife Agencies. The Wildlife Agencies will use their reasonable efforts to respond to proposed Minor Amendments within 60 days of receipt of such submission by either approving or denying the Minor Amendment or by notifying the OCTA that the proposed Minor Amendment must be processed as a Permit Amendment. Proposed Minor Amendments will become effective upon the Wildlife Agencies' written approval. The Wildlife Agencies will not approve Minor Amendments to the Plan if they determine that such Minor Amendments will result in adverse effects on the environment that are new or significantly different from those analyzed in connection with the original Plan or may result in additional Take that was not analyzed in connection with the original Plan.

15.1.2 Major Amendments

Major amendments to the Plan will require detailed analyses of the anticipated effects of the proposed action on conserved habitats and Covered Species, on sensitive habitats and species not addressed in the Plan, and on the additional conservation to be provided through the Amendment process. Major amendments will be processed as Permit Amendments in accordance with all applicable federal and state statutory and regulatory requirements, including NEPA and CEQA. The Wildlife Agencies will provide technical assistance to Permittee during the amendment process. All Major Amendments to the Plan approved by the Wildlife Agencies will be memorialized through an addendum to the Plan, a Permit Amendment, and, if necessary, an amendment to this Agreement, and will be documented in the Annual Report.

Major Amendments to the Plan and Permits will be required if a proposed action would include but are not limited to any of the following:

- Proposed increased level of Take of a Covered Species. For the three plant species, this level would include any cumulative impact above 1,000 individuals.
- Proposed addition of a Covered Species.
- Proposed addition or substantial modification to Covered Activities associated with Preserve management that could reduce conservation commitments in the Plan.

- Proposed addition of a freeway capital improvement project that does not meet the criteria included in Section 6.2 and would require additional conservation to offset impacts.
- Proposed addition of operation and maintenance of constructed freeway capital improvement projects as a Covered Activity.
- Proposed change in the location of a covered freeway project that is outside of the Permit Area, and would result in impacts that exceed caps to habitat type(s), and/or results in new environmental impacts that were not addressed in the Plan and the Environmental Impact Report/Environmental Impact Statement for the Plan.
- Increased impacts associated with covered freeway capital improvement projects that result in the caps for habitat type(s) to be exceeded. Adjustments to the caps can be made based on an analysis of conservation achieved under the Plan and if there is a determination, with the written concurrence of the Wildlife Agencies, that there are excess credits to warrant the caps on a specific habitat to be increased.
- Increased permanent impacts within Preserves that would result in the cap of 13 acres of impact on natural habitat to be exceeded.
- Proposed addition of a Preserve or other conservation actions that contribute to the conservation credits under the Plan.

15.2 Amendment to this Agreement

In addition to other approval requirements identified in this Section that may apply, this Agreement may only be amended consistent with applicable law and with the consent of each Party.

16.0 ENFORCEMENT OF PERMIT AND DISPUTE RESOLUTION

16.1 General Authorities and Legal Rights under Federal Permit

Nothing contained in this Agreement is intended to, or shall, limit the authority of the United States government to seek civil or criminal penalties or otherwise fulfill its enforcement and other responsibilities under the ESA or other applicable federal law. Nothing contained in this Agreement limits the rights of Permittee under the U.S. Constitution or other applicable federal or state law to seek redress against the Service as otherwise permitted by law.

16.1.1 Permit Suspension

The Service may suspend the Federal Permit, in whole or in part, for cause in accordance with the laws and regulations in force at the time of such suspension. (*See* 50 C.F.R. §§ 13.27-13.29, 17.22(b) and 17.32(b)). However, except where the Service determines emergency action is necessary to avoid irreparable harm to a Covered Species, it will not suspend the Federal Permit without first requesting the Permittee to take appropriate remedial actions, if any such actions are available, and providing the Permittee with written notice of the facts or conduct which may warrant the suspension, and an adequate and reasonable opportunity, including, where appropriate, use of the voluntary dispute resolution process outlined in Section 16.4, to demonstrate why suspension is not warranted.

16.1.2 Reinstatement of Suspended Permit

In the event the Service suspends the Federal Permit, in whole or in part, as soon as practicable, and if possible within ten days after such suspension, the Service shall confer with the Permittee concerning actions, if any, they would allow the suspension to be lifted. After conferring with the Permittee, the Service shall identify reasonable specific actions, if any, necessary to effectively redress the suspension. In making this determination the Service will consider the requirements of the ESA, regulations issued thereunder, the conservation needs of the Covered Species, the terms of the Federal Permit and any comments or recommendations received from the Permittee. As soon as practicable, and if possible within thirty days after the conference, the Service shall send Permittee written notice of any available, reasonable actions necessary to effectively redress the suspension. Upon Permittee’s timely and acceptable performance of such actions, the Service will promptly reinstate the Federal Permit. It is the general intent of the Parties that in the event of a total or partial suspension of the Federal Permit, and provided such action is appropriate in light of the circumstances that resulted in the suspension, the Parties will act expeditiously and cooperatively to reinstate the Federal Permit.

16.1.3 Surrender or Revocation of the Federal Permit

Permittee may withdraw from the Federal Permit by surrendering the Federal Permit to the Service in accordance with the regulations of the Service in force on the date of such surrender. (These regulations are currently codified at 50 CFR 17.22(b)(7) and 17.32(b)(7) and by their express terms apply in place of 50 CFR 13.26 to the extent of any conflict). In addition, the Service may revoke the Federal Permit for cause. (These regulations are currently codified at 50 CFR 17.13.28, 17.22(b)(8) and 17.32(b)(8)). Upon surrender or revocation of the Federal Permit, no further Take shall be authorized under the Permit. Notwithstanding surrender of the Federal Permit by Permittee or revocation of the Federal Permit by the Service, Permittee will remain obligated to fulfill any existing and outstanding minimization and mitigation measures required under the Plan, this Agreement, and the Federal Permit for any Take that occurred prior to surrender or revocation. A surrendered Federal Permit shall be deemed cancelled only upon a determination by the Service that such minimization and mitigation measures have been implemented.

16.2 State Permit

16.2.1 Suspension or Revocation of the State Permit

CDFW may suspend or revoke, in whole or in part, the State Permit in the event that it determines that the Permittee has failed to fulfill their obligations under the Plan, this Agreement, or the State Permit as stipulated in Section 7.3 of the Agreement. Unless an immediate suspension is necessary to avoid jeopardy, CDFW shall not suspend or revoke the State Permit without first notifying in writing the Permittee of the basis for its determination and the proposed action to revoke or suspend and meeting and conferring with the Permittee regarding the matter. The Parties shall meet and confer within fifteen days of issuance of such notice to assess the action or inaction that warranted CDFW's determination and to identify any appropriate responsive measures that may be taken. Within forty-five days of receiving notice from CDFW, Permittee shall either satisfy CDFW that they are in compliance with the State Permit or reach an agreement with CDFW to expeditiously obtain compliance.

Following this forty-five day period, CDFW may suspend, but shall not revoke the State Permit until such time as the review process set forth in Section 16.4 of this Agreement has been completed, provided the process has been invoked by the Permittee.

16.2.2 Rough Proportionality

Section 2820 (b)(9) of the Fish and Game Code requires NCCP Permittees to ensure that implementation of mitigation and conservation measures on a plan basis is roughly proportional in time and extent to the impact on habitat or Covered Species authorized under the Plan. Permittee will ensure rough proportionality after the Permits have been issued by implementing mitigation and conservation measures ahead of impacts from Covered Activities, as described in Chapter 5 of the Plan. As further described in Section 5.8.2 and Tables 5.3, and 5.5 of the Plan, the amount of each land cover type restored, created, and added to the Preserve Area as a proportion of the total requirement for each land cover type will be equal to or greater than the impact on that land cover type as a proportion of the total impact expected by all Covered Activities. The Permittee will fulfill the requirements of this Section and Section 5.8.2 of the Plan so long as it ensures that the pace at which the Preserve is created, and at which required habitat restoration and enhancement occurs throughout the Plan Area in core habitat areas and within key habitat linkages and riparian corridors, does not fall behind the pace at which Covered Activities impact habitat by more than ten percent of the commitments made in the Plan for each land cover type. The Permittee will include in the Annual Report a summary of all Take that has occurred as a result of all Covered Activities (i.e., cumulative Take; not just for that particular year) and the amount of mitigation undertaken to show that the Plan is meeting the rough proportionality requirement. If at any time CDFW determines that the requirement for rough proportionality on a Plan basis is not being met, it will provide written notification to Permittee. Permittee will either: (1) regain rough proportionality within forty-five days; or (2) enter into an agreement with CDFW within forty-five days, which will set a course of action to expeditiously regain rough proportionality.

If Permittee does not regain rough proportionality within forty-five (45) days or enter into an agreement with CDFW within forty-five (45) days setting a course of action to regain rough proportionality, CDFW shall suspend or revoke the NCCP Permit, in whole or in part, pursuant to Fish and Game Code Section 2820(c).

16.2.3 Approval, Adoption or Amendment of Future Plans or Projects by Permittee

The approval, adoption, or amendment of a future plan or project by Permittee that is inconsistent with the objectives and requirements of the Plan, without the concurrence of the Wildlife Agencies, is grounds for suspension or revocation of the State Permit. If CDFW determines, after conferring with the Permittee, that such a plan or project has been approved, adopted, or amended in a manner that is substantially inconsistent with the objectives or requirements of the Plan, CDFW will provide written notice to the Permittee documenting the nature of the inconsistency.

Within fifteen days of the issuance of such notice, CDFW and the Permittee shall meet and confer to consider the basis for CDFW's determination and to identify steps that may be taken to address any such inconsistency. In the event that the inconsistency is not satisfactorily addressed within forty-five (45) days or within a period mutually agreed to by the CDFW and the Permittee, CDFW, at its discretion, may suspend or revoke the State Permit, in whole or in part.

16.2.4 Reinstatement of Suspended Permit

In the event CDFW suspends the State Permit, as soon as possible but no later than 10 days after such suspension, CDFW shall confer with the Permittee concerning how the violation or breach that led to the suspension can be remedied. At the conclusion of any such conference, CDFW shall identify reasonable specific actions necessary to effectively redress the violation or breach. In making this determination, CDFW shall consider the requirements of the NCCPA, the conservation needs of the Covered Species, the terms of the State Permit and this Agreement, and any comments or recommendations received during the meet and confer process. As soon as possible, but not later than thirty days after the conference, CDFW shall send the Permittee written notice of the reasonable actions necessary to effectively redress the violation or breach. Upon performance of such actions, CDFW shall immediately reinstate the State Permit. It is the intent of the Parties that in the event of any suspension of the State Permit, all Parties shall act expeditiously and cooperatively to reinstate the State Permit.

16.2.5 Obligations in the Event of Suspension or Revocation

In the event of revocation, termination, or suspension of the State Permit, Permittee will remain obligated to fulfill any existing and outstanding minimization and mitigation measures and conservation measures required under this Agreement, the Plan, and the NCCP Permit, including measures to ensure rough proportionality under the NCCPA and Section 16.2.2., for any Take that occurs prior to such revocation, termination, or suspension, until CDFW determines that all Take of Covered Species that occurred under the NCCP Permit has been mitigated in accordance with this Agreement, the Plan, and the NCCP Permit.

16.3 Dispute Resolution

The Parties recognize that disputes concerning implementation of, compliance with, or termination of this Agreement, the Plan, and the Permits may arise from time to time. The Parties agree to work together in good faith to resolve such disputes, using the informal dispute resolution procedures set forth in this section, or such other procedures upon which the Parties may later agree. However, if at any time, the Service or CDFW determines that circumstances so warrant, either agency may seek any available administrative or judicial remedy without engaging in or waiting to complete informal dispute resolution.

16.3.1 Dispute Resolution Process

Unless the Parties agree upon another dispute resolution process, or unless the Service or CDFW has initiated administrative or judicial proceedings, the Parties may use the following process to attempt to resolve disputes:

(a) The USFWS or CDFW will notify Permittee of the alleged non-compliance with, or violation of the Permit, including the Plan and this Agreement, the basis for contending that the non-compliance or violation has occurred, and the remedies the affected Wildlife Agency proposes to correct the alleged non-compliance or violation. Where Permittee alleges that one or both Wildlife Agency's supervision of the Permit, including Plan implementation, is inconsistent with the terms of the Permit, Permittee will notify both Wildlife Agencies of its objection, the basis for the objection and the manner in which Permittee believes the Permit should be interpreted and implemented.

(b) The notified parties will have thirty days, or such other time as may be agreed to by the Parties, to respond. During this time any Party may seek clarification of the information provided in the initial notice. The Parties will use their reasonable efforts to provide any information then available to it that may be responsive to such inquiries.

(c) Within 10 days after such response was provided or was due, a representative from each Party will meet and negotiate in good faith toward a solution satisfactory to all Parties, or will establish a specific process and timetable to seek such a solution.

(d) If any issues cannot be resolved through such negotiations, the Parties may consider non-binding mediation and other alternative dispute resolution processes and, if a dispute resolution process is agreed upon, will make good faith efforts to resolve all remaining issues through that process.

17.0 MISCELLANEOUS PROVISIONS

17.1 Incorporation of the Plan

The Plan and each of its provisions are intended to be and by this reference are incorporated herein. Notwithstanding such incorporation, it is acknowledged by the parties that the Plan was drafted by the Permittee and submitted to the Service and CDFW in support of applications for Federal and State Permits. Characterizations, analyses and representations in the Plan, and in particular, characterizations, analyses and representations in the Plan of federal or state laws, regulations, and policies, represent the views of the Permittee and shall not control the administration of the Permits by the Service and CDFW in accordance with federal and state laws, regulations, and policies. In the event of any inconsistency between the Plan and this Agreement, the provisions of this Agreement control. Similarly, in the event of any inconsistency between the Plan or this Agreement and the Federal or State Permits, the Permits control.

17.2 Relationship to CESA, the NCCPA, the ESA, and Other Authorities

The terms of this Agreement shall be governed by and construed in accordance with the Federal and State Permits, NCCPA, the ESA, and other applicable federal and state law. In particular, nothing in this Agreement limits or is intended to limit the authority of the Wildlife Agencies to seek penalties or otherwise fulfill their responsibilities under CESA, the NCCPA, or the ESA. Moreover, nothing in this Agreement is intended to limit or diminish the legal obligations and responsibilities of the Service as an agency of the federal government or of CDFW as an agency of the State of California.

17.3 Changes in Environmental Laws

It is acknowledged by the Parties that through acceptance of the Permits, the Permittee commits to perform substantial avoidance, minimization, mitigation, conservation, and management measures as set forth in the Plan, this Agreement and the Permits. If a change in, or an addition to, any federal or state law governing or regulating the impacts of Covered Activities on land, water or biological resources as they relate to Covered Species, including, but not limited to, the ESA, NEPA, NCCPA, CESA, and CEQA, the Wildlife Agencies, to the extent consistent with governing law, shall give due consideration to the measures required under the Plan in applying the new laws and regulations to the Permittee.

17.4 References to Regulations

Any reference in this Agreement, the Plan, or the Permits to any regulation or rule of the Wildlife Agencies will be deemed to be a reference to such regulation or rule in existence at the time an action is taken.

17.5 Applicable Laws

All activities undertaken pursuant to this Agreement, the Plan, or the Permits must be in compliance with all applicable state and federal laws and regulations.

17.6 Governing Law

This Agreement will be governed by and construed in accordance with the laws of the United States and the State of California, as applicable.

17.7 Independent State and Federal Permits

The State and Federal Permits are independent such that revocation of the State Permit or of the Federal Permit does not automatically cause revocation of the other Permit.

17.8 Availability of Funds

Implementation of this Agreement and the Plan by the Service is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds.

Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the U.S. Treasury. The Parties acknowledge that the Service will not be required under this Agreement to expend any federal agency's appropriated funds unless and until an authorized official of the agency affirmatively acts to commit to such expenditures as evidenced in writing.

Implementation of this Agreement and the Plan by CDFW is subject to the availability of appropriated funds. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the Treasury of the State of California. The Parties acknowledge and agree that CDFW will not be required under this Agreement to expend any state appropriated funds unless and until an authorized official of that agency affirmatively acts to commit such expenditure as evidenced in writing.

17.9 Duplicate Originals

This Agreement may be executed in any number of duplicate originals. A complete original of this Agreement shall be maintained in the official records of each of the Parties hereto.

17.10 No Third-Party Beneficiaries

Without limiting the applicability of rights granted to the public pursuant to the ESA, CESA, NCCPA or other applicable law, this Agreement shall not create any right or interest in the public, or any member thereof, as a third-party beneficiary, nor shall it authorize anyone to maintain a suit for personal injuries or damages pursuant to the provisions of this Agreement. The duties, obligations, and responsibilities of the Parties to this Agreement with respect to third parties shall remain as imposed under existing law.

17.11 Agreement is not an Enforceable Contract as between Service and Permittee

Notwithstanding any language to the contrary in this Agreement, this Agreement is not intended to create and shall not be construed to create an enforceable contract between Permittee and the Service under law with regard to the Permit, and neither the Service nor Permittee shall be liable in damages to each other or to any other third party for any performance or failure to perform any obligation identified in this Agreement. The sole purpose of this Agreement as between the Service and Permittee is to clarify the provisions of the Plan and the processes the Parties intend to follow to ensure successful implementation of the Plan in accordance with the Permit and applicable federal law. Notwithstanding the foregoing, the Service intends to follow the provisions of this Agreement in administering the Permit, and Permittee intends to follow the provisions of this Agreement in implementing the Plan. This Agreement will be incorporated by reference into the Federal Permit.

17.12 Defense

Upon request by OCTA, CDFW will, to the extent authorized by California law, including but not limited to Section 7 of Article 16 of the California Constitution and subject to the responsibilities of the California Attorney General, cooperate with the Permittee in defending lawsuits regarding the Plan, this Agreement or the State Permit, and lawsuits against Permittees arising out of CDFW's approval of the State Permits. Subject to Section 17.8 (Availability of Funds), the Service, upon the request of Permittee, and subject to the responsibilities of the U.S. Department of Justice in the conduct of litigation, will use reasonably available resources to provide appropriate support to Permittee in defending, consistent with the terms of the Plan, this Agreement and the Federal Permit, lawsuits against Permittee, arising out of the Service's approval of the Permit.

17.13 Successors and Transferees

This Agreement and each of its covenants and conditions shall inure to the benefit of the Parties and their respective successors and transferees incident to transfer of the Permits under applicable law. Succession or other transfer of the Permits will be governed by provisions of the ESA, CESA, and NCCPA pertaining to the right of succession or transfer of Permits.

17.14 Notices

Any notice permitted or required by this Agreement shall be in writing, delivered personally to the persons listed below, or shall be deemed given five (5) days after deposit in the United States mail, certified and postage prepaid, return receipt requested and addressed as follows, or at such other address as any Party may from time to time specify to the other Parties in writing. Notices may be delivered by facsimile or other electronic means, provided that they are also delivered personally or by certified mail. Notices shall be transmitted so that they are received within the specified deadlines.

Assistant Regional Director
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Chief Executive Officer
Orange County Transportation Authority
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Orange, CA 92863
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17.15 Calendar Days

Throughout this Agreement and the Plan, the use of the term "day" or "days" means calendar days, unless otherwise specified.

17.16 Response Times

Except as otherwise set forth herein or as statutorily required by CEQA, NEPA, CESA, ESA, NCCPA or any other laws or regulations, the Parties will use reasonable efforts to respond to written requests from any Party within a forty-five day time period.

18.0 MISCELLANEOUS PROVISIONS BETWEEN PERMITTEE AND CDFW

The following provisions apply as between the Permittee and CDFW.

18.1 Entire Agreement

This Agreement, together with the Plan and the Permits, constitutes the entire agreement among the Parties. It supersedes any and all other agreements, either oral or in writing, among the Parties with respect to the subject matter hereof and contains all of the covenants and agreements among them with respect to said matters, and each Party acknowledges that no representation, inducement, promise or agreement, oral or otherwise, has been made by any other Party or anyone acting on behalf of any other Party that is not embodied herein.

18.2 Severability

In the event one or more of the provisions contained in this Agreement is held to be invalid, illegal or unenforceable by any court of competent jurisdiction, such portion will be deemed severed from this Agreement and the remaining parts of this Agreement will remain in full force and effect as though such invalid, illegal, or unenforceable portion had never been a part of this Agreement.

18.3 No Partnership

Neither this Agreement nor the Plan shall make or be deemed to make any Party to this Agreement the agent for or the partner of any other Party.

18.4 Elected Officials Not to Benefit

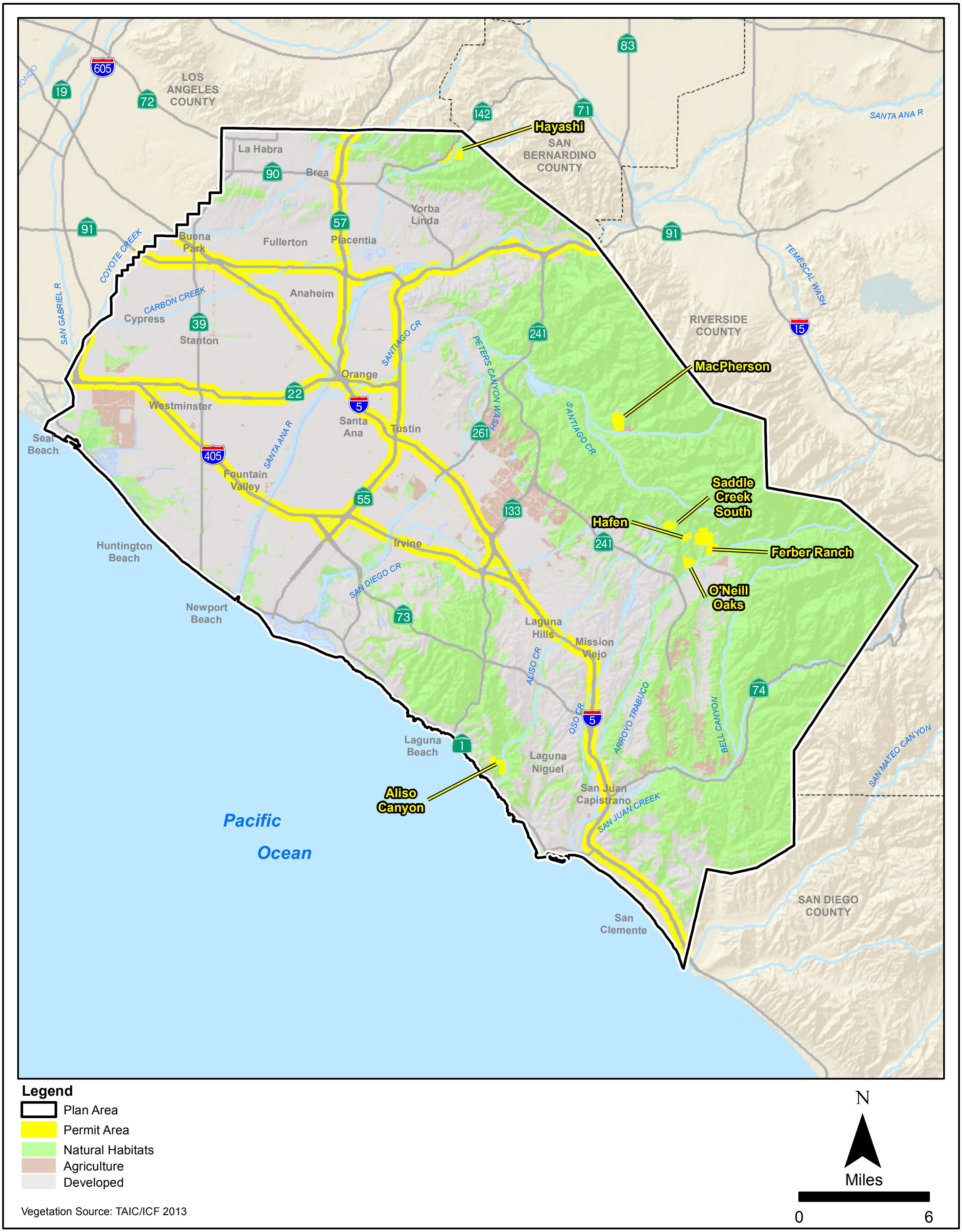
No member of or delegate to the California State Legislature or the United States Congress will be entitled to any share or part of this Agreement, or to any benefit that may arise from it.

IN WITNESS WHEREOF, THE PARTIES HERETO have executed this Implementing Agreement to be in effect as of the date that the Wildlife Agencies issue the Permits.

BY ____ Date ______________
Deputy Regional Director
Pacific Southwest Region
U.S. Fish and Wildlife Service

BY ____ Date ______________
Sandra Morey
Deputy Director
Ecosystem Conservation Division
California Department of Fish and Wildlife

BY ____ Date ______________
Darrell Johnson
Chief Executive Officer
Orange County Transportation Authority



OCTA

Plan and Permit Area

Exhibit A

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Date: 8/9/2016

Exhibit B

Covered Species for the Plan and their Listing Status

Common Name	Scientific Name	Special-Status[1]
Plants		
Intermediate mariposa lily	*Calochortus weedii* var. *intermedius*	*CNPS:1B.2*
Many-stemmed dudleya	*Dudleya multicaulis*	*CNPS:1B.2*
Southern tarplant	*Centromadia parryi* ssp. *australis*	*CNPS:1B.1*
Fish		
Arroyo chub	*Gila orcutti*	*CDFW:SSC*
Reptiles		
Coast horned lizard	*Phrynosoma blainvillii*	*CDFW:SSC*
Orangethroat whiptail	*Aspidoscelis hyperythra*	*CDFW:WL*
Western pond turtle	*Emys marmorata*	*CDFW:SSC*
Birds		
Cactus wren	*Campylorhynchus brunneicapillus*	*USFWS:BCC; CDFW:SSC*
Coastal California gnatcatcher	*Polioptila californica californica*	*FT; CDFW:SSC*
Least Bell's vireo	*Vireo bellii pusillus*	*FE; SE*
Southwestern willow flycatcher	*Empidonax traillii extimus*	*FE; SE*
Mammals		
Bobcat	*Lynx rufus*	--
Mountain lion[2]	*Puma concolor*	*CDFW:SPM*

[1] CNPS: Taxa with a California Rare Plant Rank of 1B are considered rare, threatened, or endangered in California and elsewhere and the majority are endemic to California. A Threat Rank of 0.1 indicates that it is seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat). Threat Rank 0.2 indicates that it is moderately threatened in California (20-80% of occurrences threatened/moderate degree and immediacy of threat).

[2] Mountain lion, designated as a CDFW Specially Protected Mammal Species, is included on the list of Covered Species for the federal HCP permit but not under the state NCCP Permit.

ABBREVIATIONS: CNPS = California Native Plant Society; CDFW = California Department of Fish and Wildlife; SSC = California Species of Special Concern; SPM = California Specially Protected Mammal; USFWS = U.S. Fish & Wildlife Service; BCC = Birds of Conservation Concern; FT = Federally Threatened; FE = Federally Endangered; SE = State Endangered.

Exhibit C

Certificate of Inclusion

The United States Fish and Wildlife Service (Service) has issued a take authorization to the Orange County Transportation Authority (OCTA or Permittee) pursuant to Section 10(a)(1)(B) of the Endangered Species Act of 1973, 16 U.S.C. §1539(a)(1)(B) (Permit) The Permit is issued for a term of forty (40) years and authorizes the take of certain species ("Covered Species")within the area covered by the OCTA Renewed Measure M Habitat Conservation Plan/Natural Community Conservation Plan (Plan). Under the Permit, OCTA is authorized to take the Covered Species incident to certain activities (Covered Activities) as defined in the Plan provided all of the terms and conditions of the Plan, associated Implementing Agreement, and Permit are being met. In accordance with 50 CFR § 13.25(d), the Permittee may extend the incidental take authorization granted to it to certain third parties, provided such third parties are under the Permittee's direct control for purposes of implementing the requirements of, and complying with the terms and conditions of the Plan, Implementing Agreement and Permit. The Plan and the Implementing Agreement (Agreement) provide that OCTA may extend take coverage under the Permit to the California Department of Transportation (Caltrans) by executing a Certificate of Inclusion.

You (Caltrans) are engaged in [*insert freeway capital improvement project or activity name*], which is one of the Covered Activities covered by the Permit. By executing this Certificate of Inclusion, you commit to implement all of the avoidance and minimization measures set forth in detail in Exhibit "A" to this Certificate of Inclusion. By executing this Certificate of Inclusion, you further acknowledge and consent to the enforcement against you of the terms and conditions and applicable requirements of the Plan, Agreement and Permit and consent to allow access to your property, in accordance with Section 7.1 of the Agreement, by Permittee, and the U.S. Fish and Wildlife Service for purposes of monitoring your compliance with the Plan, Agreement and Permit. If you fail to abide by the terms and conditions of the Plan, Agreement and Permit in carrying out the Covered Activity, the incidental take authorization granted to you through the Certificate of Inclusion will lapse and you may also be subject to civil and criminal liability under the Endangered Species Act.

Extension to you of incidental take coverage under the Permit will become effective upon execution of this Certificate of Inclusion by you and by OCTA. In the event the Covered Activity is assumed by another, you agree to immediately notify OCTA. Any subsequent operator will not be insulated from liability for incidental take until and unless such subsequent operator and OTCA execute a new Certificate of Inclusion. OTCA, as Permittee, remains liable for compliance with all of the terms and conditions and applicable requirements of the Plan, Agreement and Permit, including those implemented by Caltrans pursuant to this Certificate of Inclusion.

Exhibit C

____
Signature (Caltrans)

____
Title

OCTA Representative: ______________________________
Date: ______________________________

Exhibit D

Certificate of Inclusion Under the State Permit

The California Department of Fish and Wildlife (CDFW) has issued a permit to OCTA pursuant the Natural Community Conservation Planning Act, California Fish and Game Code section 2835 (State Permit) authorizing the Take of certain species (Covered Species) in accordance with the terms and conditions of the OCTA Renewed Measure M Habitat Conservation Plan/Natural Community Conservation Plan (Plan) and the associated Implementing Agreement (Agreement). The State Permit is issued for a term of 40 years. Under the State Permit, OCTA is authorized to take the Covered Species incident to certain activities (Covered Activities) as defined in the Plan provided all of the terms and conditions of the Plan, the Agreement, and the State Permit are met. The Plan and the Agreement section 7.1 provide that OCTA may extend Take authorization under the State Permit to the California Department of Transportation (Caltrans) by executing a Certificate of Inclusion with Caltrans. OCTA, as Permittee, remains liable for compliance with the Plan, the Agreement and the State Permit, including those aspects implemented by Caltrans pursuant to this Certificate of Inclusion.

You (Caltrans) are engaged in [*insert freeway capital improvement project or activity name*] (Project), which is one of the Covered Activities covered by the State Permit. By executing this Certificate of Inclusion, you agree: to comply with all applicable terms, conditions, and requirements of the Plan, the Agreement, and the State Permit that are within your responsibilities detailed in the Agreement section 8.2.1, including implementing the avoidance and minimization measures for the Project set forth in detail in Exhibit “A” to this Certificate of Inclusion; to assume liability for any non-compliance with such applicable terms and conditions; to the enforcement of such applicable terms and conditions by Permittee and by CDFW against you; and to allow access to your property by Permittee and CDFW for purposes of monitoring and enforcing your compliance with such applicable terms and conditions. If you fail to abide by the applicable terms and conditions of the Plan, Agreement, and State Permit in carrying out the Project, the Take authorization extended to you through this Certificate of Inclusion will lapse and you may be subject to civil and criminal liability under the California Endangered Species Act.

Your Take authorization under the State Permit will become effective upon execution of this Certificate of Inclusion by you and by OCTA. In the event the Project is assumed by another, you agree to immediately notify OCTA.

Exhibit D

____
Signature (Caltrans)

____
Title

OCTA Representative: ______________________________
Date: ______________________________

Appendix C

Biological Resources Background Information

Appendix C.1

Natural Community Profiles

Natural Community Profiles

Vegetation Mapping

The development of a suitable vegetation map for the Plan Area is one of the primary steps in the baseline data development process. The goal is to provide an accurate representation of the natural landscape in the Plan Area to support the evaluation and analysis of the distribution of natural communities, the development of preliminary impact assessments of the Covered Activities on existing natural communities, and the development of habitat modeling for each of the Covered Species (discussed further in Appendix C.3). The primary data source used to evaluate natural communities across the Plan Area was the USDA Forest Services Existing Vegetation (EVeg) dataset. This dataset, which initially was selected by CBI for the Conservation Assessment (Appendix C.5) because it provides a consistent mapping source for the entire Plan Area employing a 2.5-acre minimum mapping unit.

Each natural community is composed of several vegetation types, each with distinctly different plant species compositions. The vegetation types were classified in the original USFS (2004) EVeg data according to the DFG Wildlife Habitat Relationships (WHR) classification scheme, which is based on the vegetation classification system developed for the *Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995). This vegetation data was updated by CBI and Technology Associates (TAIC) using 2008 aerial photography to reflect newly developed areas not captured in the EVeg source data. Updates to the vegetation dataset were limited in scope and focused primarily on relatively large blocks of habitat that had been recently developed or cleared so that they no longer supported native vegetation. The purpose of the vegetation data update process was to identify and update significant changes that could affect the landscape-scale conservation planning and analysis for the NCCP/HCP, and was not comprehensive at a fine scale. Therefore, smaller areas of new development would not have been detected and updated. Preserve-level vegetation mapping is expected to be conducted as areas are identified and incorporated into the NCCP/HCP Preserve System and will be used for management and monitoring under the NCCP/HCP, replacing this landscape-scale vegetation data.

Vegetation Type Classification

The NCCP/HCP addresses seven major natural community types (Figure C.1-1). The seven major natural community types are as follows.

- Coniferous Forest
- Woodlands
- Chaparral
- Scrub
- Grassland

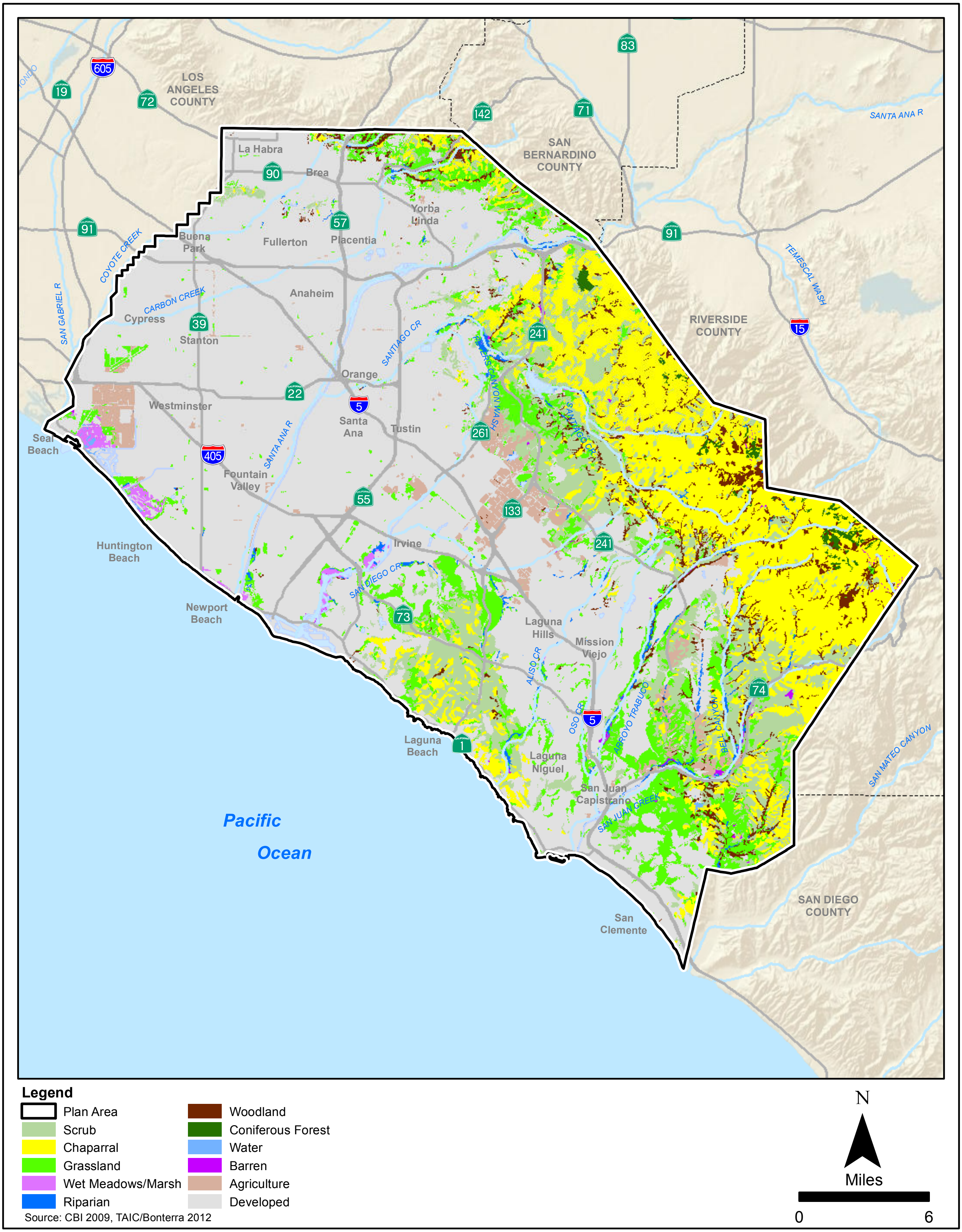
- Riparian
- Wet Meadow and Marsh

A detailed description of each of the seven natural community types is provided below. The acreages of each natural community and the 36 vegetation types in the Plan Area are provided in Table C.1-1 .

Table C.1-1. Natural Communities and Land Cover Types in the Plan Area (acres)

Natural Community	Land-Cover Type	Total Acres in Plan Area
Coniferous forest		**1,930**
	Bigcone Douglas-fir (*Pseudotsuga macrocarpa*)	1,480
	Coulter pine (*Pinus coulteri*)	73
	Knobcone pine (*Pinus attenuata*)	63
	Tecate cypress (*Cupressus forbesii*)	314
Woodland		**13,995**
	California walnut (*Juglans californica*)	843
	Canyon live oak (*Quercus chrysolepis*)	2,048
	Coast live oak (*Quercus agrifolia*)	10,591
	Coastal mixed hardwood	512
	Interior mixed hardwood	1
Chaparral		**82,965**
	Ceanothus mixed chaparral	2,451
	Chamise (*Adenostoma fasciculatum*)	7,945
	Lower montane mixed chaparral	57,974
	Scrub oak	3,475
	Soft scrub mixed chaparral	6,204
	Southern mixed chaparral	267
	Sumac shrub	5,614
	Upper montane mixed chaparral	35
Scrub		**59,427**
	Buckwheat	1,540
	California sagebrush (*Artemisia californica*)	53,761
	Coastal bluff scrub	374
	Coastal cactus	2,738
	Coyote brush (*Baccharis pitularis*)	182
	Riversidean alluvial scrub	731
	Scalebroom (*Lepidospartum squamatum*)	102
Grassland		**41,635**
	Annual grasses and forbs (generally nonnative)	39,671
	Perennial grasses and forbs (generally native)	1,964

Natural Community	Land-Cover Type	Total Acres in Plan Area
Riparian		**4,457**
	Baccharis (riparian)	322
	California sycamore (*Platanus racemosa*)	935
	Fremont cottonwood (*Populus fremontii*)	119
	Riparian mixed hardwood	1,062
	Riparian mixed shrub	489
	Willow	740
	Willow (shrub)	790
Wet meadows/marsh		**2,235**
	Pickleweed-cordgrass	1,882
	Tule-cattail	318
	Wet meadows	35
Water		**2,696**
	NATURAL COMMUNITIES SUBTOTAL	**209,340**
Agriculture		**12,870**
Barren		**1,662**
Developed/Disturbed		**287,604**
	TOTAL	**511,476**



OCTA

Vegetation Communities

C.1-1

Coniferous Forest

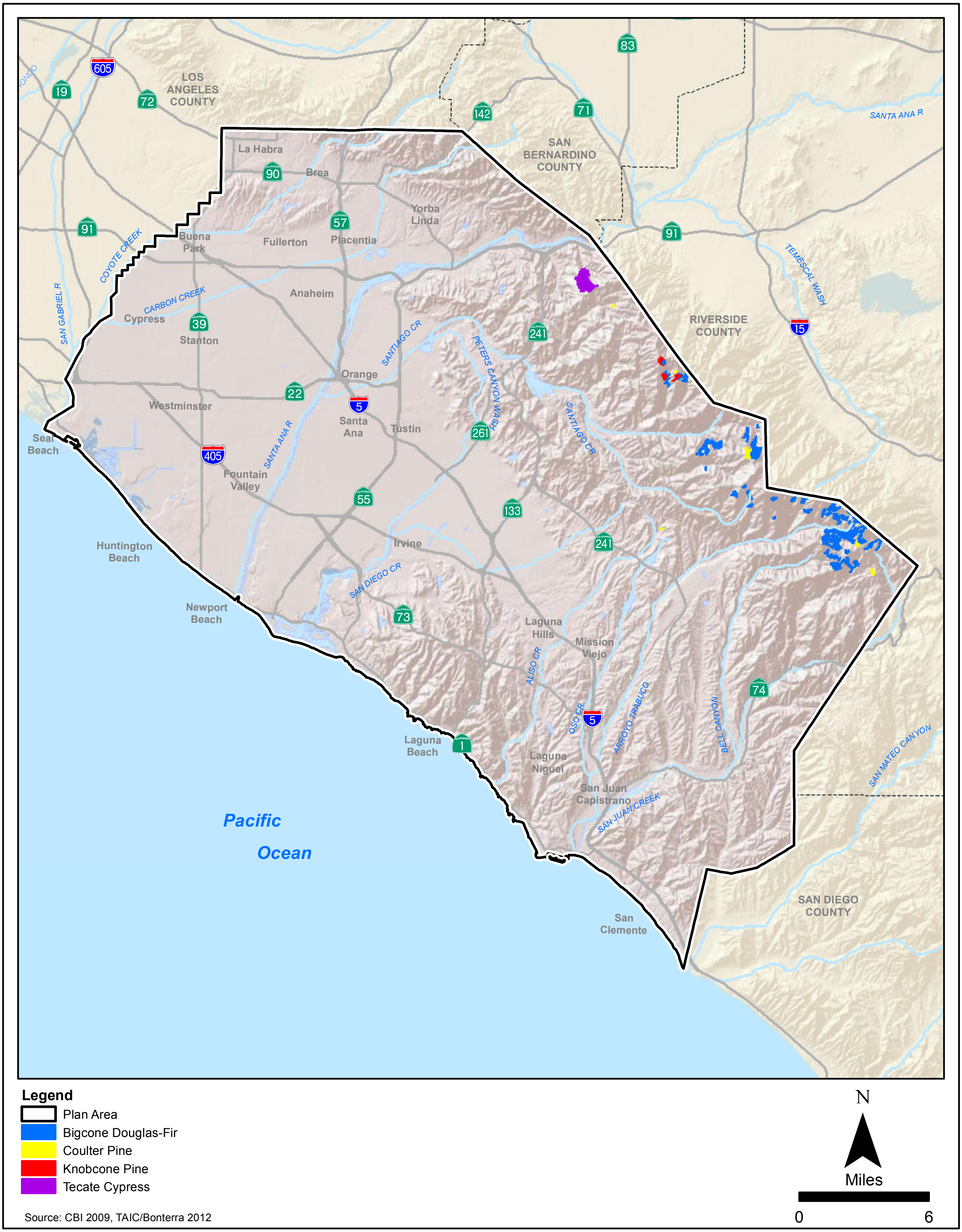
Natural Community Description

Coniferous forest is a general term used to describe those forests in which the dominant tree types are cone-bearing gymnosperms. In the Californian floristic province, of which the Plan Area is a part, there are three general categories of coniferous forests described by Barbour and Major (1990): closed-cone pine, cypress, and mixed evergreen. Closed-cone pine and cypress forests are unique vegetation communities that tend to form in areas with poor and/or unusual soil conditions, and have a high degree of endemism and low species diversity (Barbour and Major 1990). In the Plan Area these forest types are represented by knobcone pine (*Pinus attenuata*) and Tecate cypress (*Cupressus forbesii*) forests (CBI 2009). Mixed evergreen forests include a wide range of coniferous forest types that make up the majority of California's coastal mountain forests (Barbour and Major 1990). Bigcone Douglas-fir (*Pseudotsuga macrocarpa*) forests are the only mixed evergreen forest represented within the Plan Area (CBI 2009), The Coulter pine (*Pinus coulteri*) forest community also occurs within the Plan Area and is characterized by Barbour and Major (1990) as a lower montane coniferous forest.

Knobcone pine forests are fire-maintained and are typically found on ridges and upper slopes on shallow-soil, dry, rocky sites that are often serpentine in geology (Holland 1986). Coulter pine forests are most typically found on south-facing slopes and ridges (Holland 1986). Tecate cypress forests are found in moist canyons and drainages on north-facing slopes (Reiser 1994). Bigcone Douglas-fir forests are primarily found on north-facing slopes with shallow, well-drained soils (Sawyer and Keeler-Wolf 1995). There are no covered plant species or underrepresented vegetation communities within Orange County coniferous forests (CBI 2009).

Wildlife Species Uses

Many mammals such as mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), American badger (*Taxidea taxus*), and common gray fox (*Urocyon cinereoargenteus*) use coniferous forests in the Santa Ana Mountains for reproduction, foraging, shelter, and dispersal. This includes mountain lions (*Puma concolor)* and bobcats (*Lynx rufus*), both of which are proposed for coverage within the Plan Area. Bat species to use forest trunk cavities or tree bark crevices for night roosting, particularly in areas near streams or open bodies of water. Many species of raptor use coniferous forests for nesting, perching, and/or foraging including: Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*) (non-breeding only within the Plan Area), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), turkey vulture (*Cathartes aura*), western screech owl (*Megascops kennicottii*), great horned owl (*Bubo virginianus*), and the rare spotted owl (*Strix occidentalis*). Woodpeckers, flycatchers, doves, and songbirds such as jays, nuthatches, warblers, and sparrows use coniferous forests for nesting and foraging. Reptiles and amphibians use the forest floor for cover and foraging, particularly near moist areas such as seeps and springs. Coniferous forest communities within the Plan Area are shown in Figure C.1-2.



OCTA

Coniferous Forest Vegetation Types

C.1-2

Insects use the forest floor much the same way reptiles and amphibians do, foraging for detritus, carrion, and other insects and using the leaf litter for cover. Many wildlife species that reside within coniferous forest are more likely to be found at the edge of adjacent vegetation communities, providing for a greater diversity of species in both community types.

Community Distribution

Knobcone pine forests occur in the coastal ranges from southwestern Oregon to northern Baja California usually between 300 and 1,500 meters (1,000 and 5,000 feet) (Davis et al.1998). There are 63 acres of knobcone pine forests within Orange County, all of which are within the Santa Ana Core Habitat Area (CBI 2009). Within the Santa Ana Mountains, knobcone pine forests can be found in the Pleasants Peak and Santiago Peak areas of the Cleveland National Forest (USFS 2005).

Coulter pine forests are widely scattered, though fragmented, throughout the South Coast Ranges from Contra Costa County south into Baja California, Mexico. Elevations vary from 750 to 1,500 meters (2,500 to 5,000 feet) in the north, to 1,200 to 2,000 meters (4,000 to 6,500 feet) in the south. Within Orange County, there are 73 acres of Coulter pine forest, all of which occur within the Santa Ana Core Habitat Area (CBI 2009).

Tecate cypress forests are found in Orange County, San Diego County, and Baja California, Mexico. Within Orange County, there are 314 acres of Tecate cypress forests, all of which occur in the Santa Ana Mountains Core Habitat Area. In the Santa Ana Mountains, Roberts (2008) reported Tecate cypress forests in Fremont Canyon, Gypsum Canyon, and Coal Canyon.

Bigcone Douglas-fir forests are found in the montane regions of the central coast, transverse, and peninsular ranges at elevations from 275 to 2,400 meters (900 to 7,900 feet) (Sawyer and Keeler-Wolfe 1995). There are 1,531 acres of bigcone Douglas-pine forest that occur with Orange County, all of which are within the Santa Ana Mountains Core Habitat Area (CBI 2009). The headwaters of the canyons contained within the Cleveland National Forest's Silverado Place contain the greatest concentrations of bigcone Douglas-fir in the Santa Ana Mountains (USFS 2005).

Status and Trends

Of the 1,981 acres of coniferous forest in Orange County, 1,978 acres (99.8%) are currently protected, mostly within the Cleveland National Forest (CBI 2009). Of the four types of coniferous forests that occur in Orange County, only Tecate cypress type is considered rare. The dominant species in this association, Tecate cypress, is listed as a 1B.1 plant by the California Native Plant Society (CNPS) (2010) and an S1.1 by DFG (2010). A 1B.1 plant is considered "seriously endangered in California" by CNPS (2010). An S1.1 ranking means the species is "critically imperiled." In the case of the Tecate cypress, this is due to extreme rarity (less than five known occurrences, G2 S2 ranking) (DFG 2010).

Bigcone Douglas-fir forests were found to be a comparatively stable community within the Santa Ana Mountains, particularly on mesic, fire-resistant sites (Barbour and Major 1990).

Threats to the Community and Other Conservation Issues

Fragmentation is generally the greatest threat to vegetation communities. By reducing the size and shape of an ecosystem, as well as isolating it from other ecosystem types, the resiliency of that ecosystem to invasion and disturbance, as well as to stochastic natural events such as fire and drought, is also reduced. The highly protected nature of continuous stands of coniferous forests in the Santa Ana Mountains of Orange County has greatly benefited this vegetation community. This ecosystem is largely intact, and the improved understanding of the need to incorporate natural processes in current management where feasible (e.g., away from communities and private lands) will likely benefit substantial portions of this community type.

Literature Cited

Barbour, Michael G. and Jack Major (eds.). 1990. Terrestrial vegetation of California. California Native Plant Society Press, Special publication No. 9, University of California, Davis.

California Department of Fish and Game (DFG), Natural Diversity Database. 2010. Special Vascular Plants, Bryophytes, and Lichens List. July. Quarterly publication. 71 pp.

California Native Plant Society (CNPS). 2010. Inventory of Rare and Endangered Plants (online edition, v7-10c). California Native Plant Society, Sacramento, CA. Available: <http://www.cnps.org/inventory>. Accessed: August 29, 2010.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for the Orange County Transportation Authority. 54 pp.

Davis, F. W., D. M. Stoms, A. D. Hollander, K. A. Thomas, P. A. Stine, D. Odion, M. I. Borchert, J. H. Thorne, M. V. Gray, R. E. Walker, K. Warner, and J. Graae. 1998. *The California Gap Analysis Project—Final Report*. University of California, Santa Barbara, CA. Available: <http://www.biogeog.ucsb.edu/projects/gap/gap_rep.html>. Accessed: August 28, 2010.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA. Available: <http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf.

Reiser, C. H. 1994. *Rare Plants of San Diego County*. Available: <http://sandiego.sierraclub.org/rareplants>. Accessed: August 28, 2010.

Roberts, F.M., Jr. 1998. *A Checklist of the Vascular Plants of Orange County, California*. 2nd Edition. F. M. Roberts Publications, Encinitas, CA.

Roberts, F. M., Jr. 2008. *A Checklist of the Vascular Plants of Orange County, California*. 3rd Edition. F. M. Roberts Publications, Encinitas, CA.

Sawyer, J. O., and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

U.S. Department of Agriculture Forest Service (USFS). 2005. *Land Management Plan, Part 2 Cleveland National Forest Strategy*. Pacific Southwest Region. R5-MB-077.

Woodlands

Natural Community Description

Woodlands are differentiated from forests by the density of the canopy. Because of increased light availability, woodlands generally have a more diverse understory community than forests. Woodland communities primarily border the coniferous forest communities at higher elevations and border scrub, grassland, and chaparral communities in the lower elevations. Woodland communities vary considerably in canopy density; some woodlands will have a mature, well-formed canopy with a weakly-formed understory while others will have widely-spaced trees with well-developed grassland or chaparral communities in between. Community types with widely spaced trees are generally referred to as savannahs and usually compose the border between woodland and grassland communities.

Five woodland communities have been identified in the Plan Area: California walnut; canyon live oak; coast live oak; coastal mixed hardwood; and interior mixed hardwood (CBI 2009). Coastal mixed hardwood and California walnut communities were found to be under-protected by the Orange County Conservation Assessment (CBI 2009). California walnut communities are listed as rare by DFG (2009). These woodlands correspond to southern oak woodlands (Munz and Keck 1959 in Griffin 1988, Griffin 1988, Holland 1986). Southern oak woodlands are found in coastal mountain ranges from the Santa Ynez Mountains in Santa Barbara County south into Baja California, Mexico, and are mainly dominated by coast live and Engelmann oaks (*Quercus agrifolia* and *Q. engelmannii*, respectively) and California walnut (*Juglans californica*).

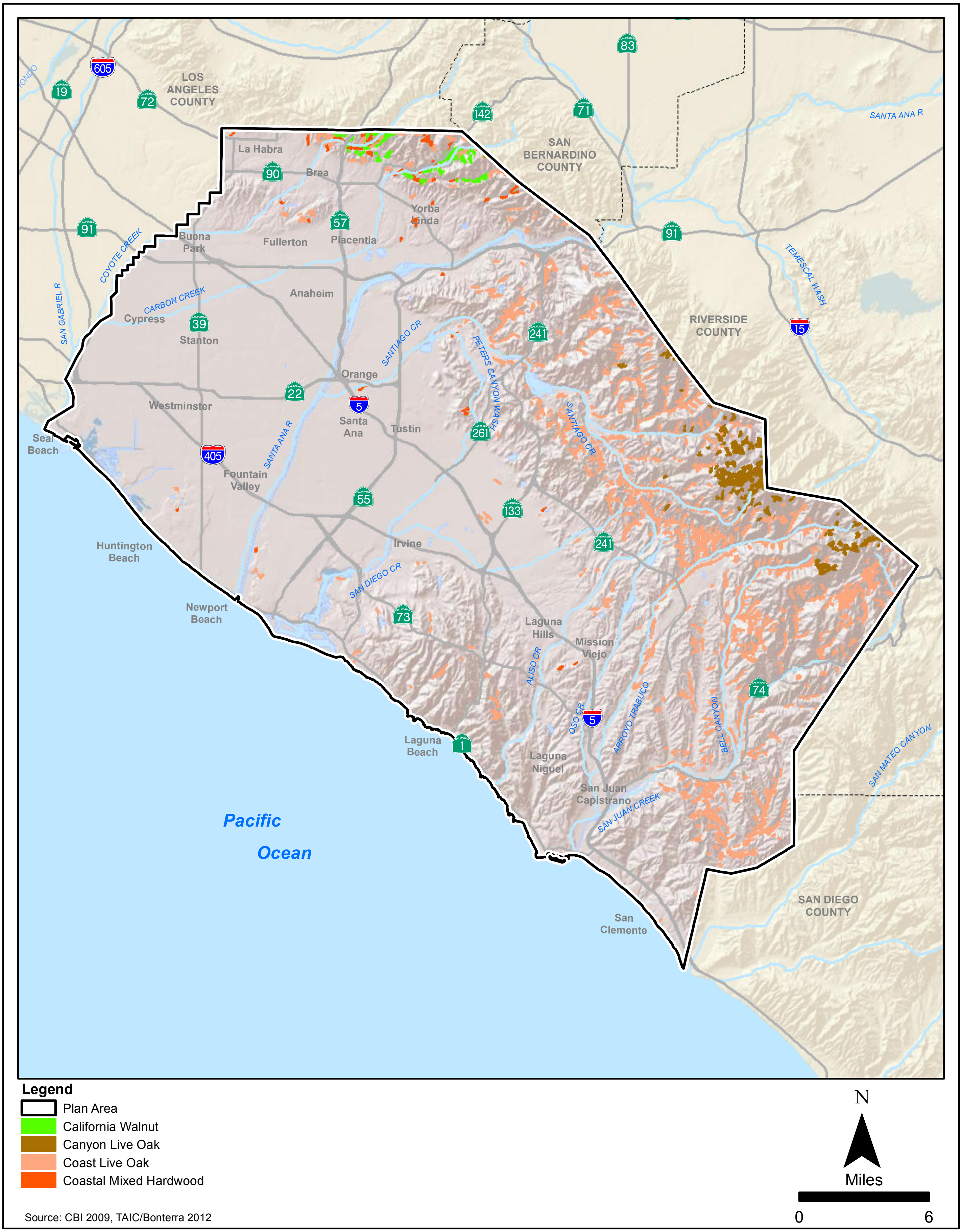
California walnut woodland is classified as a wetland facultative species (U.S. Fish and Wildlife Service [USFWS] 1997) (occurring in wetlands between 33 and 67% of the time), and California walnut woodland forests can be found in intermittently flooded wetlands, riparian corridors, floodplains, and canyons as well as in upland areas, usually on north-facing slopes with deep, shale-derived soils (Sawyer and Keeler-Wolf 1995).

Canyon live oak woodland is dominated by canyon live oak (*Quercus chrysolepis*) and occurs on shallow, well-drained soils of all aspects in raised stream benches and terraces as well as on canyon bottoms near streams (Sawyer and Keeler-Wolf 1995).

Coast live oak woodlands often occur on north-facing and shaded, steep slopes and on raised stream banks and terraces in mostly sandstone or shale-derived soils (Holland 1986, Sawyer and Keeler-Wolf 1995).

Coastal mixed hardwood woodlands are dominated by a mix of oak species, with coast live oak generally in the greatest density, often adjacent to California walnut woodlands.

Interior hardwood woodlands are dominated by a mix of oak species, but intergrade with conifers at higher elevations and big-leaf maple (*Acer macrophyllum*) and California bay (*Umbellularia californica*) at lower elevations (USFS 2009). Woodlands in the Plan Area are shown in Figure C.1-3.



Woodland Vegetation Types

C.1-3

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Date: 4/13/2016

For a community to be defined as Woodland, the tree canopy must be at least 5 percent absolute cover and the dominant tree species of the association or series much account for at least 50 percent relative cover in the tree canopy. If the tree canopy cover is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous, otherwise, it is a scrub community (Sproul and Keeler-Wolf 2011).

Wildlife Species Uses

Wide-ranging species such as mule deer, coyote, American badger, common gray fox, along with the proposed Covered Species, mountain lion and bobcat, use woodlands for reproduction, foraging, shelter, and dispersal. Bat species also have potential to use tree cavities and bark crevices for night roosting, particularly in areas sufficiently close to streams or open bodies of water. Many raptors such as hawks, owls, and vultures use woodlands, particularly open woodlands, for foraging. Mountain and California quail (*Oreortyx pictus* and *Callipepla californica*, respectively), woodpeckers, western bluebird (*Sialia mexicana*), and Cooper's hawk are a few of the bird species that heavily use oak woodland communities for nesting. Reptiles and amphibians use woodlands for cover and foraging, particularly near moist areas such as streams, seeps, and springs. Insects use the woodland understory much the same way reptiles and amphibians do, foraging for detritus, carrion, and other insects, and using the leaf litter for cover.

Community Distribution

California walnut woodlands are endemic to Southern California and are best developed from the south side of the San Gabriel Mountains south to the Santa Ana Mountains, mostly between 150 and 900 meters (500 and 3,000 feet) (Holland 1986). There are 706 acres of California walnut woodland within Orange County, all of which occur in the Chino Hills Core Habitat Area as identified in the Orange County Conservation Assessment (CBI 2009).

Canyon live oak woodlands occur in the coastal ranges from Siskiyou County south to Baja California, Mexico, and on the western slope of the Sierra Nevada from Tehama to Kern County at elevations of 300 to 1,200 meters (1,000 to 4,000 feet) in the north and 900 to 1,800 meters (3,000 to 6,000 feet) in the south (Sawyer and Keeler-Wolf 1995, Davis et al. 1998). There are 2,058 acres of canyon live oak woodland in Orange County, all of which occur within the Santa Ana Mountain Core Habitat Area (CBI 2009). This includes those areas of the County that lie within both the Peninsular and South Coast ranges.

Coast live oak woodlands occur from the outer South Coast Ranges southward to the coastal slopes of the Transverse and Peninsular ranges, usually below 1,220 meters (4,000 feet) elevation (Holland 1986). Coast live oak woodlands are widely distributed throughout Orange County. Of the 10,576 acres of coast live oak woodland within Orange County, 4,523 acres are within the Santa Ana Mountain Core Habitat Area, 1,760 acres in the Northern Foothills Core Habitat Area, 2,821 acres in the Southern Foothills Core Habitat Area, 169 acres in the San Joaquin Hills Core Habitat Area, and 569 acres in the Chino Hills Core Habitat Area (CBI 2009).

Coastal mixed hardwood woodlands are found at elevations less than 1,100 meters (3,600 feet). There are 535 acres of coastal mixed hardwood woodland in Orange County, 424 acres of which are located with the following Core Habitat Areas: Chino Hills (412 acres); Upper Santa Ana River (5 acres); and Santa Ana River Mouth (7 acres) (CBI 2009).

There is 1 acre of interior mixed hardwood woodland in Orange County, which occurs in the Santa Ana Mountains Core Habitat Area (CBI 2009).

Status and Trends

More than one million acres of California's oak woodlands have been lost to development, and approximately 750,000 acres are at risk of development before 2040 (Gaman and Firman 2006). Over 20% of the oak woodlands in Orange County have been developed and an additional 10% is at risk of development by 2040 because oak woodlands are predominately privately owned in Orange County (Gaman and Firman 2006). The percentage of oak woodland lost to development is higher in Southern California than anywhere else in California. Statewide, Orange and San Diego counties have the lowest percentages (65%) of stable oak woodlands (Gaman and Firman 2006).

Of the 13,876 acres of woodland in Orange County, 10,662 acres (77%) are currently protected. California walnut woodland and coastal mixed hardwood community types were found to be under-protected by the Orange County Conservation Assessment (CBI 2009). Of the 706 acres of California walnut woodland in Orange County, 64% (450 acres) is unprotected. Of the total acres of coastal mixed hardwood woodlands in Orange County (535 acres), 58% (312 acres) are unprotected (CBI 2009).

California walnut populations are in decline (Esser 1993). The California walnut is listed as a species of concern by the USFWS (2010). California walnut groves are listed as S3.2, “vulnerable,” by DFG (2009). Coast live oak woodlands are listed at S4, “apparently secure,” by the State of California (DFG 2009), and canyon live oak forests are listed as S5, “secure.”

Threats to the Community and Other Conservation Issues

Fire management is an important component in the conservation of woodland communities. Oaks and California walnut are fire-adapted species and adapted to re-sprout from the trunk or crown after the tree is top-killed by fire (Esser 1993, McCreary 2004). This adaptation is believed to have served these communities well when fires were frequent and less intense. Modern day fires, however, are more severe as a result of fire suppression and the associated fuel accumulation. These more intense fires often result in complete mortality of woodland trees (McCreary 2004). Oak and walnut seeds are not fire-adapted, although seedlings are believed to benefit from post-fire conditions, so mortality of mature trees in a fire can severely reduce tree densities in woodland communities. Conservation and management solutions include restoration of the native plant community in the understory, fuel load reduction, reduction of roads and other infrastructure development in woodland communities, and post-fire tree restoration (McCreary 2004).

California walnut woodlands are threatened by urban and rural development, overgrazing, and recreational use. California walnut is also highly susceptible to crown and heart rot (Esser 1993). Cattle grazing, in combination with drought, have been found to result in increased seedling mortality due to the loss of protective understory vegetation (Esser 1993). Oak regeneration is also affected by cattle grazing, with coast live oak regeneration being most successful in those areas with increased ground squirrel activity and decreased cattle grazing pressure (Griffin 1988).

Literature Cited

California Department of Fish and Game (DFG). 2009. *List of California Vegetation Alliances*. December. Biogeographic Data Branch, Vegetation Classification and Mapping Program. Available: <http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/AllianceList_Dec09.pdf>. Accessed: September 1, 2010.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for the Orange County Transportation Authority. 54 pp.

Davis, F. W., D. M. Stoms, A. D. Hollander, K. A. Thomas, P. A. Stine, D. Odion, M. I. Borchert, J. H. Thorne, M. V. Gray, R. E. Walker, K. Warner, and J. Graae. 1998. *The California Gap Analysis Project—Final Report*. University of California, Santa Barbara, CA. Available: <http://www.biogeog.ucsb.edu/projects/gap/gap_rep.html>. Accessed: August 9, 2010.

Esser, L. 1993. *Juglans californica*. In *Fire Effects Information System*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis>. Accessed: September 2, 2010.

Gaman, T., and J. Firman. 2006. *Oaks 2040, The Status and Future of Oaks in California*. The California Oak Foundation. October. Available: <http://www.californiaoaks.org/ExtAssets/Oaks2040%20Final.pdf>. Accessed: September 2, 2010.

Griffin, J. R. 1988. *Terrestrial Vegetation of California*. California Native Plant Society, Special Publication Number 9. Sacramento, CA.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA. Available: <http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf>.

McCreary, D. D. 2004. *Fire in California's Oak Woodlands*. University of California Cooperative Extension. June 2004. Available: <http://www.californiaoaks.org/ExtAssets/FireByMcCreary.pdf>. Accessed: September 2, 2010.

Sawyer, J. O., and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

Sproul, F. and T. Keeler-Wolf. 2011. Vegetation Classification Manual for Western San Diego County. First Edition.

U.S. Fish and Wildlife Service (USFWS). 1997. *National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary.* Ecology Section, National Wetlands Inventory. March 3. Available: <http://library.fws.gov/Pubs9/wetlands_plantlist96.pdf>. Accessed: September 2, 2010.

———. 2010. Species Profile for *Juglans Californica*. Last updated: September 2010. Available: <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q3L7#lifeHistory>. Accessed: September 2, 2010.

U. S. Department of Agriculture Forest Service (USFS). 2009. *Vegetation Classification, CALVEG Zones and Alliances – Vegetation Descriptions*: *South Coast and Montane Ecological Province (CALVEG Zone).* Last updated: March 30, 2009. Available: <http://www.fs.fed.us/r5/rsl/projects/classification/zone7des033009www.pdf>. Accessed: September 2, 2010.

Chaparral

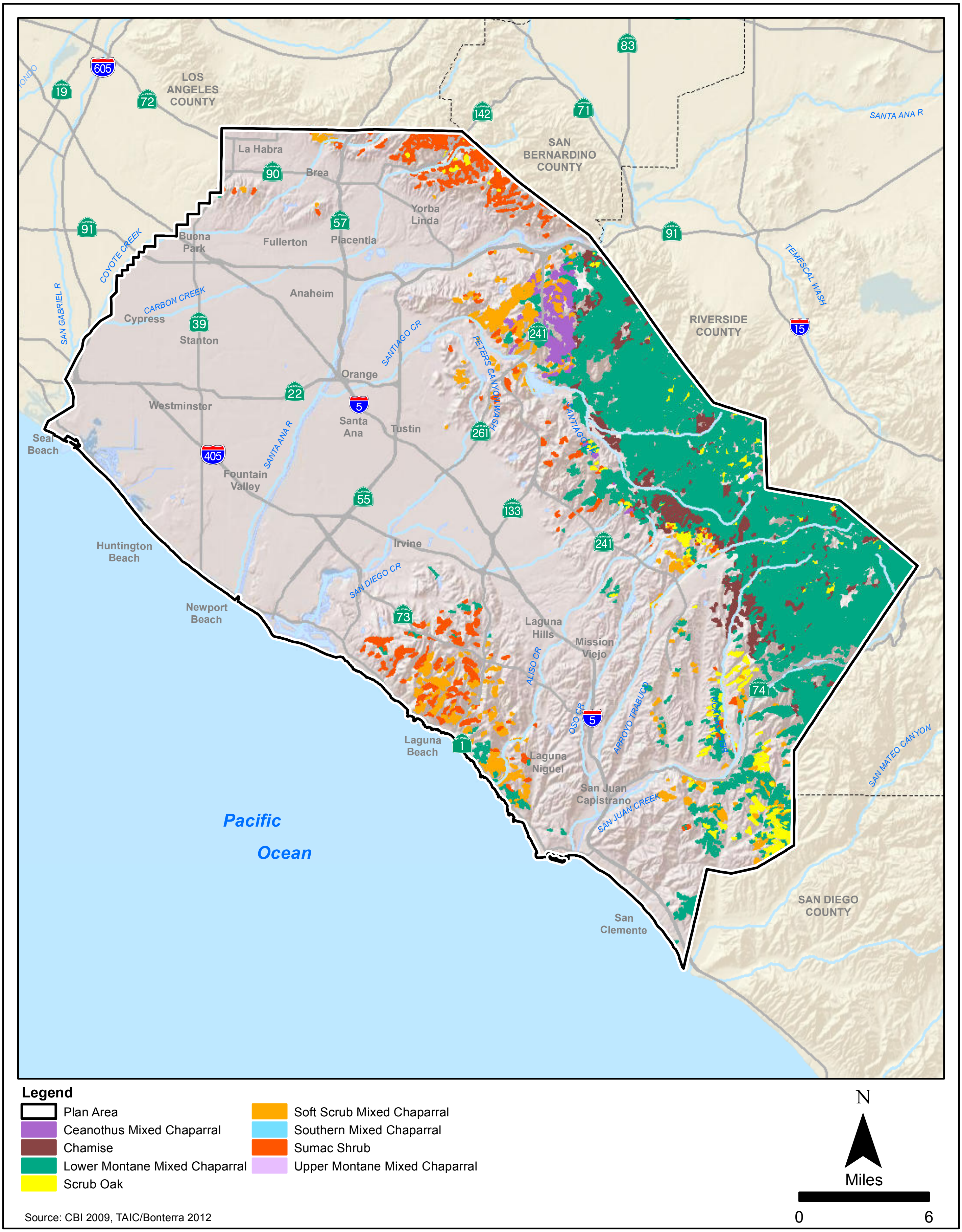
Natural Community Description

Chaparral is a semi-arid, shrub-dominated association of plants made up of sclerophyllous (hard-leaved), woody plants shaped by summer drought, mild wet winters, and infrequent fires, with natural intervals between fires being between 50 and 100 years plus (Hanes 1990, Conrad and Weise 1998). Chaparral communities cover a larger area than any other vegetation type in California. Those species that are most often dominant in chaparral communities of Southern California include chamise (*Adenostoma fasciculatum*), scrub oak (*Quercus berberidifolia*), toyon (*Heteromeles arbutifolia),* ceanothus *(Ceanothus* spp.), manzanita *(Arctostaphylos* spp.*)*, mountain-mahogany (*Cerocarpus* spp.), and silk-tassel bush (*Garrya* spp.) (Hanes 1990, Conrad and Weise 1998). Eight chaparral vegetation types, or communities, have been identified for conservation planning purposes in the Orange County Conservation Assessment: ceanothus mixed chaparral, chamise, lower montane mixed chaparral, soft scrub mixed chaparral, southern mixed chaparral, scrub oak chaparral, upper montane mixed chaparral, and sumac chaparral (CBI 2009).

Ceanothus mixed chaparral is dominated by bigpod ceonothus (*Ceanothus megacarpus*) in mesic and coastal sites and cupleaf ceanothus (*C. greggii*) in xeric sites (USFS 2009). Chamise chaparral often develops on sites with shallow soils, recent fire disturbance, or more xeric locations such as south-facing slopes than adjacent lower montane mixed chaparral. Lower montane mixed chaparral occurs extensively on cismontane, low to moderately high elevation slopes of all aspects and gradients. Soft scrub mixed chaparral is a shorter-lived community type that occurs in areas of ground disturbance, such as where there are shorter fire intervals and/or urban development (USFS 2009). Southern mixed chaparral is a low-elevation community having somewhat lower precipitation and more moderate temperatures than the lower montane mixed chaparral community. Scrub oak chaparral communities are dominant on north-facing and often steep, mesic slopes at low to moderately high elevations (Holland 1986). Upper montane mixed chaparral is found at comparatively higher elevations on sites that are often steep or have rocky, shallow soils unfavorable to conifer growth (USFS 2009). Sumac chaparral is dominated by sumac (*Rhus spp*.) or laurel sumac (*Malosma laurina*) and is found on relatively steep slopes (USFS 2009).

For a community to be defined as chaparral, the combined cover of the dominant species of the alliance or series must account for at least 50 percent relative cover in the shrub canopy. Tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous (Sproul and Keeler-Wolf 2011).

Several plant species proposed for coverage have potential to occur within chaparral communities. Matilija poppy (*Romneya coulteri*), intermediate mariposa lily (*Calochortus weedii var. intermedius*), and many-stemmed dudleya (*Dudleya multicaulis*) occur in open areas within chaparral communities. Matilija poppy is frequently found on recently burned sites, but can also be found in disturbed areas such as road cuts or graded areas. Intermediate mariposa lily is found on open, rocky outcroppings in chaparral, scrub, and grassland communities. Many-stemmed dudleya is found in open areas with heavy clay soils. Chaparral in the Plan Area is shown in Figure C.1-4.



OCTA

Chaparral Vegetation Types

C.1-4

Wildlife Species Uses

Due to their enclosed, intertwining nature, chaparral communities are well-suited for small species such as rodents and reptiles, providing cover from predators such as larger mammals and raptors. In Southern California, the big-eared woodrat (*Neotoma macrotis*) and the desert cottontail (*Sylvilagus audubonii*) are the signature chaparral mammals. Several species of mice in the genus *Peromyscus* reach peak abundance in chaparral, and many other native rodents utilize chaparral edges and sufficiently open interior areas. Other mammals such as mule deer, coyote, bobcat, and gray fox also use chaparral communities for foraging, reproduction, and cover, but are limited in the thickest, most mature stands. Although mountain lions and badgers may use chaparral for dispersal or cover, this is not primary foraging or reproductive habitat for these species. Typical chaparral bird species include wrentit (*Chamaea fasciata*), western scrub-jay (*Aphelocoma californica*), California towhee (*Pipilo crissalis*), spotted towhee (*Pipilo maculatus*), and California thrasher (*Toxostoma redivivum*). Rufous-crowned sparrow (*Aimophila ruficeps*) uses open and post-fire chaparral communities. Reptiles and amphibians use chaparral for cover and foraging, particularly near moist areas such as streams, seeps, and springs. The coast horned lizard (*Phrynosoma blainvillii*), red diamond rattlesnake (*Crotalus ruber*), and orangethroat whiptail (*Aspidoscelis hyperythra*) are found in chaparral. Insects occupy the chaparral understory much the same way reptiles and amphibians do, using leaf litter for cover and foraging for detritus, carrion, and other insects.

Community Distribution

A number of different chaparral communities exist within California. Ceonothus mixed chaparral occurs at elevations ranging from near sea level at the coast to about 1,828 meters (6,000 feet) in the Transverse, Peninsular, and Santa Ana mountains. Chamise ranges from northern California to Baja California, Mexico, east to the Sierra Nevada Mountains foothills, and west to the Channel Islands, generally below about 1,460 meters (4,800 feet) on the coast and somewhat higher inland (USFS 2009). Lower mixed montane chaparral is found at elevations from sea level to 1,650 meters (5,400 feet) in the coastal regions and up to 2,440 meters (8,000 feet) in the mountains (USFS 2009). Soft scrub mixed chaparral sites are typically found at elevations below 1,040 meters (3,400 feet) on moderately steep slopes at the coast and below 1,750 meters (5,800 feet) in the mountains. Southern mixed chaparral is found in the coastal foothills of San Diego County and northern Baja California, usually below 910 meters (3,000 feet) (Holland 1986). Scrub oak chaparral communities can be found in the western Sierran foothills and North Coast ranges from Tehama County south through the Southern California mountains to Baja California (Holland 1986). Upper montane mixed chaparral occurs at moderately high elevation levels, generally above about 1,280 meters (4,200 feet) in Southern California (USFS 2009). Sumac chaparral occurs on steeper slopes below 1,220 meters (4,000 feet) on the coast and 1,330 meters (4,350 feet) in the mountains of Southern California (USFS 2009).

Of the 82,951 acres of chaparral in Orange County, the majority (82,055 acres; 99%) occurs within the Core Habitat Areas identified in the Orange County Conservation Assessment (CBI 2009). Most of the chaparral (62,682 acres) lies within the Santa Ana Mountains Core Habitat Area. The remaining acreage is spread comparatively evenly across the following Core Habitat Areas:

Northern Foothills (3,653 acres), Southern Foothills (8,223 acres), San Joaquin Foothills (4,408 acres), and Chino Hills (2,990 acres), with a small extent in the West Coyote Hills (49 acres).

Status and Trends

Of the 82,951 acres of chaparral in Orange County (CBI 2009), 86% (70,925 acres) are protected. The Orange County Conservation Assessment did not find any of the chaparral community types to be underrepresented.

Threats to the Community and Other Conservation Issues

The greatest threats to chaparral communities are urbanization and fragmentation and the associated increase in nonnative plants and altered wildland fire cycles. Chaparral communities are fire-adapted, but fire suppression and the buildup of fuel that contributes to large, intense fires is not an issue in chaparral communities to the degree it is in oak woodlands (Conrad and Weise 1998). Instead, Regan et al. (2010) found that a ceanothus-dominated chaparral community had the greatest population abundance at fire intervals of 30 to 50 years, but that wildland fires in highly fragmented chaparral areas were occurring at intervals of approximately 20 years.

Fire management in chaparral communities is a well-studied, constantly-evolving field with considerable public interest and scrutiny. Fuel load reduction in the form of controlled burning does not seem to be an effective means of reducing fire intensity or frequency, particularly in Southern California where fire intensity is often more related to fire-favorable weather conditions than fuel load. Traditional fuel-breaks may, like those buffer areas around development, increase ignition potential due to the associated dry, herbaceous layer (Conrad and Weise 1998). Large-scale, mosaic burning and management is expensive and severely diminishes those ecosystem services and values that humans enjoy such as erosion control, recreation, and wildlife viewing (Conrad and Weise 1998). Although there is no one fire-management solution for all chaparral communities, making ecosystem function the top priority in management decisions appears to also be the best strategy for minimizing fire damage and fire potential in urban and suburban areas (Conrad and Weise 1998).

Literature Cited

California Department of Fish and Game (DFG). 2009. *List of California Vegetation Alliances*. December. Biogeographic Data Branch, Vegetation Classification and Mapping Program. Available: <http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/AllianceList_Dec09.pdf>. Accessed: September 1, 2010.

California Native Plant Society (CNPS). 2010. *Inventory of Rare and Endangered Plants* (online edition, v7-10c). California Native Plant Society, Sacramento, CA. Available: <http://www.cnps.org/inventory>. Accessed: August 29, 2010.

Conrad, S. G., and D. R. Weise. 1998. *Management of fire regime, fuels, and fire effects in Southern California chaparral: lessons from the past and thoughts for the future.* Pages 342–350. Available: <http://ddr.nal.usda.gov/bitstream/10113/34404/1/IND44266785.pdf>. Accessed: September 2, 2010.

Hanes, T. L. 1990. California Chaparral. In Michael G. Barbor and Jack Major (eds.), *Terrestrial Vegetation of California*. California Native Plant Society, Sacramento, CA.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA. Available: <http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf.

Sproul, F. and T. Keeler-Wolf. 2011. Vegetation Classification Manual for Western San Diego County. First Edition.

Regan, H. M., J. B. Crookston, R. Swab, J. Franklin, and D. M. Lawson. 2010. Habitat fragmentation and altered fire regime create trade-offs for an obligate seeding shrub. *Ecology*. 91:1114–1123.

U. S. Department of Agriculture Forest Service (USFS). 2009. *Vegetation Classification, CALVEG Zones and Alliances – Vegetation Descriptions*: *South Coast and Montane Ecological Province (CALVEG Zone).* Last Updated: March 30, 2009. Available: <http://www.fs.fed.us/r5/rsl/projects/classification/zone7des033009www.pdf>. Accessed: September 2, 2010.

Scrub

Natural Community Description

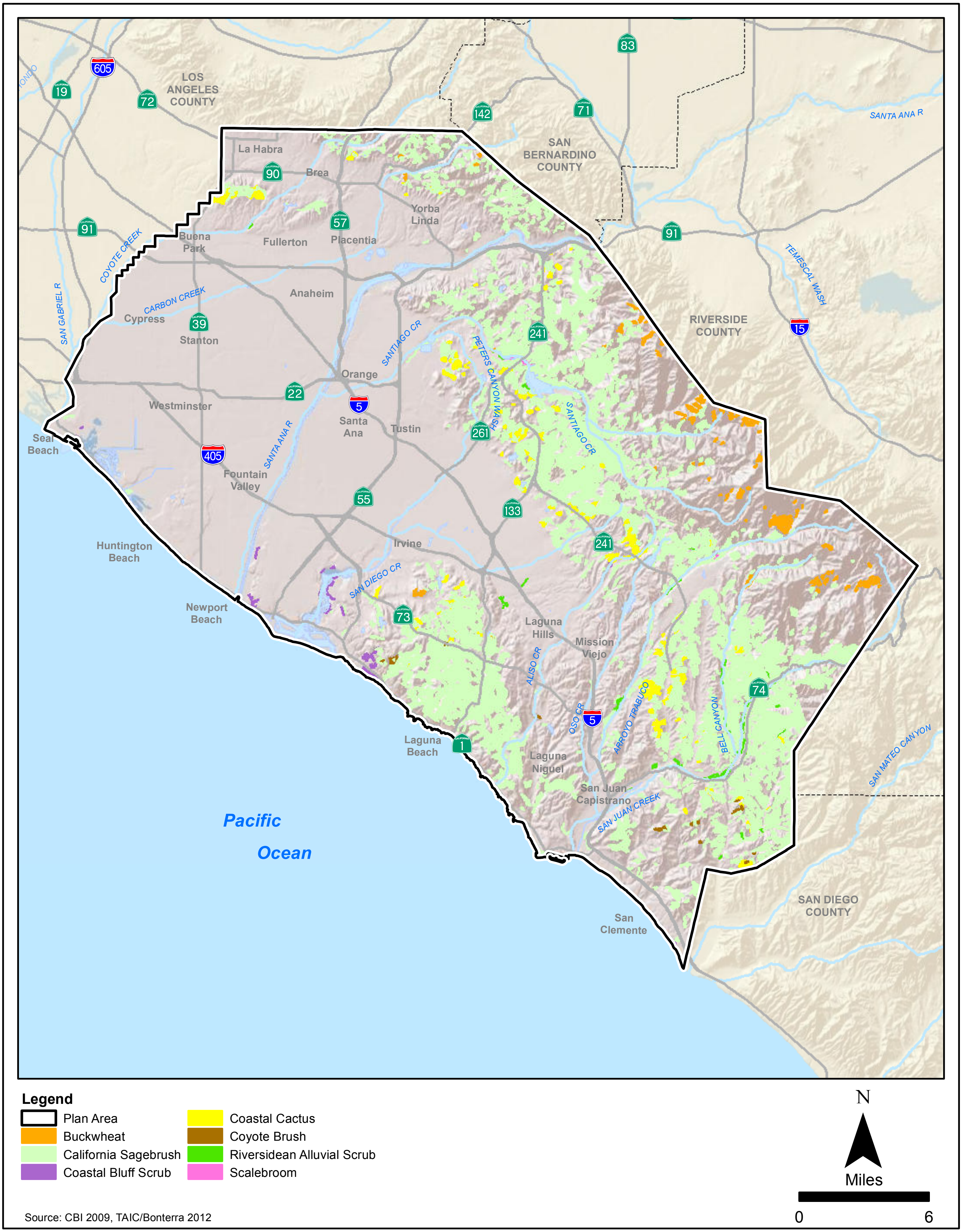
Southern coastal scrub is a distinct California scrub community that occurs in coastal lowland regions from Point Sur south to Baja California, Mexico (Mooney 1990). Scrub communities have short (<2 meters [<6.5 feet]), dense to fairly open vegetation. This vegetation community is found on shallow to steep, shallow-soiled slopes in the coastal areas of Southern California and Baja California, including the Channel Islands, from sea level to 1,200 meters (4,400 feet) (Sawyer and Keeler-Wolfe 1995, USFS 2009). The community generally occurs with chaparral communities at higher elevations and grassland communities at lower elevations. Southern coastal scrub is characterized by California sagebrush (*Artemisia californica)*, white sage (*Salvia apiana)*, black sage (*Salvia mellifera)*, purple sage (*Salvia leucophylla)*, California buckwheat (*Eriogonum fasciculatum)*, lemonade berry (*Rhus integrifolia)*, California bush sunflower (*Encelia californica)*, saw-toothed goldenbush (*Hazardia squarrosa*, coastal goldenbush (*Isocoma menziesii*), and golden-yarrow (*Eriophyllum confertiflorum*) (Mooney 1990).

For a community to be defined as scrub, the combined cover of the dominant species of the alliance or series must account for at least 50 percent relative cover in the shrub canopy. Tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous (Sproul and Keeler-Wolf 2011).

Several plant species proposed for coverage have potential to occur within the scrub community. Matilija poppy, intermediate mariposa lily, and many-stemmed dudleya occur in scrub communities. Matilija poppy is frequently found in disturbed areas such as road cuts and graded areas in scrub communities. Intermediate mariposa lily is found on open, rocky outcroppings in chaparral, scrub, and grassland communities. Many-stemmed dudleya is found in open areas of scrub habitat with heavy clay soils. Scrub communities in the Plan Area is shown in Figure C.1-5.

Wildlife Species Uses

Rodents are the most common mammals in scrub communities. Because of this, larger mammalian predators such as coyote, common gray fox, and American badger are also likely to be found in these habitat types. Mule deer regularly utilize scrub communities when they are extensive and/or adjacent to chaparral and woodland communities. Mountain lions and bobcats, both of which are proposed for coverage by this Plan, also have potential to hunt in scrub habitats. The coastal California gnatcatcher (*Polioptila californica californica*), a federally threatened species and proposed for coverage under this Plan, is dependent upon southern coastal scrub. Scrub ecotones, such as scrub/grassland and scrub/eucalyptus, also provide valuable habitat for the gnatcatcher and other sensitive birds for foraging, cover, and dispersal. The cactus wren (*Campylorhynchus brunneicapillus*), a species proposed for coverage under this Plan and a state Species of Special Concern, is dependent upon the cactus scrub community. Two of the four reptiles species proposed for coverage by the Plan are found in southern coastal scrub: coast horned lizard,and orangethroat whiptail. Insects use the scrub community in the same way they use other communities, using the leaf litter for cover and foraging for detritus, carrion, or other invertebrates.



OCTA

Scrub Vegetation Types

C.1-5

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Date: 4/13/2016

Community Distribution

Buckwheat scrub alliance or the California buckwheat-white sage series (Sawyer and Keeler-Wolfe 1995, USFS 2009) is found on south-facing, xeric sites with bouldery, shallow soils. It is found in the coastal and interior portions of Southern California and Baja California, Mexico, at elevations between 500 and 1,500 meters (1,640 and 4,900 feet).

California sagebrush alliance or series is found in coastal areas from Point Conception south to Baja California, Mexico, including the Channel Islands (Sawyer and Keeler-Wolf 1995, USFS 2009). There are 53,838 acres of California sagebrush community in Orange County, 50,186 acres of which occur in the Core Habitat Areas designated in the Orange County Conservation Assessment and 81% (43,477 acres) of which is are currently protected (CBI 2009). These acres are relatively evenly distributed in the following Core Habitat Areas: Santa Ana Mountains (9,510 acres, 84% protected); Northern Foothills (11,963 acres, 82% protected); Southern Foothills (15,834 acres, 84% protected); San Joaquin Hills (10,218 acres, 90% protected); and Chino Hills (2,388 acres, 63% protected) (CBI 2009)

Coastal bluff scrub was historically more widespread, but currently is relegated to scattered and exposed preserves that are primarily in San Diego County but also in other coastal areas of Southern California (USFS 2009). This community type is found below 180 meters (600 feet) elevation. There are 375 acres of coastal bluff scrub in Orange County, 141 acres of which are distributed among the Seal Beach, Bolsa Chica, Santa Ana River Mouth, and the Upper Newport Bay Core Habitat Areas designated by the Orange County Conservation Assessment (CBI 2009).

Coastal cactus alliance or coast prickly-pear series is dominated by any combination of *Opuntia* (prickly-pear and cholla) species. There are 2,731 acres of coastal cactus scrub in Orange County, 2,298 acres of which are found in the Core Habitat Areas designated in the Orange County Conservation Assessment (CBI 2009). The 2,298 acres are distributed among the following Core Habitat Areas: Santa Ana Mountains (75 acres); Northern Foothills (771 acres); Southern Foothills (994 acres); San Joaquin Hills (208 acres); Chino Hills (38 acres); and West Coyote Hills (212 acres).

Coyote brush alliance ranges from Tillamook County, Oregon, south to Baja California, Mexico, and east to the Sierra Nevada and California Cascade mountains, including the Channel Islands. It is dominated by coyote brush (*Baccharis pilularis*). This vegetation community can be found on dunes, river mouths, spits, coastal bluffs, and terraces in deep, well-drained soils from sea level to 1,000 meters (3,300 feet). There are 179 acres of coyote brush scrub in Orange County, 163 acres of which are protected, almost evenly, in the Southern Foothills (83 acres) and Chino Foothills (80 acres) Core Habitat Areas designated in the Orange County Conservation Assessment (CBI 2009).

Riversidean alluvial scrub alliance or Riversidean sage scrub is the most xeric expression of coastal sage scrub south of Point Conception and is dominated by California sagebrush, California buckwheat, and nonnative red brome (*Bromus madritensis rubens*), each attaining at least 20% cover (Holland 1986, Sawyer and Keeler-Wolf 1995). This community is found on shallow to steep, dry slopes along the coastal base of the Transverse and Peninsular ranges from central Los Angeles County south to Baja California, Mexico. There are 731 acres of Riversidean alluvial scrub in Orange County, 628 acres of which are contained with Core Habitat Areas designated in the Orange County Conservation Assessment (CBI 2009). Most of the 628 acres are in the Southern Foothills Core

Habitat Area, with the remaining acres spread throughout the Santa Ana Mountains (10 acres), Northern Foothills (73 acres), and San Joaquin Hills (18 acres) Core Habitat Areas.

Scalebroom is found in intermittent stream and wash drainages on sand and coarse-textured alluvial fan deposits in both outer and interior portions of the coastal mountain areas of Southern California (USFS 2009). It is dominated by, or includes as a significant component, scalebroom (*Lepidospartum squamatum*). Other components are often a mix of species typical of chaparral and other scrub communities, reflecting the dynamic nature of ongoing, natural disturbances in this system. There are 96 acres of scalebroom scrub in Orange County, all of which are found in the Northern Foothills Core Habitat Area (CBI 2009).

Scrub/grassland ecotone is defined as an open scrub/grassland with shrub cover of 5-20 percent. Scrub/grassland subassociations are based on the presence of a single main shrub species, plus a “mixed” sage scrub/grassland association.

Scrub/eucalyptus is an ecotone occurring where eucalyptus trees have been intentionally planted within extant scrub. Until the eucalyptus trees become dominant to the point that the scrub is excluded from this community, scrub/eucalyptus may provide valuable wildlife habitat, including some of the Covered Species.

Status and Trends

California sagebrush scrub is listed as an S5, “secure,” community by DFG. California sagebrush-California buckwheat scrub and California sagebrush-black sage scrub communities are both listed as S4, “apparently secure” (DFG 2009). However, there is some disagreement regarding the scale of historic decline and the status of the coastal sage scrub community (O’Leary 1995, Minnich and Dezzani 1998). This disagreement is in part due to the great variety in coastal sage scrub community composition and, thus, differences in how it is characterized and delimited (DFG 1993). DeSimone (1995) offers the rare, sensitive, threatened, or endangered status of over 100 coastal sage scrub species as evidence of the community’s imperiled nature.

DFG (1993) has recognized the “severely degraded” status of Southern California coastal sage scrub by creating specific conservation guidelines for the vegetation community. The guidelines for conservation are based largely on the protection of “target species” (DFG 1993). The identified target species are coastal California gnatcatcher, coastal cactus wren, and orangethroat whiptail, three species covered by this Plan. These species’ combined geographic range encompasses the wide and varied range of Southern California coastal sage scrub.

There are 59,521 acres of scrub community in Orange County, 11,054 acres of which are within the Core Habitat Areas designated by the CBI (2009). Of the 11,054 acres within those Core Habitat Areas, 85%, or 9,424 acres, are presently protected. Seven scrub communities were identified in the Orange County Conservation Assessment (CBI 2009): buckwheat, California sagebrush, coastal bluff scrub, coastal cactus, coyote brush, Riversidean alluvial scrub, and scalebroom. The coastal bluff scrub community was found to be under-protected.

There are currently 1,571 acres of buckwheat scrub vegetation in Orange County, nearly all of which (1,459 acres) is found in the Santa Ana Mountains Core Habitat Area as designated in the Orange

County Conservation Assessment (CBI 2009). Of the 1,459 acres in the Core Habitat Areas, 1,424 acres (98%) are currently protected.

Threats to the Community and Other Conservation Issues

The effects of fragmentation related to urbanization, invasion of nonnative species, altered fire regimes, and air pollution are likely the greatest threats to the diversity, abundance, and ecosystem function of the coastal sage scrub community in California (O'Leary 1995). Minnich and Dezzani (1998) found land clearing, grazing, altered fire cycles, and the associated competitive exclusion by nonnative herbs and forbs to be significant contributors to the loss and degradation of coastal scrub habitat.

Literature Cited

California Department of Fish and Game (DFG). 1993. Southern California Coastal Sage Scrub NCCP Process Guidelines. Available: <http://www.dfg.ca.gov/habcon/nccp/>. Accessed: September 24, 2012.

California Department of Fish and Game (DFG). 2009. *List of California Vegetation Alliances*. December. Biogeographic Data Branch, Vegetation Classification and Mapping Program. Available: <http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/AllianceList_Dec09.pdf>. Accessed: September 1, 2010.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. Prepared for the Orange County Transportation Authority, Orange, CA.

DeSimone, S. 1995. Coastal Sage Scrub: Threats and Current Status. *Fremontia* 23(4):27–31.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA. Available: <http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf.

Minnich, R. A., and R. J. Dazzani. 1998. Historical Decline of Coastal Sage Scrub in the Riverside-Perris Plain, California. *Western Birds* 29:366–391.

Mooney, H. A. 1990. Southern Coastal Scrub. In Michael G. Barbor and Jack Major (eds.), *Terrestrial Vegetation of California*. California Native Plant Society, Sacramento, CA.

O'Leary, J. F. 1995. Coastal Sage Scrub: Threats and Current Status. *Fremontia* 23(4):27–31.

Regan, H. M., J. B. Crookston, R. Swab, J. Franklin, and D. M. Lawson. 2010. Habitat fragmentation and altered fire regime create trade-offs for an obligate seeding shrub. *Ecology* 91:1114–1123.

Sawyer, J. O., and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

Sproul, F. and T. Keeler-Wolf. 2011. Vegetation Classification Manual for Western San Diego County. First Edition.

U. S. Department of Agriculture Forest Service (USFS). 2009. Vegetation Classification, CALVEG Zones and Alliances—Vegetation Descriptions: South Coast and Montane Ecological Province

(CALVEG Zone). Last Updated: March 30, 2009. Available: <http://www.fs.fed.us/r5/rsl/projects/classification/zone7des033009www.pdf>. Accessed: September 2, 2010.

Grassland

Natural Community Description

Most grasslands in the Plan Area are dominated by nonnative, but naturalized, annual grasses and forbs. These annual, nonnative grasslands have not traditionally been regulated for biological purposes, but their conservation is important to the Plan preserve design goals. In addition to supporting some grassland specialist species, the continued presence of grasslands is important to the Plan preserve system's connectedness and resilience to disturbances, such as fire and drought.

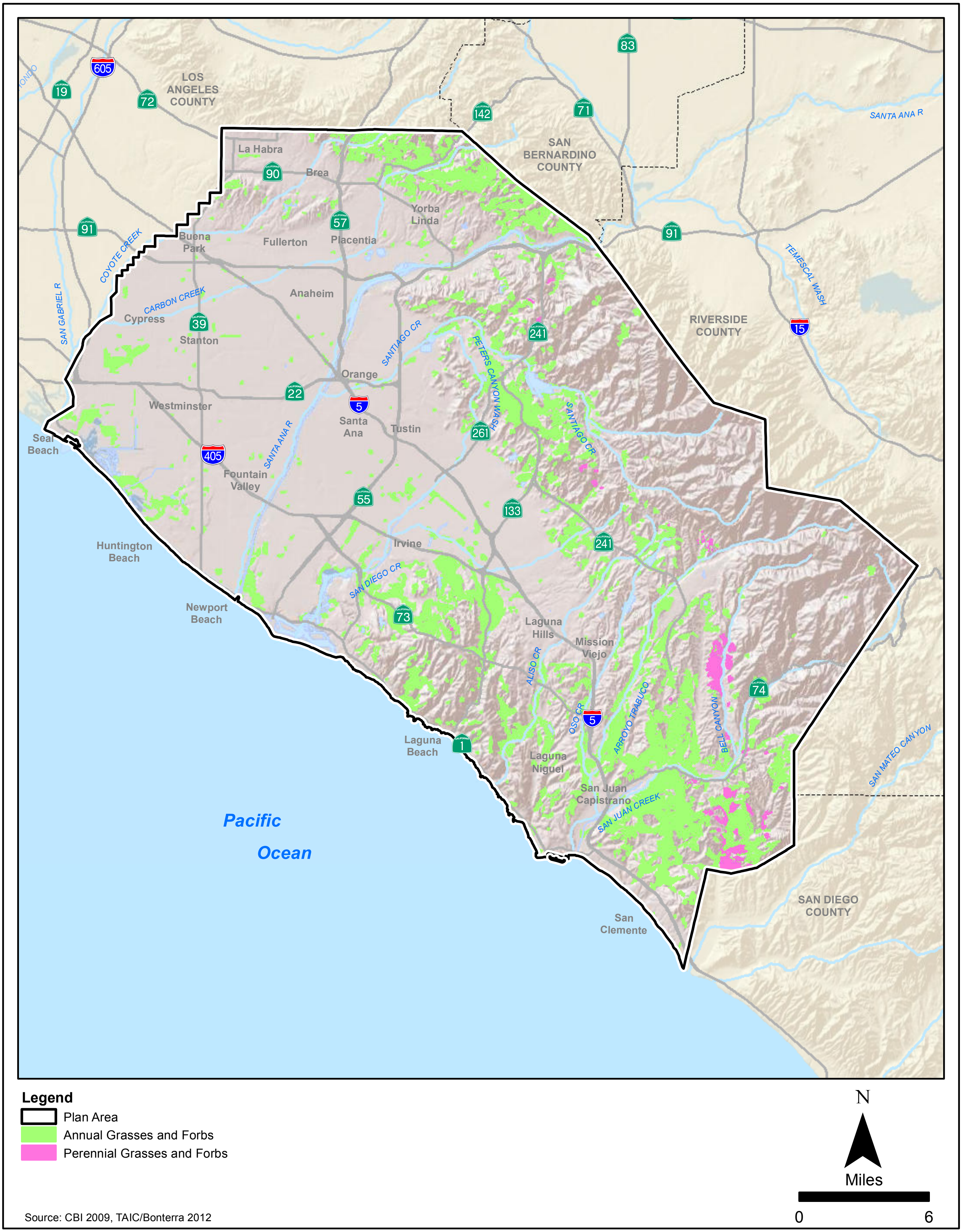
In order to conserve grasslands or require mitigation for impacts to grasslands, the Plan must clearly define and map annual grasslands as opposed to agricultural or disturbed lands (see below for a description of these non-regulated vegetation communities). Plan implementation must include unambiguous mapping of grasslands, as distinct from non-regulated vegetation communities.

This Plan will discuss grassland communities characterized by the *Vegetation Description for the South Coast and Montane Ecological Province* (USFS 2009): perennial grasses and forbs alliance and the annual grasses and forbs alliance. Grasslands within the California Floristic Province are described as "Valley Grasslands" by Heady (1990). Grassland communities in California are generally divided into two categories: native, perennial grasslands and annual, nonnative grasslands (Heady 1990, USFS 2009). Grassland in the Plan Area is shown in Figure C.1-6.

The annual grasses and forbs alliance (USFS 2009), which corresponds to nonnative grassland (Holland 1986), occurs on seasonally moist, sometimes loamy or fine-textured, soils usually below 1,200 meters (4,000 feet) in Southern California (Holland 1986). Annual grasslands may develop in otherwise well-vegetated shrub or woodland regions, usually due to disturbance such as land clearing, grazing, or frequent/intense fire. This alliance can include some perennial grasses that develop on coarse, well-drained soils within sunny openings of Jeffrey pine (*Pinus jeffreyi*) and Ponderosa pine (*Pinus ponderosa*) savannas (USFS 2009). Annual and herbaceous perennial wildflowers are typically moderate to absent in this community and when present are usually low to moderate in diversity, and often primarily nonnative, disturbance-adapted species.

This Plan further defines annual, nonnative grassland consistent with the annual grassland series described in Sawyer and Keeler-Wolf (1995), and defines Disturbed Land and Agricultural (including Fallow) Land, for purposes of classifying and delineating Covered Activity impacts. These definitions are also consistent with the Multiple Habitat Conservation Plan Biological Goals, Standards, and Guidelines (Ogden 1998) and Multiple Species Conservation Plan vegetation mapping criteria (Ogden 1995).

<u>Annual, Nonnative Grassland.</u> Annual, nonnative grassland is a mixture of annual grasses and broad-leaved, herbaceous species. Annual species comprise from 50 percent to more than 90 percent of the vegetative cover, and most annuals are nonnative species. Nonnative grasses typically comprise at least 30 percent of the vegetation, although this number can be much higher in some years and lower in others, depending on land use and climatic conditions. Usually, the annual grasses are less than 1 m (3 ft) in height, and form a continuous or open



Source: CBI 2009, TAIC/Bonterra 2012

OCTA

Grassland Vegetation Types

C.1-6

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cover. Emergent shrubs and trees may be present, but do not comprise more than 15 percent of the total vegetative cover. Characteristic annual grassland species include foxtail chess (*Bromus madritensis* ssp. *rubens*), ripgut grass (*Bromus diandrus*), wild oats (*Avena* spp.), fescues (*Vulpia* spp.), filarees (*Erodium* spp.), mustards (*Brassica* spp.), lupines (*Lupinus* spp.), and goldfields (*Lasthenia* spp.), among others.

Disturbed Land. Disturbed land includes areas in which the vegetative cover comprises less than 10 percent of the surface area (disregarding natural rock outcrops) and where there is evidence of soil surface disturbance and compaction (e.g., grading); or where the vegetative cover is greater than 10 percent, there is soil surface disturbance and compaction, and the presence of building foundations and debris (e.g., irrigation piping, fencing, old wells, abandoned farming or mining equipment) resulting from legal activities (as opposed to illegal dumping). Vegetation on disturbed land (if present) will have a high predominance of nonnative, weedy species that are indicators of surface disturbance and soil compaction, such as Russian thistle (*Salsola tragus*), telegraph weed (*Heterotheca grandiflora*), horehound (*Marrubium vulgare*), and sow-thistle (*Sonchus oleraceus*). Although nonnative grasses may be present on disturbed land, they typically do not dominate the vegetative cover. Examples of disturbed land include recently graded firebreaks, graded construction pads, construction staging areas, off-road vehicle trails, and old homesites.

Agricultural (including Fallow) Land. Active agricultural land includes lands that are currently disturbed by cultivation or other agricultural activities involving crop production practices (e.g., nurseries, orchards, field crops, improved pastures). Fallow agricultural land is land that has been previously disturbed by cultivation, but is currently out of production. Vegetation on fallow land is dependent, in part, on prior crops and crop culture practices. Depending on the type and intensity of disturbance, fallow fields may support either annual grassland or disturbed vegetative associations. Lands that are not currently in production but that are identified as agriculture and have been cultivated in 3 of the last 5 years or according to accepted cultural practices will be considered fallow agriculture, regardless of species composition. Conversely, agricultural lands that have not been cultivated in 3 of the last 5 years, or that are proposed for conversion to non-agricultural land uses (e.g., residential, commercial, industrial), shall be mapped and mitigated according to the actual vegetation type (e.g., annual grassland) based on vegetative characteristics, without regard to current or historic land uses. Pastures should be defined as active agriculture if cultivation practices such as seeding or irrigation have been used to improve these lands for livestock forage. Unimproved or natural grazing lands should be defined and mitigated according to the current vegetation type (e.g., annual grassland).

The perennial grass and forb alliance is characterized by native perennial grasses such as needlegrass (*Nassella* spp.), dropseed (*Sporobolus* spp.), squirreltail (*Elymus elymoides*), and wildrye (*Leymus* spp.) (USFS 2009). The perennial grass and forbs alliance is found in areas of present and /or historic ground-disturbing activities such as grazing, crop agriculture, and mining (USFS 2009). In Southern California, this community is characterized by the presence of exotic grasses such as wild oats (*Avena* spp.), bromes (*Bromus* spp.), and foxtail fescue (*Vulpia myuros*) (USFS 2009).

Two known sensitive species, intermediate mariposa lily and many-stemmed dudleya occur in grassland as well as other communities. Intermediate mariposa lily is found on open, rocky outcroppings in grassland communities. Many-stemmed dudleya is found in sparsely vegetated areas in grassland communities such as clay barrens.

Wildlife Species Uses

Grassland communities, due to their open, exposed nature, are home to small rodent species such as California ground squirrels (Spermophilus beecheyi), valley pocket gophers (Thomomys bottae), and kangaroo rats (Dipodomys spp.). Larger mammals such as badgers and foxes excavate dens in open, grassland communities while mule deer, coyote, and mountain lion use this area for foraging, travel routes, and dispersal. Grasslands and the associated rodent community attract raptors such as hawks, eagles, and owls. Two of the three reptiles species proposed for coverage within the Plan Area can be found in grassland communities: coast horned lizard and orangethroat whiptail. Insects use the grassland community in the same way they use other communities, using the leaf litter for cover and foraging for detritus, carrion, or other invertebrates.

Community Distribution

The perennial grasses and forb alliance (USFS 2009), which corresponds to valley needlegrass grassland (Holland 1986), describes areas of native, perennial grasses and herbaceous plants most commonly in coastal areas and occasionally in the mountains, generally below 1,586 meters (5,200 feet). This vegetation community forms on fine-textured (usually clay) soils and seasonally moist, low-gradient slopes. It is a form of dry to moist grassland in which the species composition is a mix of perennial and some annual grasses and legumes that vary according to management practices (USFS 2009). This community often intergrades with oak woodlands in areas of moister, well-drained soils (Holland 1986). Annual and herbaceous perennial wildflowers are generally moderate to abundant in this community, and can be highly diverse.

Status and Trends

As rationale for its recently undertaken *Grassland Initiative,* CNPS states that California grasslands have been reduced by more than 90% of their historic extent and "continue to disappear at an alarming rate" (Buck and Evans 2008). Buck and Evans (2008) state that less is known about this vegetation community than any other in California and that many grassland communities are termed nonnative despite having high occurrence rates of native plant and animal species. Purple needlegrass (*Nassella pulchra*) and foothill needlegrass (*Nassella lepida*) grasslands are listed as S3?, "vulnerable?," by DFG (2009).

There are 41,731 acres of grassland (including annual and perennial) in Orange County, 62% (25,896 acres) of which is currently protected (CBI 2009). There are 31,949 acres of grassland within the Core Habitat Areas designated by the Orange County Habitat Assessment (CBI 2009). There are grassland communities in every Core Habitat Area. However, the following contain the majority of the acreage: the Santa Ana Mountains (1,463 acres), Northern Foothills (5,067 acres), Southern Foothills (13,224 acres), San Joaquin (5,259 acres), and Chino Hills (5,253 acres) Core Habitat Areas (CBI 2009). The annual grasses and forbs vegetation community was found to be under-protected by the Orange County Conservation Assessment (CBI 2009).

Threats to the Community and Other Conservation Issues

Conversion, fragmentation, altered fire cycles, grazing, and the associated invasion of nonnative species pose the greatest threat to grassland communities in California (Heady 1990, Stromberg et al. 2007). Herbicide application, prescribed burns, grazing, and mowing are the most widely used management techniques to control nonnative grassland species.

Nonnative grassland species may readily invade recently burned areas and provide a fuel load that increases the likelihood of more frequent fires. The initial invasion of nonnative grassland species initiates a positive feedback loop that promotes further invasion of nonnative grassland species over native species (Brooks et al. 2004, Minnich and Dezzani 1998). Not only does this pattern reduce the number of native grassland species, it also can result in type-conversion of scrub habitats to nonnative grasslands.

Increased deposition of atmospheric nitrogen in habitats near large metropolitan centers has been identified as a chronic cause of alteration of species diversity, often favoring nonnative invasive species over native species adapted to lower soil nitrogen levels (Fenn et al. 2003). This pattern of nitrogen-influence species shift has also been implicated in increased fire frequency as described above.

Literature Cited

Brooks, M. L., C. M. D'antonio, D. M. Richardson, J. B. Grace, J. E. Keeley, J. M. Ditomaso, R. J. Hobbs, M. Pellant, and D. Pyke. 2004. Effects of Invasive Alien Plants on Fire Regimes. *BioScience* 54(7):677–688.

Buck, J., and J. Evans. 2008. A new initiative to describe and protect California grasslands. California Native Plant Society. Available: <http://www.cnps.org/cnps/vegetation/pdf/grassland_init_article_buck.pdf>. Accessed: September 7, 2010.

California Department of Fish and Game (DFG). 2009. *List of California Vegetation Alliances*. December. Biogeographic Data Branch, Vegetation Classification and Mapping Program. Available: <http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/AllianceList_Dec09.pdf>. Accessed: September 1, 2010.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. Prepared for the Orange County Transportation Authority, Orange, CA.

Fenn, M. E., J. S. Baron, E. B. Allen, H. M. Rueth, K. R. Nydick, L. Geiser, W. D. Bowman, J. O. Sickman, T. Meixner, D. W. Johnson, and P. Neitlich. 2003. Ecological Effects of Nitrogen Deposition in the Western United States. *BioScience* 53(4):404–420.

Heady, H. F. 1990. Southern Coastal Scrub. In Michael G. Barbor and Jack Major (eds.), *Terrestrial Vegetation of California*. California Native Plant Society, Sacramento, CA.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA. Available: <http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf>. Accessed: September 8, 2010.

Minnich, R. A., and R. J. Dezzani. 1998. Historical decline of coastal sage scrub in the Riverside-Perris plan, California. *Western Birds* 29(4):366–391.

Stromberg, M. R., J. D. Corbin, and C. M. D'Antonio (eds.). 2007. *California Grasslands, Ecology and Management*. University of California Press, Berkeley and Los Angeles, CA.

U. S. Department of Agriculture Forest Service (USFS). 2009. *Vegetation Classification, CALVEG Zones and Alliances—Vegetation Descriptions: South Coast and Montane Ecological Province (CALVEG Zone)*. Last Updated: March 30, 2009. Available: <http://www.fs.fed.us/r5/rsl/projects/classification/zone7des033009www.pdf>. Accessed: September 2, 2010.

Riparian

Natural Community Description

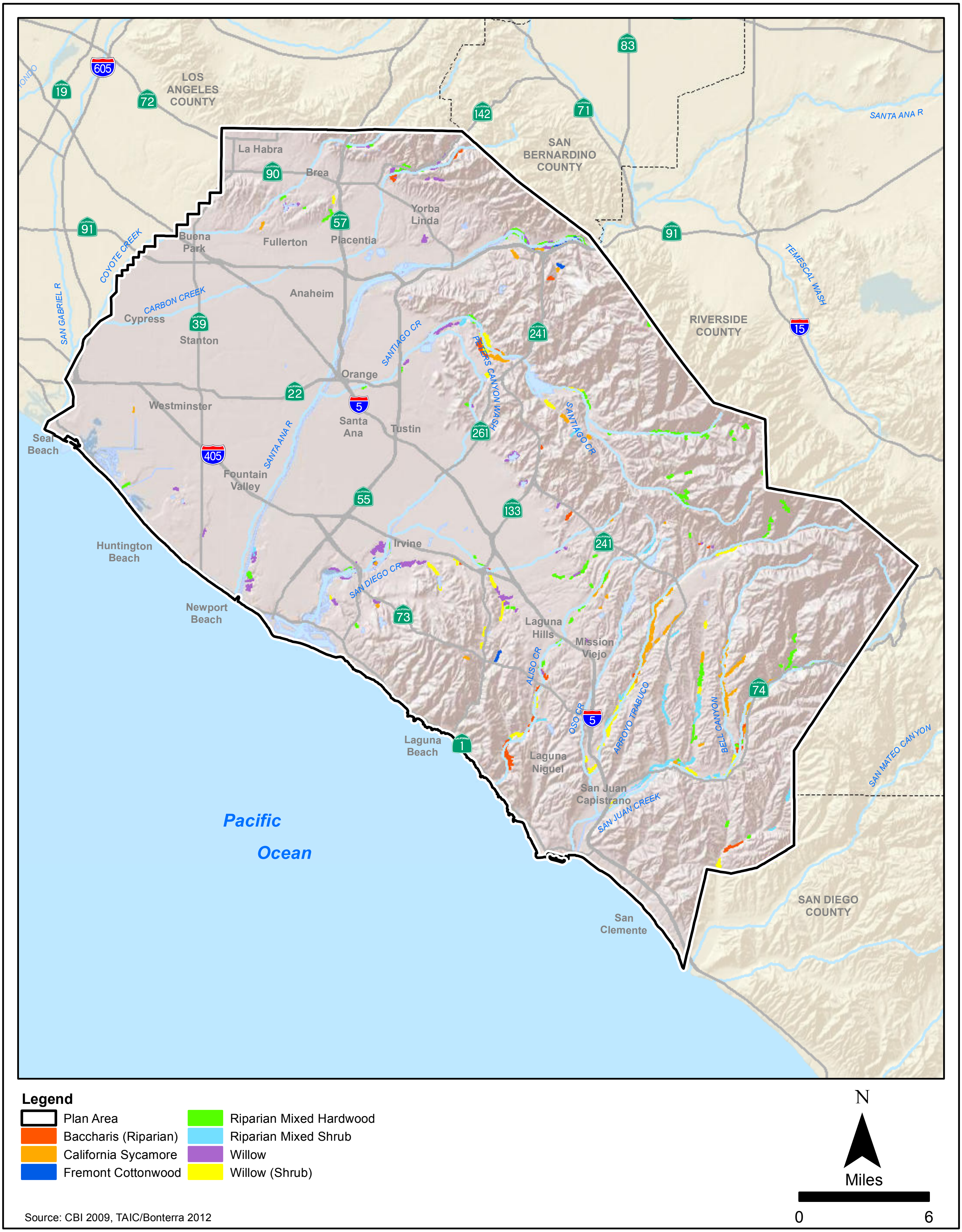
Riparian communities include those vegetation types that occur in the terrestrial or emergent zones directly adjacent to freshwater (Faber 1989). In Southern California, this includes deciduous forest and scrub communities along perennial and intermittent drainages, floodplains, and margins of lakes and reservoirs. Riparian communities in Southern California can be divided into three zones: (1) an active zone closest to the stream that is most subject to disturbance from winter storm damage and is characterized by willows and alders; (2) a border zone that is less subject to disruption but has a reliable water supply and is characterized by larger trees of willow, cottonwood, and sycamore and a well-developed understory with considerable plant diversity; and (3) an outer zone on high terraces that are only occasionally subjected to flooding, but where trees, particularly sycamores and oaks, take advantage of the higher water table (Faber 1989).

The baccharis (riparian) alliance can be dominated by any one or a mix of the following Southern Californian *Baccharis* species occupying wet habitats: mule fat (*B. salicifolia*), desert baccharis (*B. sergiloides*), shortleaf baccharis (*B. brachyphylla*), marsh baccharis (*B. douglasii*), broom baccharis (*B. sarothroides*), and emory baccharis (*B. emoryi*) (USFS 2009). Tree willows (*Salix spp.*), California sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), and coast live oak (*Quercus agrifolia*) are some of the associated trees in this alliance.

The California sycamore alliance is dominated by the California sycamore, a fast-growing, deciduous hardwood native to California and northern Baja California (USFS 2009). Common associates include Fremont cottonwood, California walnut, white alder (*Alnus rhombifolia*), and coast live oak. California sycamore communities occasionally occur on lower floodplains of more xeric areas (USFS 2009).

The Fremont cottonwood alliance is dominated by Fremont cottonwood, a relatively long-lived, deciduous riparian tree which germinates best on newly moist alluvium such as stream gravel beds (USFS 2009). Along with other associated trees such as California sycamore, white alder, coast live oak, and willows, Fremont cottonwood is a major component of the riparian mixed hardwood alliance.

The riparian mixed hardwood alliance or community is not occupied by a single dominant hardwood species, but rather a mixture of (mostly deciduous) trees and shrubs whose composition changes along the stream length (USFS 2009). The species mixture includes any combination of native obligate or facultative riparian hardwoods such as white alder, willow, California sycamore, Fremont or black cottonwood (*Populus balsamifera* ssp*. trichocarpa*), bigleaf maple (*Acer macrophyllum*), coast live oak, and California bay (*Umbellularia californica*). A variety of riparian shrubs and perennial species may be included in this alliance, such as California wild rose (*Rosa californica*), mugwort (*Artemisia Douglasiana*), baccharis, blackberry (*Rubus* spp.), and currant (*Ribes* spp.) (USFS 2009). Riparian communities in the Plan Area are shown in Figure C.1-7.



Source: CBI 2009, TAIC/Bonterra 2012

OCTA

Riparian Vegetation Types

C.1-7

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The riparian mixed shrub alliance is not dominated by any one species but is made up of a mixture of willow, elderberry (*Sambucus mexicanus*), wild rose, and occasionally mule fat (USFS 2009). This vegetation community is most often found adjacent to annual grasses and forbs, California sagebrush, coast live oak, hardwoods of the riparian mixed hardwood alliance, and urban landscapes.

The willow alliance is defined by the dominance of one or more willow tree species such as Goodding black willow (*Salix gooddingii*), red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), and/or shining willow (*Salix lucida*). Associates include Fremont cottonwood, California sycamore, and a variety of perennial and annual forbs, including invasive species such as pampas grasses (*Cortaderia* spp.). Coast live oak is also commonly associated with this alliance (USFS 2009).

The willow (shrub) alliance is made up of shrub forms of willow species such as narrowleaf willow (*S. exigua*) and smaller arroyo willows. Riparian associates at these sites include tree willows, cottonwoods, white alder, elderberry, *Baccharis* species, and nonnative herbaceous species such as giant reed (*Arundo donax*).

Wildlife Species Uses

Riparian areas provide habitat for more than 225 species of birds, mammals, reptiles, and amphibians in California (Riparian Habitat Joint Venture [RHJV] 2004). This is due to the highly productive nature of riparian communities as well as their location within the landscape. The existence of water is the key to the community's productivity because it provides the basis for a thriving invertebrate community, which in turn fuels the food chain upwards to reptiles, amphibians, birds, and mammals. On the landscape scale, riparian systems provide corridors or linkages between high-elevation and low-elevation communities, and are thus likely to be used by a large suite of species for dispersal and cover.

All mammals that are proposed for coverage within the Plan Area have potential to use riparian areas for foraging and dispersal. Bat species are known to forage upon the productive insect populations in or near riparian areas.

Reptiles and amphibians also use riparian areas for foraging and dispersal and, in some cases, nesting and breeding. All of the reptile species proposed for coverage have potential to use riparian areas for foraging and dispersal.

Riparian areas are the most critical habitat for the conservation of neotropical migrant and resident birds in California (RHJV 2004). California's riparian habitat provides important breeding and over wintering grounds, migration stopover areas, and corridors for the dispersal of neotropical migratory birds (RHJV 2004). Three of the four bird species proposed for coverage have potential to use riparian areas for dispersal and foraging: coastal California gnatcatcher, least Bell's vireo (*Vireo bellii pusillus*), and southwestern willow flycatcher (*Empidonax traillii extimus*). Gnatcatcher has been observed using riparian habitat adjacent to scrub habitats, most notably during the hottest and driest seasons of the year when shade and water are scarcest. Temporary movement into more shaded habitats may allow them to avoid heat stress, as well as seek water whether directly or through food sources. Least Bell's vireo and southwestern willow flycatcher are riparian obligates, using the riparian community exclusively for breeding and nesting.

Community Distribution

The baccharis alliance is widely scattered along intermittent streams and near larger rivers from about Tehama County south through the Coast Ranges and Sierra Nevada to San Diego and northwestern Baja California, Mexico, usually below 600 meters (2,000 feet) elevation (Holland 1986). In Orange County, there are 320 acres of baccharis scrub. These acres are fairly evenly distributed between the following Core Habitat Areas designated by the Orange County Conservation Assessment (CBI 2009): Santa Ana Mountains (49 acres), Northern Foothills (20 acres), Southern Foothills (62 acres), San Joaquin Hills (162 acres), and Chino Hills (16 acres).

The California sycamore alliance is restricted to the South Coast Ranges from Alameda County to northern Baja California, Mexico, at elevations up to 1,400 meters (4, 600 feet) (Holland 1986, USFS 2009). In Orange County, there are 935 acres of California sycamore community, most of which is in the Southern Foothills Core Habitat Area (CBI 2009). The remaining acres are spread out amongst the following Core Habitat Areas: the Santa Ana Mountains (10 acres), Northern Foothills (102 acres), San Joaquin Hills (8 acres), Upper Santa Ana River (8 acres), and Upper Newport Bay (4 acres).

The Fremont cottonwood alliance occurs in the Transverse and Peninsular Ranges at elevations below about 1,700 meters (5,600 feet) (USFS 2009). In Orange County, there are 119 acres of Fremont cottonwood communities, most of which (89 acres) are found in the Upper Santa Ana River Core Habitat Area. The remaining acres are found in the Santa Ana (10 acres), San Joaquin Hills (15 acres), and Upper Newport Bay (4 acres) Core Habitat Areas (CBI 2009).

In Southern California, the riparian mixed hardwood alliance occurs on the coast from Santa Barbara to San Diego counties at elevations below 1,840 meters (6,000 feet). In Orange County, there are 1,047 acres of riparian mixed hardwood communities within the following Core Habitat Areas: Santa Ana Mountains (399 acres), Southern Foothills (67 acres), Chino Hills (70 acres), Upper Santa Ana River (223 acres), Bolsa Chica (12 acres), Santa Ana River mouth (22 acres), and Upper Newport Bay (22 acres).

In Southern California, the riparian mixed shrub alliance occurs at elevations below 1,100 meters (3,600 feet) (USFS 2009). In Orange County, there are 489 acres of this community distributed between the following Core Habitat Areas: Santa Ana Mountains (44 acres), Northern Foothills (26 acres), Southern Foothills (180 acres), San Joaquin Hills (9 acres), and Santa Ana River mouth (26 acres) (CBI 2009).

The willow alliance is found along perennially wet stream reaches of the Transverse and Peninsular ranges, from Santa Barbara County south to Baja California, Mexico, and east to the edge of the deserts (Holland 1986). In Southern California, the willow alliance occurs along streambanks below 490 meters (1,600 feet) on the coast and below 2,500 meters (8,200 feet) in the mountains (USFS 2009). In Orange County, there are 743 acres of willow communities, which are divided amongst the following Core Habitat Areas: Northern Foothills (31 acres), San Joaquin Hills (38 acres), Chino Hills (106 acres), Upper Santa Ana River (116 acres), Santa Ana River Mouth (54 acres), and Upper Newport Bay (150 acres) (CBI 2009).

The willow (shrub) alliance is found from western Santa Barbara County to southern San Diego County at elevations below 2,135 meters (7,000 feet) (USFS 2009). In Orange County, there are 756 acres of this community distributed amongst the following Core Habitat Areas: Santa Ana Mountains (196 acres), Northern Foothills (42 acres), San Joaquin Hills (119 acres), and Upper Newport Bay (4 acres).

Status and Trends

Fremont cottonwood and California sycamore alliances are listed as S3, “vulnerable,” communities by DFG (2009). Several willow alliances are also listed as S3, “vulnerable,” or S4, “apparently secure,” communities: red willow (S3), arroyo willow (S4), and shining willow (S3). Coyote brush scrub and mule fat alliances are listed, respectively, as S5, “secure,” and S4, “apparently secure,” communities (DFG 2009). Of the 4,409 acres of riparian habitat in Orange County, 75% (3,302 acres) is protected (CBI 2009). However, the Fremont cottonwood, willow, riparian mixed shrub, and riparian mixed hardwood communities were found to be under-protected.

The Orange County Conservation Assessment (CBI 2009) identified the following riparian community types that will be used for conservation planning purposes by this Plan: baccharis (coyote brush), California sycamore, Fremont cottonwood, riparian mixed hardwood, riparian mixed scrub, willow, and willow shrub. Fremont cottonwood, willow, riparian mixed shrub, and riparian mixed hardwood were the riparian community types that were identified as being under-protected in Orange County (CBI 2009).

Threats to the Community and Other Conservation Issues

Urbanization and altered hydrology have led to widespread and pervasive degradation of riparian systems. Urbanization and subsequent habitat fragmentation isolate pockets of vegetation, leaving them less capable of recovering from stochastic events such as flooding or fire. Channelization and dams have resulted in altered hydrology, loss of ecosystem functions, and reduction in floodplain area. Channelization and the resulting scour erode soils, leaving mature riparian vegetation without suitable material in which to root. Dams reduce peak flood flows and lead to reductions in the extent and quality of the moist soils that support riparian communities.

An important threat to remaining riparian communities in coastal Southern California is invasive, nonnative plants, especially *Arundo donax* (Bell no date). Arundo is an invasive grass that displaces native riparian vegetation in altered systems, turning the normally productive, heterogeneous community into a monoculture. Giant reed also reduces soil moisture, increases fire risk, and can actually dewater a low-flowing creek.

Habitat loss and degradation are probably the most important factors causing the decline of riparian bird populations (RHJV 2004). Alteration of riparian landscapes narrows or destroys important population dispersal corridors. Disruption of natural hydrological conditions by dams, levees, and diversions; clearing associated with farming and development; overgrazing; and invasion by exotic species have all contributed to degradation of riparian zones.

Literature Cited

Bell, G. P. No date. *Ecology and Management of* Arundo donax*, and Approaches to Riparian Habitat Restoration in Southern California*. The Nature Conservancy, Santa Fe, NM. Available: <http://ceres.ca.gov/tadn/ecology_impacts/arundo_ecology.pdf>. Accessed: September 8, 2010.

California Department of Fish and Game (DFG). 2009. *List of California Vegetation Alliances*. December. Biogeographic Data Branch, Vegetation Classification and Mapping Program. Available: <http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/AllianceList_Dec09.pdf>. Accessed: September 1, 2010.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. Prepared for the Orange County Transportation Authority, Orange, CA.

Faber, P.M. 1989. The Ecology Of Riparian Habitats of the Southern California Coastal Region: A community profile. U.S. Department of Interior, Fish & Wildlife Services. V.85 (7.27). 152 pgs.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California.* California Department of Fish and Game, Sacramento, CA. Available: <http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf>. Accessed: September 8, 2010

Riparian Habitat Joint Venture (RHJV). 2004. Version 2.0. The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. Available: <http://www.prbo.org/calpif/pdfs/riparian.v-2.pdf>. Accessed: September 8, 2008.

U. S. Department of Agriculture Forest Service (USFS). 2009. *Vegetation Classification, CALVEG Zones and Alliances—Vegetation Descriptions: South Coast and Montane Ecological Province (CALVEG Zone)*. Last Updated: March 30, 2009. Available: <http://www.fs.fed.us/r5/rsl/projects/classification/zone7des033009www.pdf>. Accessed: September 2, 2010.

Wet Meadow and Marsh

Natural Community Description

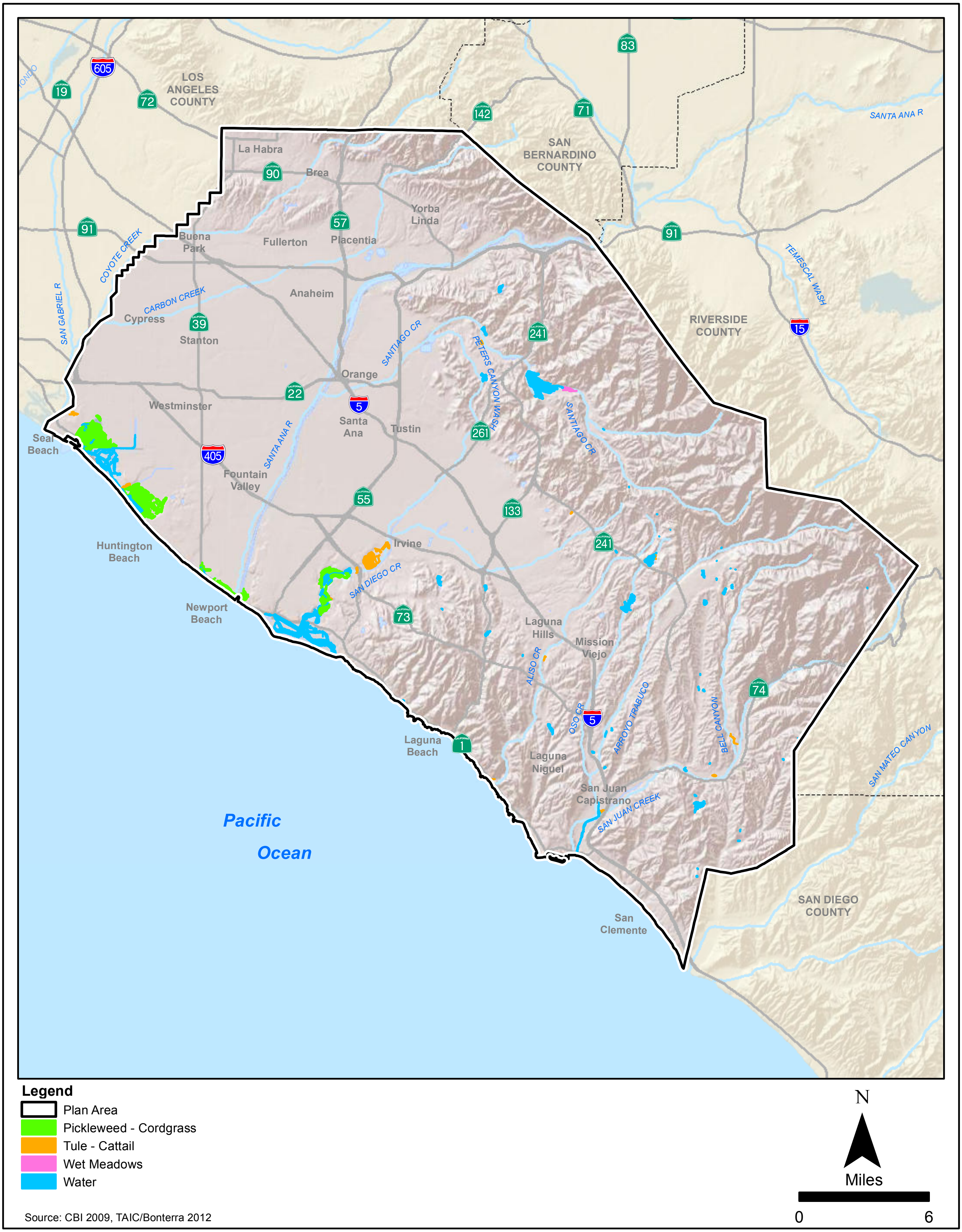
Wet meadow and marsh habitats, for the purposes of this Plan, are based on the USFS's (2009) vegetation descriptions for the South Coast and Montane Ecological Province (CalVeg Zone 7), and include pickleweed-cordgrass alliance, tule-cattail alliance, and wet meadows. Holland (1986) and Sawyer and Keeler-Wolfe (1995) also have descriptions of equivalent or similar community types that will be used, when possible, to provide more complete descriptions.

The pickleweed-cordgrass alliance (USFS 2009) is described in Holland (1986) as southern coastal salt marsh. In Sawyer and Keeler-Wolfe (1995) the communities are described separately as the pickleweed series and the cordgrass series. Southern coastal salt marsh is comprised of moderate to dense communities of highly productive, herbaceous and suffrutescent (stem is woody only at the base), salt-tolerant hydrophytes (Holland 1986). The dominant species in this alliance are pickleweed (*Salicornia* spp.) and cordgrass (*Spartina* spp.) (USFS 2009). Associated plant species in this community include: saltgrass (*Distichlis spicata*), bulrushes (*Schoenoplectus* spp., *Scirpus* spp., etc.), fat-hen (*Atriplex patula*), saltwort (*Batis maritima*), and sea blite (*Sueda californica*) (Holland 1986, Sawyer and Keeler-Wolfe 1995).

The tule-cattail alliance (USFS 2009) is described in Holland (1986) as coastal and valley freshwater marsh and in Sawyer and Keeler-Wolfe (1995) as the bulrush-cattail series. This vegetation community occurs in permanently flooded freshwater and is composed of perennial, emergent monocots, often forming completely closed canopies 4 or 5 meters tall (13 or 16 feet) (Holland 1986). Tule, or bulrush, cattail (*Typha* spp.), sedge (*Carex* spp.), and spikerush (*Eleocharis* spp.) species dominate with some of the following species in co-occurrence: saltgrass, slender-beaked sedge (*Carex athrostachya*), and umbrella flatsedge (*Cyperus eragrostis*) (Sawyer and Keeler-Wolfe 1995, USFS 2009). Loosestrife (*Lythrum hyssopifolia*), an invasive nonnative, is also found within this alliance (USFS 2009).

Wet meadows (USFS 2009), or montane meadows (Holland 1986), develop in coniferous areas on fine-textured, more or less permanently moist, or wet soils (Holland 1986, USFS 2009). In Southern California, these conditions often develop from springs, seeps, or faulted areas where the water table is high. Wet meadows are characterized by dense growths of sedges; rushes (*Juncus* spp.); perennial grasses (e.g. mat muhly [*Muhlenbergia richardsonis*] and San Bernardino bluegrass [*Poa atropurpurea*]); and herbs, clovers (*Trifolium sp.),* and monkey flower *(Mimulus guttatus*) (USFS 2009).

There are no plant species proposed for coverage within the wet meadow and marsh community. None of the vegetation communities found to be under-protected by the Conservation Assessment of Orange County (CBI 2009) are found with this natural community. Wet meadow and marsh communities in the Plan Area are shown in Figure C.1-8



Source: CBI 2009, TAIC/Bonterra 2012

OCTA

Wet Meadow and Marsh Vegetation Types

C.1-8

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C1\Wet Meadow and Marsh.mxd

Date: 4/13/2016

Wildlife Species Uses

Mammals such as mountain lions and bobcats, proposed for coverage by this Plan, as well as coyotes, mule deer, and woodrats, may forage and even reside in areas directly adjacent to meadows and marshes to take advantage of their high productivity. Bats likely use these vegetation communities to forage upon the associated insect community. Aquatic snakes forage and breed in and around marshes and meadows. Southwestern pond turtles (*Actinemys marmorata pallida*), a species proposed for coverage by this Plan, use coastal freshwater and salt marshes for cover, dispersal, foraging, and breeding.

These areas are very important for waterfowl and migratory birds and have been designated as Important Areas by the Audubon Society of California. Migratory waterfowl, wading bird, songbird, and raptor species use meadows and marshes for foraging, dispersal, and breeding. Ducks, geese, and mergansers use freshwater and saltwater marshes for breeding. Egrets and herons forage within these communities and roost and nest in the adjacent riparian and other communities. Least Bell's vireo and southwestern willow flycatcher have some potential to use marsh habitats for foraging, particularly in those areas near riparian corridors. Raptor species that forage in marsh communities include white-tailed kite (*Elanus leucurus*), red-shouldered hawk, and northern harrier (*Circus cyaneus*). Although many raptor species nest in trees near marshes, northern harrier nests on the ground, often in dry, protected spots within marshes.

Community Distribution

The pickleweed-cordgrass alliance is found in bays, lagoons, and estuaries along the coast from about Point Conception to the Mexican border (Holland 1986). In Orange County, there are 1,882 acres of this community, and it occurs within the following Core Habitat Areas (CBI 2009): Seal Beach (717 acres), Bolsa Chica (614 acres), Santa Ana River mouth (129 acres), and Upper Newport Bay (373 acres).

The tule-cattail alliance is occasional along the coast and in coastal valleys near river mouths and around the margins of lakes and springs throughout California (Holland 1986). In Orange County, there are 318 acres of this community, and it occurs in the following Core Habitat Areas (CBI 2009): Santa Ana Mountains (6 acres), Northern Foothills (15 acres), Bolsa Chica (25 acres), and Upper Newport Bay (239 acres).

Wet meadows are scattered within the North Coast coniferous forests, and within the lower and upper montane forests of the North Coast Ranges, Klamath Ranges, Cascade Range, Sierra Nevada, and Transverse and Peninsular Ranges at elevations from 300 to 2,130 meters (1,000 to 7,000 feet) in the north and 1,500 to 2,750 meters (5,000 to 9,000 feet) in the south (Holland 1986). There are 35 acres of wet meadows in Orange County, occurring within the Santa Ana Mountains (9 acres) and the Northern Foothills (25 acres) Core Habitat Areas (CBI 2009).

Status and Trends

Ninety percent of California's original coastal wetland acreage has disappeared, and many of the remaining wetlands are in danger of being further degraded or destroyed (California Coastal Commission 1987). However, the areal extent of vegetated wetland communities, including freshwater and saltwater marshes, has remained stable in recent years (Dahl 2000). California bulrush marsh is listed as an S4?, "apparently secure?," community by DFG (2009). California cordgrass marsh is listed as S3, "vulnerable," and cattail marsh is listed as S5, "secure" (DFG 2009). There are 2,235 acres of wet meadow and marsh in Orange County, and 2,110 acres (94%) are protected (CBI 2009).

Threats to the Community and Other Conservation Issues

Historic loss of freshwater and saltwater marsh and wet meadows was due to "wetland reclamation," the filling of wetlands and conversion to upland land uses such as agriculture and urban and rural development. Dams, diking, dredging, and sedimentation from upland land uses also have reduced the extent, quality, and vegetation distribution and diversity in coastal wetlands. More recently, saltwater intrusion into historically freshwater marshes has resulted in the net loss of these types of marshes (Dahl 2000).

Rural and urban development, agricultural conversion, and managed forestry plantations are responsible for the majority of historically lost acres of wet meadow (Dahl 2000). Wet meadow acreage has also been lost due to conversion of meadows to deepwater habitats as well as siltation and hydrology changes associated with grazing, forestry, development, and altered fire cycles that result in succession of wetland habitat into shrub habitat (Dahl 2000).

Literature Cited

California Coastal Commission. 1987. *California Coastal Resource Guide*. University of California Press, Los Angeles and Berkeley, CA.

California Department of Fish and Game (DFG). 2009. *List of California Vegetation Alliances*. December. Biogeographic Data Branch, Vegetation Classification and Mapping Program. Available: <http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/AllianceList_Dec09.pdf>. Accessed: September 1, 2010.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. Prepared for the Orange County Transportation Authority, Orange, CA.

Dahl, T. E. 2000. Status and trends of wetlands in the conterminous United States 1986 to 1997. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 82 pp.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA. Available: <http://www.cal-ipc.org/ip/inventory/pdf/HollandReport.pdf>. Accessed: September 8, 2010.

Sawyer, J. O., and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

U. S. Department of Agriculture Forest Service (USFS). 2009. *Vegetation Classification, CALVEG Zones and Alliances—Vegetation Descriptions: South Coast and Montane Ecological Province (CALVEG Zone)*. Last Updated: March 30, 2009. Available: <http://www.fs.fed.us/r5/rsl/projects/classification/zone7des033009www.pdf>. Accessed: September 2, 2010.

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Appendix C.2

Covered Species Accounts

Appendix C.2
Covered Species Accounts

Introduction

This appendix provides detailed species accounts for the 13 taxa covered by the Plan in the order presented in Table C.2-1.

Table C.2-1. Covered Species

Common Name	Scientific Name
Plants	
Intermediate mariposa lily	*Calochortus weedii* var. *intermedius*
Many-stemmed dudleya	*Dudleya multicaulis*
Southern tarplant	*Centromadia parryi* ssp. *australis*
Fish	
Arroyo chub	*Gila orcutti*
Reptiles	
Coast horned lizard	*Phrynosoma blainvillii*
Orangethroat whiptail	*Aspidoscelis hyperythra*
Western pond turtle	*Emys marmorata*
Birds	
Cactus wren	*Campylorhynchus brunneicapillus*
Coastal California gnatcatcher	*Polioptila californica californica*
Least Bell's vireo	*Vireo bellii pusillus*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Mammals	
Bobcat	*Lynx rufus*
Mountain lion	*Puma concolor*

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Intermediate Mariposa Lily
Calochortus weedii *var.* intermedius

Legal Status:

Federal: None

State: None

Forest Service: Sensitive Species

Photo credit: Paul Schwartz

CNDDB Rank (2013): T2[1]/S2.2[2]

CNPS List (2013): 1B.2[3] (")

Recovery Plan: n/a

Species Description and Life History

Intermediate mariposa lily (*Calochortus weedii* var. *intermedius*), a member of the family Liliaceae, is a perennial; the bulb has a fibrous coat (Roberts 2008, Fiedler 2012). The species is distinguished from closely related taxa by rounded petals with fringed petal tips that lack hair-tufts, and rounded anthers (Fiedler 2012). Stems are 30 to 90 centimeters (12 to 36 inches) tall, slender, and generally branched. Leaves are basal with upper cauline leaves in-rolled. The inflorescence has 2–6 erect flowers that are widely bell-shaped with rounded petals that are light yellow or tan (or dark, purple to red-brown) and fringed with one row of hairs (Fiedler 2012). Intermediate mariposa lily intergrades with *Calochortus weedii* var*. weedii* and hybridizes with Plummer's mariposa lily (*C. plummerae*) in the San Jose Hills and Puente Hills (CNPS 2013).

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[1] T2: Globally Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

[2] S2: State Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province; S0.2: Fairly endangered in California.

[3] 1B: Rare, threatened, or endangered in California and elsewhere; 0.2: Moderately threatened in California (20-80% of occurrences threatened/moderate degree and immediacy of threat).

Habitat Requirements and Ecology

This species occurs on dry, rocky, open slopes in coastal sage scrub, chaparral, and valley and foothill grassland communities between 105 and 855 meters (350 to 2800 feet) (CNPS 2013). Intermediate mariposa lily is an obligate fire re-sprouter, relying upon the survival of the buried bulb for fire survival (Halsey 2008). The core blooming period for the species is from May through July (CNPS 2013).

Species Distribution and Population Trends

Distribution

Intermediate mariposa lily is endemic to the South Coast ecoregion, with populations in Orange, Riverside, Los Angeles, and San Bernardino Counties (CNPS 2013). Within the Plan Area, intermediate mariposa lily is distributed in the following core habitat areas and linkages as identified in the Conservation Assessment of Orange County (Conservation Biology Institute 2009): Santa Ana Mountains (Area A), Northern Foothills (Area C), Southern Foothills (Area C and D), San Joaquin Hills (Area C), Chino Hills (Area C), West Coyote Hills (Areas A, B, and C), and Upper Santa Ana River. Modeled habitat for this species is concentrated in the San Joaquin Hills and Santa Ana Mountains, with a smaller amount modeled in the Chino Hills and the Northern Foothills. Occurrences reported since 2000 show concentrations of the species in the Santa Ana Mountains near Freemont and Coal Canyons, near Limestone Canyon Regional Park in the Northern Foothills, and the Southern Foothills (Figure C.3-1, Intermediate Mariposa Lily Modeled Habitat).

Population Trends

Intermediate mariposa lily is believed to be imperiled within its range; however, very little is known about the current status of the species (CNPS 2013).

Threats to the Species and Other Conservation Issues

Intermediate mariposa lily is threatened by development, nonnative plants, road construction, and fuel modification (CNPS 2013). It is potentially threatened by frequent wildfires and horticultural collecting. The species intergrades with *Calochortus weedii* var. *weedii* and hybridizes with *C. plummerae* (CNPS 2013).

Survey and Restoration Requirements

Intermediate mariposa lily is a perennial that produces bulbs that can be salvaged and replanted. Its core blooming period is from May through July and should be surveyed for during that time period. If this species is to be replanted, bulbs should be dug up after the plant has died back, and stored in a cool, dry place (or planted at a suitable temporary receptor site). If possible, bulbs should be collected with their surrounding soil in order to improve survival of transplanted bulbs. Bulbs may be transplanted back to the location they came from if the site is only temporarily disturbed. If seeds are present, they should be collected from flagged individuals once the seed has matured but prior to the seed capsules opening to disperse the seed. Seed can be stored under cool, dry conditions, or once completely dry, can be stored in the freezer to extend seed viability.

Literature Cited

California Native Plant Society (CNPS). 2013. *Inventory of Rare and Endangered Plants of California.* Available: http://www.rareplants.cnps.org/ Accessed: April 8 2013.

Fiedler, P.L. 2012. *Calochortus*. In J. C. Hickman (ed.).*The Jepson Manual, Vascular Plants of California. 2nd Edition.* University of California Press, Berkeley, CA.

Halsey, R. W. 2008. The Essential 64 Plants and Animals. In *Fire, Chaparral and Survival in Southern California*. Sunbelt Publications, San Diego, California.

Roberts, F. M., Jr. 2008. *The Vascular Plants of Orange County, California. An Annotated Checklist*. F.M. Roberts Publications, San Luis Rey, California.

Many-Stemmed Dudleya
Dudleya multicaulis

Legal Status:

Federal: None

State: None

Forest Service: Sensitive Species

BLM Sensitive Species

Photo credit: Andrew Borcher

CNDDB Rank (2013): G2[4]/S2[5]

CNPS List (2013): 1B.2[6]

Recovery Plan: n/a

Species Description and Life History

Many-stemmed dudleya (*Dudleya multicaulis*) is a perennial, deciduous succulent in the Crassulaceae or stonecrop family (Roberts 2008). The species is distinguished by odorless, yellow flowers and linear leaves that are sharply acute at the tip (McCabe 2012). The stem is corm-like, 1.5 to 5 centimeters (0.6 to 2 inches) long, simple, and oblong. The summer deciduous leaves are 4 to 15 centimeters (1.6 to 6 inches) long, 4-10 mm (0.16 to 0.4 inches) wide, linear, cylindric at the base, and narrowly acute at the tip. The primary inflorescence has two to many branches and is simple or has one fork. The flowers are elliptic-lanceolate, acute and yellow with petals 5 to 9 millimeters (0.2 to 0.35 inches) and sepals 2 to 3 millimeters (0.08 to 0.1 inches) long (McCabe 2012).

Many-stemmed dudleya blooms from April through July (Jones et al. 2010, CNPS 2013). Seeds are small (0.8 mm long) and the average flower produces about 12 seeds that are dispersed by wind and water with the aid of gravity (Dodero 1995, Jones et al. 2010). It employs a generalist pollination strategy, an adaptation which helps ensure some successful reproduction even in years in which plant population levels and pollinator numbers fluctuate due to substantial variation in rainfall.

[4] G2: Globally Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

[5] S2: State Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

[6] 1B: Rare, threatened, or endangered in California and elsewhere; 0.2: Moderately threatened in California (20-80% of occurrences threatened/moderate degree and immediacy of threat).

Important pollinators include the soft-winged flower beetles, honey bees, and bees from the families Halictidae and Megachilidae (Jones et al. 2010). It appears that many-stemmed dudleya may be self-fertile and do not require a pollinator to produce fruit.

Blochman's dudleya (*Dudleya blochmaniae* ssp. *blochmaniae*), a related species, appears to set large numbers of seeds and has high germination in favorable years (Roberts pers. comm.). Initial germination in Blochman's dudleya can number in the thousands but the number of seedlings rapidly declines as the season progresses because of herbivory, dry conditions, or a poor germination site. Dodero (1995) observed one population of variegated dudleya (*D. variegata*) noting that about 1,000 individuals had sprouted in January 1991. A 7-week dry period followed, and by May, only 15 individuals developed inflorescences that produced fruit. The actual number of plants to reach maturity and bloom in a typical year is only a small fraction of individuals that either germinated or leafed out early in the growing season (Dodero 1995). Many-stemmed dudleya appears less prolific than Blochman's dudleya; however, it appears that, like Blochman's dudleya, only a fraction of the plants at a site actually bloom during any given year (Roberts pers. comm.).

Habitat Requirements and Ecology

Habitat for many-stemmed dudleya includes areas within open chaparral, coastal sage scrub, and valley and foothill grasslands, on heavy, often clay soils, coastal plains, or sandstone outcrops from 15 to 790 meters (49 to 2592 feet) (McCabe 2012). Populations appear to thrive in relatively thinly vegetated habitat such as clay barrens, sparse grasslands, and openings in coastal sage scrub. Frequently associated species include coast Turkish rugging (*Chorizanthe staticoides* ssp. *chrysacantha*), Palmer's grapplinghook (*Harpagonella palmeri*), Munz's onion (*Allium munzii*), chocolate lily (*Fritillaria biflora*), miniature lupine (*Lupinus bicolor*), purple needlegrass (*Nasella pulchra*), foothill needlegrass (*Nasella lepida*), California buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), and California juniper (*Juniperus californica*) (CNDDB 2013).

The dudleyas, like many species in the Crassulaceae, have the ability to tolerate long periods of drought. This is primarily attributed to the corm or stem, which is filled with water and starch (Dodero 1995). Dead outer layers form a protective coating that reduces water loss (Dodero 1995). Dormant plants of the closely related *D. blochmaniae* have been known to survive at least 3 years without water (Dodero 1995). Observations indicate that early rains followed by prolonged dry periods during midwinter may cause individuals to become dormant, while extended periods of rain throughout the rainy season encourage flowering (Dodero 1995).

Population size varies considerably from year to year both in number of seedlings produced and number of mature plants leafing out (Dodero 1995). Populations may not be detectable in dry years, and population boundaries may be difficult to delineate in all but the most optimal years. Populations may be suppressed by nonnative species competition.

Species Distribution and Population Trends

Distribution

Many-stemmed dudleya is endemic to Southern California and historically found in Los Angeles, Orange, Riverside, San Diego, and San Bernardino Counties, with the San Bernardino County population being potentially extirpated (CNPS 2013). Orange County supports the majority of the known populations of this species and was estimated by Roberts to support as much as 80% of the total dudleya in the species' range (Roberts 1999). Roberts identified five areas of dudleya concentration in Orange County: (1) the San Joaquin Hills, (2) the northern Lomas de Santiago including the Santiago Hills north to Gypsum and Blind Canyons (1 and 2 combined generally comprise the Orange County Central/Coastal Subregion), (3) the Rancho Mission Viejo (Southern Subregion), and (4) the northern portion of San Diego County that comprises Camp Pendleton (Roberts 1999). Sizeable colonies have been reported in the Coal and Gypsum Canyon drainages near the river, at the northern edge of the Santa Ana mountains, and in the hills bordering Temescal Creek (Clarke et al. 2007).

Within the Plan Area, many-stemmed dudleya occurs in the following core habitat areas and linkages as identified in the Conservation Assessment of Orange County (Conservation Biology Institute 2009): Santa Ana Mountains, Northern Foothills, Southern Foothills (Areas B, C, and D), San Joaquin Hills, Chino Hills (Areas A, B, and C), and Upper Newport Bay (Area F). Modeled habitat for this species is concentrated in the San Joaquin Hills, Southern Foothills, Northern Foothills, Chino Hills, and portions of the Santa Ana Mountains. Recent occurrences since 2000 show concentrations of this species along the northwest portion of the Santa Ana Mountains and Northern Foothills, west of Bell Canyon, Christianitos Creek, and scattered throughout the San Joaquin Hills (Figure C.3-2, Many Stemmed Dudley Modeled Habitat).

Population Trends

The extant populations of many-stemmed Dudleya appear relatively stable (Reiser 1994). Roberts (1999) reviewed the status of this species in Orange County and conducted a range-wide review of the populations and their status. Many-stemmed dudleya has apparently been extirpated from the western portion of its range (CNPS 2013).

Threats to the Species and Other Conservation Issues

Several factors make dudleyas prone to extinction in southern California, including narrow endemism with low population numbers, invasion by nonnative species, and the increasing destruction and fragmentation of the natural landscape (Marchant et al. 1998). The distribution of many-stemmed dudleya appears to be constricting throughout its range, and approximately 30% of the populations known from Orange County in 1981 were extirpated by 1988 and as many as 50% may now be extinct (Marchant et al. 1998). Many-stemmed dudleya populations are seriously threatened by development, road construction and maintenance, fire suppression, nonnative plants, mining, grazing, and recreation, and possibly by military activities (CNPS 2013). In Orange County, Roberts (1999) found the species to be threatened by highway construction and urban development.

Survey and Restoration Requirements

Many-stemmed dudleya is drought-deciduous. Because of its small stature and the senescence of all above-ground parts in summer (leaving only a dried inflorescence in place) it is difficult to see and is easily overlooked during botanical surveys (Marchant et al. 1998, Jones et al. 2010). It differs from other dudleya species in the area because it is more diminutive, has more slender, cylindrical leaves, and has bright yellow flowers produced on multiple stalks (Clarke et al. 2007). Because it flowers between April and July, it is only visible in late spring to early summer and surveys should be conducted during that time period. Rainfall coupled with cold nights triggers the start of plant growth (Marchant et al. 1998). This plant remains dormant as an underground corm in the dry months (June–November) and produces small seeds that disperse not far from the parent plant; in order to salvage this species, both the underground corm and seeds can be collected, although transplantation may not be as good a mitigation measure as seeding, and artificial watering following seed inoculation of a new location may be necessary to ensure adequate germination and survival (Marchant et al. 1998, Jones et al. 2010). Dudleya seeds remain viable for many years if stored in a cool, dark location to prevent desiccation (RECON 2009). Experience with translocation of Blochman's dudleya suggests that plants do well at new sites as long as herbivory is not severe and weeds are controlled (RECON 2009). Like other Dudleya species, this plant is likely capable of self-fertilization without a pollination vector which may enable it to persist in newly established mitigation populations (Jones et al. 2010). Dudleya species are often associated with microbiotic soil crusts so soil salvage and replacement of native soil with a minimum of disturbance during re-introduction is important as openings in the crust can allow weeds to become established (RECON 2009).

Literature Cited

Printed References[7]

California Natural Diversity Database (CNDDB) 2013. Element Occurrence Query. RareFind, Version 4.0 (Commercial Subscription). Sacramento, California: CDFW, Biogeographic Data Branch. Available: http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp. Accessed: April 8, 2013.

California Native Plant Society (CNPS). 2013. *Inventory of Rare and Endangered Plants of California.* Available: http://www.rareplants.cnps.org/. Accessed: April 8, 2013.

Clarke, O.F., D. Svehla, G. Ballmer, and A. Montalvo. 2007. *Flora of the Santa Ana River and Environs*. Heyday Books, Berkeley, California.

Conservation Biology Institute. 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Dodero, M. W. 1995. Phylogenetic analysis of Dudleya subgenus Hasseanthus (Crassulaceae) using morphological and allozyme data. M.S. thesis. San Diego State University, San Diego, CA.

[7] Sources consulted but not cited include Rancho Santa Ana Botanic Gardens and herbarium specimen labels.

Jones, C. E., F.M. Shropshire, R.L. Allen and Y.C. Atallah. 2010. Pollination and reproduction in natural and mitigation populations of the many-stemmed dudleya, *Dudleya multicaulis* (Crassulaceae). Madroño 57(1):42-53.

Marchant, T. A., R. Alarcon, J.E. Simonsen, and H. Koopowitz. 1998. Population ecology of *Dudleya multicaulis* (Crassulaceae): a rare narrow endemic. Madroño 45(3):215-220.

McCabe, S. W. 2012. Dudleya. In J.C. Hickman (ed.), *The Jepson Manual, Vascular Plants of California. 2nd Edition*. University of California Press, Berkeley, CA.

RECON 2009. Carmel Mountain and Del Mar Mesa Resource Management Plan. Appendix 5. Short-leaved dudleya enhancement and restoration plan for the Carmel Mountain Preserve. Available: http://www.sandiego.gov/planning/community/profiles/delmarmesa/pdf/2012/cmdmmpreservmgtplan.pdf. Accessed: April 8, 2012.

Reiser, C.H. 1994. Rare Plants of San Diego County. Aquafir Press, Imperial Beach. Update on October 6, 2001 by Ellen Kanner and Brad Buffett. Available: http://sandiego.sierraclub.org/rareplants/207.html. Accessed: August 7, 2010.

Roberts, F. M. 1999. Many-stemmed dudleya (*Dudleya multicaulis*) Status Trend Summary. Unpublished Report prepared for the California Native Plant Society, Sacramento, CA.

Roberts, F. M., Jr. 2008. *The Vascular Plants of Orange County, California. An Annotated Checklist*. F.M. Roberts Publications, San Luis Rey, California.

Personal Communications

Roberts, F. M. 2000—regarding the status of many-stemmed dudleya for Southern Orange County NCCP.

Southern Tarplant

Centromadia parryi *ssp*. australis

Photo credit: Korey Klutz

Legal Status:

Federal: None

State: None

Forest Service: None

CNDDB Rank (2010): G4T2[8]/S2.1[9]

CNPS List (2010): 1B.1[10]

Recovery Plan: n/a

Species Description and Life History

Southern tarplant (*Centromadia parryi* ssp. *australis)*, previously described as *Hemizonia parryi* ssp. *australis*, is an aromatic annual herb and a member of the Asteraceae family (Baldwin 2012, Roberts 2008, Clarke et al. 2007) . The species is distinguished from *Centromadia* ssp. *parryi* by having darker, red to dark purple anthers (rather than yellow to brown) (Baldwin 2012). Leaves are generally puberulent and soft- to coarsely-hairy, with yellow glands. This taxon typically blooms from May through November (CNPS 2013).

Habitat Requirements and Ecology

Southern tarplant is known to occur at the margins of marshes and swamps, in vernally mesic (saline) valley and foothills grasslands, and vernal pools below 427 meters (1,400 feet) (Baldwin 2012, CNPS 2013). It is a summer-blooming annual that looks and acts weedy where it occurs, and its spiny morphology resembles that of a tumbleweed (Bowler 2000, Clarke et al. 2007).

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[8] T2: Subspecies is globally Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

[9] S2: State Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province; 0.1: Seriously endangered in California.

[10] 1B: Rare, threatened, or endangered in California and elsewhere; 0.1: Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat).

Species Distribution and Population Trends

Distribution

Southern tarplant is historically known from Santa Barbara County southward to Baja California, Mexico, and is possibly found on Santa Catalina Island as well. Many historical occurrences have been extirpated, including many in Orange County (CNPS 2013). The taxon has declined significantly over the last 50 years, and is now mostly extirpated from Santa Barbara, Ventura, and Los Angeles Counties and is rare in San Diego County (Roberts 2008). In fact, Orange County supports the majority of the remaining populations (Roberts 2008).

Within the Plan Area Southern tarplant are distributed in the following core habitat areas and linkages as listed in the Conservation Assessment of Orange County (Conservation Biology Institute 2009): Northern Foothills, Southern Foothills, Chino Hills, Seal Beach, Bolsa Chica (Areas G, H, and I), Santa Ana River Mouth (Areas A and B), and Upper Newport Bay. Modeled habitat for this species is concentrated along coastal and foothill areas. Within the Plan Area occurrence data is concentrated within Upper Newport Bay, Santa Ana Rivermouth, Bolsa Chica, and Seal Beach (Figure C.3-3, Southern Tarplant Modeled Habitat).

Population Trends

Many historical occurrences of southern tarplant, including those in Orange County, have been recently extirpated (CNPS 2013). Southern tarplant is almost extirpated in San Diego County and severely declining throughout its U.S. range (Reiser 1994). Large colonies in Newport Back Bay in Orange County are threatened by extensive recreational use and development. Reiser (1994) concluded that this subspecies should be a candidate for Federal Endangered status and all sites should be protected.

Threats to the Species and Other Conservation Issues

Population fragmentation is a serious problem and this plant continues to be threatened by urbanization, vehicles, development, foot traffic, grazing, habitat disturbance, and competition from nonnative plants (CNPS 2013).

Southern tarplant appears to respond well to translocation, as exhibited by the Tesoro mitigation site, and it establishes well in highly disturbed areas, based on its abundance in cultivated and grazed areas of Chiquita Canyon.

Survey and Restoration Requirements

This summer annual flowers from May through November (CNPS 2013) so surveys should be done during that time period. Often, the all-male disk flowers fall away with age, leaving the central portion of the receptacle bare, while fruit continues to mature in the ring of ray florets (Clarke et al. 2007). Seed can be collected from the mature plant and stored until sowing later at the designated site. Disc and ray seeds may exhibit different strategies for dormancy and benefit from physical scarification to break dormancy and improve germination. This plant is not capable of selfing, and requires a pollinator for successful seed set. Salvaging topsoil to reuse at the target site is recommended, in order to preserve any seed bank and beneficial microbial species.

Literature Cited

Baldwin, B. G. 2012. *Centromadia*. In J.C. Hickman (ed.). *The Jepson Manual, Vascular Plants of California. 2nd Edition*. University of California Press, Berkeley, CA.

Bowler, P.A. 2000. Experimental salvage strategy for transplanting a rare California plant: southern tarplant (California). Ecological Restoration. 18(4):268-269.

California Native Plant Society (CNPS). 2013. *Inventory of Rare and Endangered Plants of California.* Available: http://www.rareplants.cnps.org/ Accessed: April 8 2013.Clarke, O.F., D. Svehla, G. Ballmer, and A. Montalvo. 2007 *Flora of the Santa Ana River and Environs*. Heyday Books, Berkeley, California.

Clarke, O.F., D. Svehla, G. Ballmer, and A. Montalvo. 2007. *Flora of the Santa Ana River and Environs*. Heyday Books, Berkeley, California.

Conservation Biology Institute. 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Reiser, Craig H. 1994. Rare Plants of San Diego County. Aquafir Press, Imperial Beach, CA. Updated on October 6, 2001 by Ellen Kanner and Brad Buffett. Available: <http://sandiego.sierraclub.org/rareplants/207.html>. Accessed: August 7, 2010.

Roberts, F. M., Jr. 2008. *The Vascular Plants of Orange County, California. An Annotated Checklist*. F.M. Roberts Publications, San Luis Rey, California. 256 pp.

Arroyo Chub
Gila orcutti

Legal Status:

Federal: None

State: DFW Species of Special Concern

U.S. Forest Service: Sensitive

Photo credit: C. Page

Recovery Plan: None

Species Description and Life History

The arroyo chub (*Gila orcuttii*) is a small, chunky minnow (<7.6 centimeters [<3 inches]) in the Cyprinidae family. They have gray-olive green backs and white bellies, fairly large eyes, and small mouths. Arroyo chubs are named for the gullies and small canyons they inhabit. The species is named for the botanist C. R. Orcutt, who first collected them (Moyle 1976). In the Cuyama and Mojave Rivers, where introduced, arroyo chub have hybridized with California roach (*Lavinia symmetricus*) and Mojave tui chub (*Siphateles bicolor mohavensis*), respectively (Hubbs and Miller 1943, Greenfield and Deckert 1973).

A recent genetic analysis using microsatellite data collected from arroyo chub populations across six watersheds found that there are eight isolated populations within the species native range. The genetic diversity observed between populations was average to high as compared to other freshwater fishes. Two sites (Bell Canyon-Starr Ranch and Hot Springs Creek) were sampled within the plan area from the San Juan Creek watershed. The analysis found that these two sites are actually one genetic population. (Benjamin et al. 2016.)Breeding takes place continuously from February through August, with a peak in June and July (Tres 1992). Arroyo chubs usually spawn in pools or slow moving side waters with temperatures of 14 to 22°C during March and April (Moyle et al. 1995). Chubs attach their eggs to trailing vegetation in flowing water, at least in captive situations (Tres 1992). A single clutch of eggs may be fertilized by more than one male. The eggs hatch after 4 days and young spend their first 3 to 4 months in calmer waters among vegetation or other cover. They become reproductively mature after 1 year. Tres (1992) found that arroyo chubs live 3 to 4 years and seldom grow larger than 7.5 centimeters (2.95 inches) (Moyle 2002).

Natural dispersal is up- or downstream as conditions and suitable habitat permit, and is typically facilitated by flooding events (Moyle 1976). Fisher and Swift (1998), for example, noted that arroyo chub dispersal within the main stem of the Santa Margarita River appeared to increase dramatically after El Niño rains produce flood waters that heavily scour vegetation within the drainage, widening channels and reducing channel depths, and creating habitat conditions that favor the chub and reduce exotic fish presence. Larvae and juveniles tend to invade standing backwaters and/or disperse downstream from upstream spawning areas (Swift 2001).

Habitat Requirements and Ecology

Preferred habitat is slow moving or backwater sections of warm to cool streams with substrates of sand or mud and depth greater than 40 centimeters (16 inches) (Moyle 1976). Arroyo chub prefer clean, clear pools and flowing streams with cobble and riffles. They are adapted for surviving the warm, fluctuating streams of the Los Angeles Plain, which historically shifted between muddy torrents in winter and clear, intermittent brooks in summer (Moyle 1976). Additionally, Castleberry and Cech (1986) demonstrated in laboratory studies that this species is physiologically adapted to survive hypoxic (low oxygen) conditions and the wide fluctuations in temperature common in south coastal streams.

The arroyo chub is omnivorous, feeding primarily on algae but also known to eat aquatic plants, insects, insect larvae, small crustaceans, and roots of water ferns (*Azolla* spp.) occupied by nematodes (Greenfield and Deckert 1973, Moyle 1976).

Species Distribution and Population Trends

Distribution

The historic range of the arroyo chub includes the Los Angeles, San Gabriel, San Luis Rey, Santa Ana, and Santa Margarita Rivers and also Malibu and San Juan Creeks (Wells and Diana 1975). This species remains common at three localities within its historic range: the upper Santa Margarita River and its tributary, De Luz Creek; Trabuco Creek below O'Neill Park and San Juan Creek; and Malibu Creek. It is present, but scarce, in Big Tujunga Canyon (Pacoima Creek above Pacoima Reservoir); the Los Angeles River including the Sepulveda Flood Control Basin; the upper San Gabriel River drainage; and middle Santa Ana River tributaries between the Riverside and Orange County line (Swift et al. 1993). Introduced populations occur in the Santa Maria–St. Inez, Mojave, Santa Clara, and Cuyama river drainages, and a portion of San Felipe Creek (Miller 1968; Moyle 1976; Bell 1978; Sigler and Sigler 1987; Page and Burr 1991).

One of the largest remaining natural populations occurs in Orange County in the San Juan and Trabuco Creeks. Surveys conducted in San Juan Creek in 2004 detected arroyo chub downstream of the Rancho Mission Viejo boundary near the La Novia Bridge, and it is expected that the species continues to occupy areas within Rancho Mission Viejo and Caspers Wilderness Park, extending well into the Cleveland National Forest, which exhibits the largest areas of suitable habitat. Surveys conducted by Michael Brandman Associates (1996) report the arroyo chub in Gobernadora Creek, upstream of San Juan Creek. However, this population is isolated from San Juan Creek due to impassable areas in Gobernadora Creek immediately upstream of the confluence with San Juan Creek that allow only downstream movement from Cañada Gobernadora to San Juan Creek. Surveys by Johnston (1998) for the Arroyo Trabuco Golf Course project documented the chub in lower Arroyo Trabuco.

Most recent observations within the Plan Area come from Trabuco Creek in O'Neill Regional Park (Barabe pers. comm.), and Bell Creek. Two stretches of Bell Creek have had successful breeding between 2011 and 2015 (Gibson pers. comm.), Despite these observations and the recent genetic analysis of the species, the current status of the arroyo chub across its native range is largely unknown (O'Brien pers. comm.).

Within the Plan Area arroyo chubs occur in the following core habitat areas and linkages; Santa Ana Mountains, Southern Foothills, and Trabuco Creek and San Juan Creek Linkages. Modeled habitat for the species occurs within the upper reaches of the Santa Ana River and throughout the San Juan Creek basin. Within the Santa Ana River habitat is modeled from Anaheim to the Prado Dam in Chino. Modeled habitat within the San Juan Creek basin begins at the coast and goes upstream branching into Trabuco Creek and numerous smaller tributaries stretching into the Santa Ana Mountains (Figure C.3-4, Arroyo Chub Modeled Habitat). The arroyo chub has a very restricted range in southern California, and southern Orange County populations in San Juan and Trabuco Creeks are among the largest remaining natural habitats for the species.

This species occurs on protected lands in many of these core habitat areas. However, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Trabuco Creek and San Juan Creek Linkages (Priority Conservation Areas F and G).

Population Trends

Arroyo chub is now considered scarce within its native range due to habitat loss, and most populations are in danger of extirpation (Moyle 1976). As the Los Angeles urban area has expanded, the Los Angeles, Santa Ana, and San Gabriel Rivers have been highly modified, channelized, or moved in an effort to either capture water runoff or protect property. This has degraded the streams as arroyo chub habitat and reduced and fragmented these populations (Moyle et al. 1995).

Threats to the Species and Other Conservation Issues

Threats to the arroyo chub may be generalized into three categories: habitat based-threats (e.g., degradation, fragmentation, destruction), biological threats (e.g., predation, competition), and water quality threats (e.g., temperature, salinity, pollution). The most important threats are introduced fish species (e.g., mosquitofish [*Gambusia sp.*], green sunfish [*Lepomis cyanellus*], and largemouth bass [*Micropterus salmoides*]) and continued degradation of urbanized streams that comprise most of their habitat. The red shiner (*Cyprinella lutrensis*) has been introduced into arroyo chub streams and may competitively exclude chubs from many areas. Chubs generally decline when the shiners become abundant (Moyle et al. 1995). Dams and reservoirs greatly reduce the natural variability in environmental conditions, resulting in the domination of nonnative fish faunas (Moyle 2002, Herbold and Moyle 1986, Moyle and Light 1996). High disturbance systems support groups of species that would probably not coexist under natural conditions. For example, three to four species of predatory bass commonly live within reservoirs of California rivers while rarely are more than two species found together in natural systems (Moyle and Light 1996). Other impacts include recreational use of rivers and streams that can disturb spawning and feeding behavior. Cattle ranching alters water quality by introducing large amounts of urine and feces into the drainages. This increases ammonia and nitrate levels and results in increased oxygen consumption by nitrifying bacteria and a decrease in oxygen available for fish, as well as being toxins that can be deleterious in chronic amounts (Thurston et al. 1986).

The highly fragmented remaining populations, which are now known to function independently are especially vulnerable to extirpation due to their small size (USFWS 2007, Benjamin et al. 2016). Random natural events such as floods, annual weather variation, predation, and associated demographic uncertainty, formerly a boon when populations were large, may lead to the demise of remnant populations in the Los Angeles and Santa Ana basins. Management considerations should include local preservation and management (including livestock exclusion) for key drainage sections, as well as elimination of introduced predatory fishes such as green sunfish and largemouth bass (Moyle 1976).

The San Juan Creek population was historically a much larger population and still exhibits high genetic diversity (Benjamin et al. 2016). Maintaining this genetic diversity will preserve the adaptive potential that may aid future recovery or reintroduction efforts within this watershed or other suitable watersheds such as the Santa Margarita River. Efforts should be made to maintain or restore the existing habitat for this population to ensure the long-term genetic stability of the species. Threats within the Santa Ana River watershed are widespread and diverse. Habitat-based threats include extensive existing and proposed channelization, hardbank stabilization, and flood control projects that directly remove habitat for the chub, make it unsuitable, or fragment it within the watershed. An additional habitat-based threat within the Santa Ana River includes the spread of invasive plants such as arundo (*Arundo donax*) and tamarisk (*Tamarix* spp.). These plants tend to create large monocultures of emergent vegetation and areas suitable to exotic, predatory fish by gradually increasing water depth, lowering flow gradients, covering spawning gravels or cobbles, and out-competing emergent vegetation beneficial to the arroyo chub and other native fishes.

Literature Cited

Printed References

Bell, M. A. 1978. Fishes of the Santa Clara River System, Southern California. Natural History Museum, Los Angeles County, CA. *Contributions in Science Series* 295:1–20.

Benjamin, A., B. May, J. O'Brien, and A. J. Finger. 2016. Conservation Genetics of an Urban Desert Fish, the Arroyo Chub, Transactions of the American Fisheries Society. 145(2): 277-286. DOl: 10.1080/00028487.2015.1121925

Castleberry, D. T., and J. J. Cech, Jr. 1986. Physiological responses of a native and an introduced desert fish to environmental stressors. *Ecology* 67:912–918.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Fisher, R. N., and C. Swift. 1998. *Preliminary Survey of the Fish of the Santa Margarita River Watershed, San Diego and Riverside Counties*.

Greenfield, D. W. and G. D. Deckert. 1973. Introgressive hybridization between *Gila orcutti* and *Hesperoleucus symmetricus* (Pices: Cyprinidae) in the Cuyama River Basin, California: II. Ecological aspects. *Copeia* 1973:417–427.

Herbold, B., and P. B. Moyle. 1986. Introduced species and vacant niches. *American Naturalist* 128:751–760.

Hubbs, C. L., and R. R. Miller. 1943. Mass hybridization between two genera of cyprinid fishes in the Mojave Desert, California. *Papers of the Michigan Academy of Science Arts and Letters* 28:342–378.

Johnston, D. 1998. *Fish Survey for Lower Arroyo Trabuco Golf Course*. Prepared for Dudek & Associates, 7 pp + appendices.

Michael Brandman Associates (MBA) 1996. *Draft Natural Environmental Study for Foothill Transportation Corridor-South*. Prepared for the Orange County Foothill Transportation Corridor Agency.

Miller, R. R. 1968. Records of some native freshwater fishes transplanted into various waters of California, Baja California, and Nevada. *California Fish and Game* 54(3):170–179.

Moyle, P. 1976. *Inland Fishes of California*. University of California Press, Berkeley. 405pp.

———. 2002. *Inland Fishes of California*. University of California Press, Berkeley and Los Angeles, California. 502pp.

Moyle, P. D. and T. Light. 1996. Fish invasions in California: do abiotic factors determine success? *Ecology* 77(1996):1666–1670.

Moyle, P., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. *Fish Species of Special Concern in California*. The Resources Agency, Department of Fish and Game. Final Report for Contract No. 2128IF.

Page, L. M. and B. M. Burr. 1991. *A Field Guide to Freshwater Fishes of North America north of Mexico*. The Peterson Field Guide Series, Vol. 42. Houghton Mifflin Company, Boston, MA.

Sigler, W. F., and J. W. Sigler. 1987. *Fishes of the Great Basin: A Natural History*. University of Nevada Press, Reno, NV. 425 pp.

Swift, C. C. 2001. *The Santa Ana Sucker in the Santa Ana River: Distribution, Relative Abundance, Spawning Areas, and Impact of Exotic Predators*. Submitted to the Santa Ana Water Project Authority, Riverside CA. 94 pp.

Swift, C. C., T. R. Haglund, M. Ruiz, and R. N. Fisher. 1993. The status and distribution of the freshwater fishes of southern California. Bull. *Southern California Academy of Science* 92(3):101–167.

Thurston, R. V., R. C. Russo, E. L. Meyn, R. K. Zajdel, and C. E. Smith. 1986. Chronic toxicity of ammonia to fathead minnows. *Transactions of the American Fisheries Society* 115:196–207.

Tres, J. 1992. Breeding biology of the Arroyo chub, *Gila orcutti* (Pices: Cyrpindae). Unpublished M.S. Thesis, California State Polytechnic University, Pomona.

U.S. Fish and Wildlife Service (USFWS). 2007. Biological Opinion for the Southern Orange Habitat Conservation Plan, Orange County, California. Carlsbad Fish and Wildlife Service, Carlsbad, CA.

Wells, A. W., and J. S. Diana. 1975. Survey of the freshwater fishes and their habitats in the coastal drainages of southern California. Rep. Submitted to DFG, Inland fish. Branch from the Los Angeles County Museum of Natural History. 360 pp.

Personal Communications

Barabe, Russ. Environmental Scientist. California Department of Fish and Wildlife. September 17, 2015—conversation with Christine Beck, California Department of Fish and Wildlife.

Gibson, Scott. Assistant Director of Research and Education. Audubon's Starr Ranch. May 20, 2015—telephone call to Christine Beck, California Department of Fish and Wildlife.O'Brien, John. Senior Fish Biologist. California Department of Fish and Wildlife. September 11, 2015—telephone conversation with Christine Beck, California Department of Fish and Wildlife.

Coast Horned Lizard (San Diego Horned Lizard)
Phrynosoma blainvillii

Photo credit: Kailash Mozumder

Legal Status:

Federal: None

State: DFW Species of Special Concern

U.S. Forest Service: Sensitive

Recovery Plan: None

Species Description and Life History

The coast horned lizard (*Phrynosoma blainvillii*) is a medium sized (6.3–11.4 centimeters snout to vent), wide, flat bodied terrestrial lizard that has conspicuously pointed scales along its body and large horns around the base of its head. Leaché et al. (2009) recognized five phylogeographic groups in the Coast Horned Lizard complex, which include three ecologically divergent and morphologically diagnosable species: *Phrynosoma coronatum*, *Phrynosoma cerroense*, and *Phrynosoma blainvillii*. The first two are restricted to Mexico. They show that *Phrynosoma blainvillii*, which occurs in California, consists of three phylogeographic groups, but concluded that these groups do not represent three distinct species. The former *P. c. blainvillei* (San Diego subspecies of coast horned lizard) is no longer treated as a separate subspecies by CDFW. However, for consistency with the widely used terminology for the “blainvillei” population(s) in the literature, the English name “San Diego horned lizard” is retained in this account and account information pertains to animals in the range of this former subspecies except as indicated.

Breeding behavior has been observed from March through July. Female horned lizards are capable of laying multiple clutches in one year; typical clutch size is 6 to 17 eggs laid between May and July (Stebbins 1954, Howard 1974, Goldberg 1983). Little information is known about the selection of nest sites for this species. Eggs are laid in nests constructed of loose soil and take approximately 2 months to hatch (Morey 2000). Hatchlings are first seen in July and August. Studies done on the San Diego horned lizard found that 2–3 years are needed for this species to reach the minimum size for sexual maturity (Jennings and Hayes 1994). In captivity they are known to live more than 8 years, however, data on life expectancy in the wild is lacking (Jennings and Hayes 1994).

Dispersal abilities and home range sizes for the San Diego horned lizard are uncertain. Early studies found daily movements average about 150 feet per day within their 3- to 3.5-acre home range

(Whitford and Bryant 1979, Suarez pers. comm.). Later studies employing radio-telemetry on individuals in southern California found a mean home range of about 25 acres (Fisher et al. 2002). Most recently studies in the southern San Joaquin Valley found an average home range size of about 12 acres (Hult and Germano 2015). The Hult and Germano (2015) study concluded that home range size can fluctuate greatly year to year even for the same individual and that with the current data available we are not able to determine the optimal area required for the species conservation.

Habitat Requirements and Ecology

This species is known to use a wide variety of vegetation types, including chaparral, coastal sage scrub, grassland, oak woodland, riparian woodland, and coniferous forest (Klauber 1939, Stebbins 2003). In inland areas this species will typically use areas with open microhabitats that can be caused by either natural or anthropogenic disturbances (i.e., floods, fires, roads, grazed areas, fire breaks) (Jennings and Hayes 1994). Important habitat features include loose, fine soil with high sand fraction, abundance of native ant species, open areas with limited overstory for basking, and areas with low, dense shrubs for refuge (USFS 2008).

Horned lizards emerge from hibernation in March, and become active April through July, after which most adults aestivate (summer hibernation) (Hagar 1992). The adults reappear again briefly in late summer and return to overwinter sites from August to early October depending on elevation (Klauber 1939, Howard 1974, Hagar 1992). Daily activity patterns are closely related to surface temperatures. When surface temperatures reach 66°F, usually just prior to sunrise, lizards will emerge from burial sites into positions that allow them to bask in the sun. Their optimum temperature is 84–102°F; when midday temperatures exceed 104°F they will bury themselves and emerge later in the day.

Horned lizards feed primarily on native harvester ants (90% of their diet) but will also prey on other slow moving insects, such as beetles, flies, and caterpillars (Presch 1969, Pianka and Parker 1975). In one study, the total number of ants ingested in a day varied from approximately 30 to >100 per day (Whitford and Bryant 1979). Horned lizards do not appear to eat nonnative Argentine ants (*Linepithema humile*), which tend to displace native ants wherever they are introduced (Suarez et al. 2001).

Species Distribution and Population Trends

Distribution

In California, San Diego horned lizard ranges from the Transverse Ranges south to the Mexican border west of the deserts, although the taxon also occurs on scattered sites along the desert (eastern) slopes of the Peninsular Ranges (Jennings 1988). The known elevation range of this species is from 10 meters at the El Segundo dunes (Los Angeles County) to approximately 2,130 meters at Tahquitz Meadow, on San Jacinto Mountain, in Riverside County.

Within the Plan Area, San Diego horned lizards are known to occur in the following core habitat areas: Santa Ana Mountains, Northern Foothills, Southern Foothills, San Joaquin Hills, Chino Hills, and Seal Beach. Case and Fisher (1998) found coast horned lizards in the Chino Hills, as far west as the ridges between Carbon and Tonner Canyons (near the Olinda Landfill), but did not detect them at points farther west. Within the Northern Foothills they are known to occur at Agua Chinon, Limestone Canyon and Weir Canyon (Fisher 2000, Fisher et al. 2002) with the highest proportion found at Agua Chinon. These same studies conducted for the Nature Reserve of Orange County also found them near the Santa Ana Mountains at Starr Ranch. Modeled habitat for this species is found throughout all the core areas and linkages (Figure C.3-5, Coast Horned Lizard Modeled Habitat).

This species occurs on protected lands in many of these core habitat areas; however, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Northern Foothills (Priority Conservation area C), Southern Foothills (Priority Conservation areas A, B and D), and San Joaquin Hills (Priority Conservation area C).

Population Trends

San Diego horned lizard seems to have disappeared from about 45% of its former range in southern California, in particular on the coastal plain where it was once common (Hayes and Guyer 1981) and in riparian and coastal sage scrub habitats on the old alluvial fans of the southern California coastal plain (Bryant 1911, Van Denburgh 1922). Trends for existing populations on protected lands are not well understood, but some research is currently underway (Rochester et al. 2001).

Threats to the Species and Other Conservation Issues

Horned lizards are prey for a variety of natural predators, such as coyotes, badgers, foxes, small raptors (kestrels, falcons, shrikes, burrowing owls), roadrunners, and several other lizards and snakes (Zeiner et al. 1988).

The principal factors contributing to the decline of the San Diego horned lizard are believed to be loss of habitat due to urban development, conversion of habitat to agricultural lands, introduction of nonnative ant species, and pesticide use (Jennings and Hayes 1994, SDNHM 2015). The primary stressor on the San Diego horned lizard is habitat loss and fragmentation, with approximately 45% of habitat extirpated as of 1988 (Jennings 1988). In addition to direct habitat loss, urbanization is changing adjacent habitat used by the horned lizards. Nonnative Argentine ants, for example, displace native harvester ants and thus are considered a threat to horned lizards (Suarez et al. 2001, Fisher et al 2002, Sherbrooke 2003, Mitrovich et al. 2010, SDNHM 2015). Because Argentine ants tend to invade the urban wildland interface, habitat fragmentation is an important issue for the horned lizard. Experiments show that horned lizards reared solely on Argentine ants and the arthropods typical of an invaded community show negative or neutral growth rates, suggesting that horned lizards are disappearing from habitat remnants at least in part due to the effects of biological invasion (Suarez and Case 2002). Jennings and Hayes (1994) identified several other threats to the horned lizard, including collection by humans (including for commercial uses), off-road vehicles, livestock grazing, and conversion of habitat to agriculture.

Extensive surveys and studies of this taxon are needed, as well as long-term studies. In addition to studies of impacts of domestic pets, the invasion by both Argentine ants and nonnative red fire ants into remaining suitable horned lizard habitat should be monitored.

Literature Cited

Printed References

Bryant, H. C. 1911. The horned lizards of California and Nevada of the genera Phrynosoma and Anota. *University of California Publications in Zoology* 9:1–84.

Case, T., and R. Fisher. 1998. Inventories of the herpetofauna of the Chino-Puente Hills, and identification of important conservation priorities. Unpublished report. Department of Biology, University of California, San Diego, CA.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Fisher, R.N. 2000. Monitoring Reptiles and Amphibians and Biodiversity: Nature Reserve of Orange County. USGS annual report prepared for CDFW Local Assistance Grant

Fisher, R.N., A.V. Suarez, and T.J. Case. 2002. Spatial patterns in the distribution of the coastal homed lizard. Conservation Biology 16(1):205-2015.

Goldberg, R. S. 1983. Reproduction of the coast horned lizard, Phrynosoma coronatum, in Southern California. *The Southwest Naturalist* 28(4):478–479.

Hagar, S. B. 1992. Surface activity, movement, and home range of the San Diego horned lizard, Phrynosoma coronatum blainvillei. Master's Thesis, California State University, Fullerton.

Hayes, M. P., and C. Guyer. 1981. The herpetofauna of Ballona. Pages H1–H80 in R. W. Schreiber (ed.), *The biota of the Ballona region, Los Angeles County. Supplement I, Marina Del Rey/Ballona Local Coastal Plan*. Los Angeles County Natural History Museum Foundation, Los Angeles, CA.

Howard, C. W. 1974. Comparative reproductive ecology of horned lizards (genus Phrynosoma) in southwestern United States and northern Mexico. *Journal of the Arizona Academy of Science* 9(3):108–116.

Hult, S.M., and D.J. Germano. 2015. Habitat use and home range of *Phrynosoma blainvillii* in the San Joaquin Desert of California. Herpetological Conservation and Biology 10(3): 850-863.

Jennings, M. R. 1988. *Phrynosoma coronatum*. *Catalogue of American Amphibians and Reptiles* 428.1–428.5.

Jennings, M. R. and M. P. Hayes. 1994. Amphibian and reptile subspecies of special concern in California. California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA. iii+255 pp.

Klauber, L. M. 1939. Studies of reptile life in the arid southwest. Part I, Night collecting on the desert with ecological statistics; Part II, Speculations on protective coloration and protective reflectivity; Part III, Notes on some lizards of the southwestern United States. *Bulletin of the Zoological Society of San Diego* (14):1–100.

Leaché, A. D., M. S. Kooa, C. L. Spencera, T. J. Papenfussa, R. N. Fisher, and J. A. McGuirea. 2009. Quantifying ecological, morphological, and genetic variation to delimit species in the coast horned lizard species complex (Phrynosoma). Proceedings of the National Academy of Sciences published online before print July 22, 2009, doi:10.1073/pnas.0906380106.

Mitrovich, M.J., T. Matsuda, K.H. Pease, and R.N. Fisher. 2010. Ants as a Measure of Effectiveness of Habitat Conservation Planning in Southern California. Conservation Biology 24(5): 1239-1248.

Morey, S. 2000. Coast horned lizard Phrynosoma coronatum frontale. California Wildlife Habitat Relationships System, California Department of Fish and Game, California Interagency Wildlife Task Group. Available: http://www.dfg.ca.gov/whdab/cwhr/A043.html.

Pianka, E. R., and W. S. Parker. 1975. Ecology of horned lizards: A review with special reference to Phrynosoma platyrhinos. *Copeia* 1975(1):141–162.

Presch, W. 1969. Evolutionary Osteology and Relationships of the Horned Lizard Genus Phrynosoma (Family Iguanidae). *Copeia* 1969:250–275.

Rochester, C., S. Hathaway, C. Brown, K. Pease, and R. N. Fisher. 2001. *Herpetofaunal Monitoring in MSCP Region of San Diego*. Prepared for City of San Diego. 91pp.

San Diego Natural History Museum (SDNHM). 2015. Coast Homed Lizard. Field guide: Reptiles and Amphibians. Available: http://archive.sdnhm.org/fieldguide/herps/phry-cor.html. Accessed: May 8, 2015.

Sherbrooke, W. C. 2003. Introduction to Horned Lizards of North America. California Natural History Guides, Volume 64. Berkeley (California): University of California Press.

Stebbins, R. C. 1954. *Amphibians and Reptiles of Western North America*. McGraw-Hill Book Company, Inc., New York.

———. 2003. *A Field Guide to Western Reptiles and Amphibians*. Houghton-Mifflin Company, Boston. 533 pp.

Suarez, A. V. and T. J. Case. 2002. Bottom-up effects on persistence of a specialist predator: ant invasions and horned lizards. *Ecological Applications* 12(1):291–298.

Suarez, A. V., D. A. Holway, and T. J. Case. 2001. Patterns of spread in biological invasions dominated by long-distance jump dispersal: Insights from Argentine ants. *Proceedings of the National Academy of Sciences of the United States of America* 98:1095–1100.

USDA Forest Service (USFS). 2008. Species Accounts: Animals. Available: <http://www.fs.fed.us/r5/scfpr/projects/lmp/read.htm>.

Van Denburgh, J. 1922. The reptiles of western North America: An account of the species known to inhabit California and Oregon, Washington, Idaho, Utah, Nevada, Arizona, British Columbia, Sonora, and Lower California. *Occasional Papers of the California Academy of Sciences* Volume 10.

Whitford, W. G. and M. Bryant. 1979. Behavior of a Predator and Its Prey: The Horned Lizard (*Phrynosoma cornutum*) and Harvester Ants (*Pogonomyrmex* spp.). *Ecology* 60:686–694.

Zeiner, D. C., W .F. Laudenslayer, Jr., and K. E. Mayer (eds.). 1988. *California's Wildlife*. Volume I. Amphibians and reptiles. California Statewide Wildlife Habitat Relationships System, California Department of Fish and Game, Sacramento, CA.

Personal Communication

Suarez, A. V. 2005—communication with Dudek & Associates regarding San Diego horned lizard home ranges.

Orangethroat Whiptail
Aspidoscelis hyperythra

Legal Status:

Federal: None

State: DFW Watch List

U. S. Forest Service: None

Photo credit: Kailash Mozumder

Recovery Plan: None

Species Description and Life History

The orangethroat whiptail (*Aspidoscelis hyperythra*) is a small (5- to 9.4-centimeter snout to vent), slender, unspotted whiptail lizard. The back is black, dark brown or grayish with up to six pale yellow stripes. The underside is a blue-gray or white, and adult males will have a bright orange throat and chest.

Based on examining reproductive structures throughout the year, Bostic (1966b) inferred males are reproductively active from the first week of April through the first week of July. The average clutch size for the orangethroat whiptail is approximately 2.3 eggs (Bostic 1966a). The number of egg clutches deposited each season is not known; however, multiple clutches may be laid, one in June and again in mid-July (Milstead 1957, Bostic 1966a, Parker 1972, Crews et al. 1986). Incubation of hatchlings appears to be approximately 50–55 days based on the time interval between the last record of females with oviductal eggs (mid-July) to dates hatchlings were last observed in the field. Juveniles reach reproductive maturity in their first spring. There is no information regarding dispersal or life expectancy for this species.

In early studies, Bostic (1965) recorded an average home range of 0.04 hectare (0.10 acre) for adult orangethroat whiptails. Female ranges were slightly larger than male ranges at 0.06 hectare (0.15 acre) versus 0.03 hectare (0.07 acre), respectively. Female home ranges overlap extensively with other females' ranges as well as male ranges. Bostic (1965) also noted some overlap among male home ranges, but not as extensive as for females. More recent studies found that the home range for the western whiptail was approximately 2.5 acre for males and 0.8 acres for females (Anderson 1993) and densities of approximately 10 to 40 lizards per hectare (or 4 to 16 per acre) (Brattstrom 2000).

Habitat Requirements and Ecology

This species is known to occupy open, sparsely covered land often with well-drained loose soils and rocks. Habitat types include chaparral, nonnative grassland, coastal sage scrub, juniper, and oak woodlands. This species may be associated with perennial vegetation because its major food source, termites (Bostic 1966a), uses perennial plants as a food base. Surveys conducted by Lilburn (1994) indicated that they are most strongly associated with coastal scrub but that oak woodland and chaparral communities have significant value to the species. California buckwheat appears to be an important indicator of suitable habitat for the orangethroat whiptail, perhaps because it is associated with vegetation cover with 10 to 40% bare ground (McGurty 1981).

Orangethroat whiptail adults enter into hibernation in late July and will remain there through most of September (Bostic 1966a). Hibernation, and likely oviposition sites, occurs on well isolated, south-facing slopes (Jennings and Hayes 1994). Daily activity patterns for this diurnal species show activity peaks in the mid-morning and late afternoon, avoiding the peak mid-day temperatures. As expected, the diurnal cycle fluctuates with seasonality. As temperatures increase through spring and summer, whiptails are active both earlier and later in the day. Work by Rowland (1992) at the Motte Rimrock Reserve in Riverside County, suggests that adult and juvenile orangethroat whiptails are generally active 8 months out of the year, but juveniles were observed in every month but January. Adults were most active in April and May, while hatchling/juvenile activity was greatest in September.

Termites comprise 72 to 92% of the orangethroat whiptail's diet, with peak consumption occurring simultaneously with the swarming of reproductive individuals in April, and again in July (Bostic 1966b). In late summer, however, when termites migrate deep into the soil to avoid high surface temperatures, alternate prey items dominate the whiptail's diet. The most important alternate prey are spiders, followed by cockroaches, grasshoppers, crickets, moths, and beetles. No significant differences in diet between the sexes or between adults and juveniles were found (Bostic 1966a).

Species Distribution and Population Trends

Distribution

Orangethroat whiptail is found from the Santa Ana River in Orange County south through the Baja California peninsula. To the east they are located on the coastal slope of the Peninsular Ranges, and extend from near sea level to 1,040 meters (northeast of Aguanga, Riverside County) (Jennings and Hayes 1994). The distribution of the western subterranean termite (*Reticulitermes hesperus*), their primary prey item, plays a key factor in the distribution of this species. Western subterranean termites and suitable whiptail habitat are abundant in Los Angeles and Orange Counties.

Within the Plan Area, orangethroat whiptails are distributed in the following core habitat areas and linkages: Santa Ana Mountains, Northern Foothills, Southern Foothills, San Joaquin Hills, Chino Hills, and Trabuco Creek and San Juan Creek Linkages. Modeled habitat for this species is found throughout all of the priority conservation areas, both core areas and linkages. Recent occurrence data since 2000 has documented them in the Northern Foothills and Trabuco Creek Linkage (Figure C.3-6, Orangethroat Whiptail Modeled Habitat).

Monitoring studies conducted for the Nature Reserve of Orange County found the orangethroat whiptail to be the fourth most commonly recorded lizard (Fisher 2000). For these studies 10 sites were surveyed and found the whiptail at all of the sites except two, with the highest densities found at Peter's Canyon. A slightly more current report from 2003 found the highest density at Agua Chinon (Backlin et al. 2003).

This species occurs on protected lands in many of these core habitat areas; however, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Northern Foothills (Priority Conservation area C), Southern Foothills (Priority Conservation areas A–D), San Joaquin Hills (Priority Conservation areas A and C), and Trabuco Creek and San Juan Creek Linkages (Priority Conservation area G).

Population Trends

The CDFW estimated in 1990 that the orangethroat whiptail had been extirpated from 75% of its historic range (Jennings and Hayes 1994). The lower coastal floodplains have been developed, leaving the smaller, higher elevation and relatively isolated drainages and terraces as remaining habitat for the whiptail. Because these areas are smaller and isolated, thus limiting dispersal opportunities, local populations have a greater risk of local extinction. Argentine ants (*Linepithema humile*), displace many native insects, and may also influence the prey base of orangethroat whiptail (Jennings and Hayes 1994). McGurty (1981) suggested the frequent fires resulting in type conversion from scrub to grassland habitat reduces woody shrubs and food sources for termites.

The monitoring data for orangethroat whiptail within the Nature Reserve of Orange County indicates good evidence of reproduction and recruitment at most of the sites where they have been documented (Fisher 2000).

Threats to the Species and Other Conservation Issues

The greatest threat to this species is loss, alteration, and fragmentation of occupied habitat. The major predators for whiptails are scrub jays, roadrunners, northern mockingbirds, and other species of predatory birds and snakes. Domestic cats and other urban edge predators also appear to be significant for whiptails (Brattstrom 1989). This species can also be affected by off-road vehicle activity and over-grazing by livestock.

Literature Cited

Anderson, R.A. 1993. An Analysis of Foraging in the Lizard, *Cnemidophorus tigris*. In: Wright, J. W., and L.J. Vitt, eds., 1993. Biology of Whiptail Lizards (Genus *Cnemidophorus*). Oklahoma Museum ofNatural History, Norman, Oklahoma.

Backlin, A., C. Hitchcock, K. Pease, and R. Fisher. 2003 Monitoring Results for Reptiles, Amphibians and Ants in the Nature Reserve of Orange County (NROC) 2002. USGS Report prepared for The Nature Reserve of Orange County and The Nature Conservancy. 13 pp.

Bostic, D. L. 1965. The home range of the teiid lizard, *Cnemidophorus hyperythrus beldingi*. *The Southwest Naturalist* 10(4):278–281.

———. 1966a. Food and feeding behavior of the teiid lizard, *Cnemidophorus hyperythrus beldingi*. *Herpetologica* 22(1):23–31.

———. 1966b. Thermoregulation and hibernation of the lizard, *Cnemidophorus hyperythrus beldingi* (Sauria: Teiidae). *The Southwestern Naturalist* 11(2):275–289.

Brattstrom, B. H. 1989. Status survey of the Orange-throated Whiptail, *Cnemidophorus hyperythrus beldingi*, and the San Diego Horned Lizard, *Phrynosoma coronatum blainvillei*. Progress report on Fish and Game Contract FG 8597.

Brattstrom, B.H. 2000. The range, habitat requirements, and abundance of the orangethroated whiptail, *Cnemidophorus hyperythrus beldingi*. Bulletin of the Southern California Academy of Science 99:1-24.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Crews, D., M. Grassman, and J. Lindzey. 1986. Behavior facilitation of reproduction in sexual and unisexual whiptail lizards. *Proceedings of the National Academy of Sciences* 83:9547–9550.

Fisher, R.N. 2000. Monitoring Reptiles and Amphibians and Biodiversity: Nature Reserve of Orange County. USGS annual report prepared for CDFW Local Assistance Grant

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile Species of Special Concern in California. Final report submitted to California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA, under Contract 8023.

Lilburn Corporation. 1994. Orange-throated whiptail surveys conducted on portions of Rancho Mission Viejo. Prepared for the Santa Margarita Company, Rancho Santa Margarita, CA.

McGurty B. M. 1981. Status survey report on the orang-throated whiptail lizard, *Cnemidophorus hyperythrus beldingi* occurring on Camp Pendleton U.S. Marine Corps Base, Miramar U.S. Naval Air Station, and Fallbrook Annex U.S. Naval Weapons Station during the survey period August to November 1981. Contract 11310-0129-81. San Diego, CA.

Milstead, W. W. 1957. Observations on the natural history of four species of whiptail lizard, *Cnemidophorus* (Sauria, Teiidae) in Trans-Pecos Texas. *Southwest Naturalist* 2:105–121.

Parker, W. S. 1972. Ecological study of the western whiptail lizard, *Cnemidophorus tigris gracilis*, in Arizona. *Herpetologica* 28:360–369.

Rowland, S. D. 1992. Activity, behavior, ecology, and home range of the orange-throated whiptail, *Cnemidophorus hyperythrus beldingi Cope*. MA Thesis, California State University, Fullerton, CA.

Western Pond Turtle
Emys marmorata

Photo credit: Kailash Mozumder

Legal Status:

Federal: None

State: DFW Species of Special Concern

U.S. Forest Service: Sensitive

Recovery Plan: None

Species Description and Life History

The western pond turtle (*Emys marmorata*) is a medium-sized (8.9 to 21.6 centimeters) aquatic turtle that ranges in color from olive to dark brown or black (Stebbins 2003). Previously assigned to the genus *Clemmys*, Feldman et al. (2002) has also proposed taxonomic realignments that would place *Actinemys marmorata* within the genus *Emys*; current literature may refer to this taxon under either generic name. There are recent publications indicating that the western pond turtle should be split into two different species, with one inhabiting the area north of San Francisco (and including the central valley and Sierra Nevada), and another inhabiting the central and southern coast and referred to as the southwestern pond turtle (*E. marmorata pallida*),a distinct subspecies (Spinks et al. 2014). At this point a definitive split has not been made (Spinks and Shaffer 2009).

Breeding behavior has been observed from February through November; the peak nesting season occurs from May through June, but can be as early as April or as late as August (Holland 1988, 1994). Females reach sexual maturity at 6 to 7 years, or when the carapace length reaches at least 11 centimeters. Females select nesting sites in loose soil up to 400 meters from their aquatic habitat. Most nest sites are located on south-facing slopes along the margin of the aquatic habitat. Once selected the female will excavate a 9- to 12.5-centimeter deep hole and deposit 1 to 13 hard-shelled eggs (Holland 1994, Jennings and Hayes 1994). Incubation times range from 80 to 126 days (Goodman 1997, Holland 1994). Hatchlings utilize shallow, slow-moving waters with emergent vegetation, such as that found alongside channels of stream or pond margins; while juveniles 1 year old or more tend to utilize the same aquatic habitats as adults (Holland pers. comm.).

Though capable of dispersal Holland and Goodman (1996) state that “most animals appear to remain within a given watercourse for extended periods of up to several years.” Overland movement up to 5 kilometers has been documented; however, most frequently these dispersals are less than

3 kilometers. It is unknown whether these large movements are in response to environmental stresses such as drought, or if movements such as these are part of the animal's movements within its home range. Home ranges are largest for males (2.42 acres), smallest for females (0.62 acres), with juveniles in the middle (0.89 acres) (Bury 1972).

Habitat Requirements and Ecology

This species is known to use both permanent and intermittent water sources ranging from rivers and lakes to ponds, streams, and irrigation ditches. Preferred habitat is pools within streams with a rocky or muddy bottom and a predominance of aquatic vegetation (Bury 1972). In addition pond turtles will select areas with high quality refugia for basking, such as floating vegetation, logs, rocks, terrestrial islands, and human-made debris (Holland 1994). The upland habitat is also an important factor, as these areas are used to lay eggs, overwinter, and for dispersal.

Pond turtles are active year round in warmer climates, but have peak activity from February through November. When turtles do overwinter they will move as far as 500 meters away from their aquatic habitat before burrowing into leaf litter or loose soils (Holland 1994). For reasons not entirely clear, pond turtles may move into upland habitats for variable intervals at other times of the year, during which times they may be found burrowed into duff or under shrubs (Rathbun et al. 1992). Pond turtles can also overwinter within aquatic habitat and will bury themselves underwater in the mud and enter torpor (Reese 1996, Goodman 1997).

Pond turtles are opportunistic omnivores. Their diet is known to include aquatic plants, water beetles, duck carrion, adult larval insects, spiders, fish, frogs, tadpoles, coyote (*Canis latrans*) scat, and snails (Pope 1939, Evenden 1948, Carr 1952, Holland 1988, Bury 1986, Goodman and Stewart 1998). Adults ingest plants as part of their diet, which provides nutrients when live prey are unobtainable, but they tend to prefer live or dead animal food instead of plant material. Bury (1986) found that prey sizes and proportions of prey items differ between age and sex classes. This may reduce intraspecific competition for limited resources. His data reveal that females utilize a greater variability (20 categories) in food items than males (15 categories), and juveniles were found to utilize the greatest (22 categories).

Species Distribution and Population Trends

Distribution

The historic range of the full species of the western pond turtle (*E. marmorata*) extended along most of the west coast of North America, primarily west of the Cascade-Sierra crest, from western British Columbia to northern Baja California (Ernst et al. 1994). Currently the southwestern pond turtle ranges from south of San Francisco Bay to northern Baja California, Mexico, and intergrades with northwestern pond turtle (*E.m. marmorata*) over a large area in central California (Bury 1970, Stebbins 1985). Isolated populations of the southwestern pond turtle are known to exist as far into the Mojave Desert as Afton Canyon and the Amargosa River (Lovich 1999). The elevational range for the species is from brackish estuarine waters at sea level to over 2,000 meters, but it's uncommon above 1,529 meters (Stebbins 1954; Bury 1963; Holland 1994).

Within the Plan Area western pond turtles are reported from the following core habitat areas: Santa Ana Mountains, Northern Foothills, Southern Foothills, San Joaquin Hills, Chino Hills, West Coyote Hills, Upper Santa Ana River, Seal Beach, and Upper Newport Bay. Within these core habitat areas breeding locations are: San Juan Creek (six locations), a stock pond in upper Christianitos Canyon (one location), and Jerome's Lake in upper Gabino Canyon (one location) (USFWS 2007). Data from the Irvine Ranch Conservancy identified western pond turtles in Lower Silverado Creek with a known breeding population occurring in neighboring Ladd Canyon in 2005 (IRC 2015). Recent studies conducted by USGS also found individuals in Santa Ana River, San Juan/Oso/Trabuco creeks, Aliso Creek, San Diego Creek, and Shady Canyon Pond (San Joaquin Hills Core Habitat Area). The sizable population observed at Shady Canyon Pond (74 individual turtles) may serve as an important source population for future reintroduction efforts in the Plan Area (Fisher et al. 2013, IRC 2013).

Modeled habitat for this species is found throughout all of the core areas and linkages. There are recent occurrences since 2000 within Chino Hills, Aliso Creek, Trabuco Creek, and the Southern Foothills (Figure C.3-7, Western Pond Turtle Modeled Habitat).This species occurs on protected lands in many of these core habitat areas; however, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Santa Ana Mountains (Priority Conservation areas A and B), Northern Foothills (Priority Conservation areas A-C), Southern Foothills (Priority Conservation area B), San Joaquin Hills (Priority Conservation area B), Chino Hills (Priority Conservation areas A–C), West Coyote Hills, Upper Santa Ana River (Priority Conservation areas A–C), Seal Beach, and Upper Newport Bay.

Population Trends

Many populations of western pond turtles throughout California are heavily adult-biased (Holland pers. comm.), an indication that little recruitment is occurring within those populations. Known localities for western pond turtles in southern California decreased from 87 in 1960 to 57 in 1970. In 1987, of 255 sites that were surveyed for this species, only 53 contained western pond turtles, and only 10 of these could support reproductively viable populations (USFS 2006). These 53 sites are located in Ventura, Los Angeles, San Diego, Orange, San Bernardino, and Riverside Counties (Brattstrom 1988, Brattstrom and Messer 1988, Lovitch 1999).

Threats to the Species and Other Conservation Issues

The major predators for pond turtles are northern raccoons (*Procyon lotor*), bullfrogs (*Rana catesbeiana*), largemouth bass (*Micropterus salmoides*), sunfish (*Lepomis sp.*), crayfish (*Procambarus clarkii*), common gray fox (*Urocyon cineroargenteus*), coyote (*Canis latrans*), and feral and domestic dogs (*Canis familiaris*) (Holland 1994, Fisher et al. 2013). The western pond turtle is the only remaining native turtle in southern California (Fisher et al. 2013). Exotic turtles, including painted turtles, snapping turtles, and sliders, are found in most, if not all of the watersheds in southern California and are known to compete with pond turtles for food and basking sites. These exotic turtles also may harbor and transmit diseases, such as upper respiratory diseases, to pond turtles (Holland 1994). The added pressures caused by the nonnative turtles are a threat to the long-term viability of the species (Fisher et al. 2013).The greatest threat to this species is loss, alteration, and fragmentation of occupied habitat. Within this species' historic range, more than 90% of the wetland habitat has been eliminated by agricultural development, flood control, water diversion projects, and urbanization (USFWS 1992, 1993). In recent decades additional pressures to turtle habitat have come from introduced species, contamination spills, off-road vehicle use, and vehicle strikes on roads (Holland 1994). Dams and other alterations of channel morphology have greatly reduced the availability and quality of suitable habitat (Reese and Welsh 1988). In some areas the invasion of exotic vegetation such as tamarisk (*Tamarix* spp.) and arundo (*Arundo donax*) has altered channel morphology and altered food chains, degrading pond turtle habitat. Other threats include collection of individuals for the pet trade and shooting or other means of indiscriminate killing by humans (Holland 1994). Extended drought and associated fire can also result in significant mortality of western pond turtles (Holland 1991). Holland (1994) indicated that mortality caused by automobile strikes probably matches or exceeds mortality from most other anthropogenic sources.

The lack of data on nesting, movement, and recolonization led Rathbun et al. (1992) to recommend protecting at least 500 meters (1,640 feet) from known occupied aquatic habitat to avoid impacts on nesting habitat. The pond turtle is not currently state or federally listed; however, petitions to list this species have been reviewed. To date the petition to list this species has been denied due to the fact that the species is present across a large percent of the original range.

Literature Cited

Printed References

Brattstrom, B. H. 1988. Habitat destruction on California with special reference to *Clemmys marmorata*: A perspective. In H. F. DeLisle, P. R. Brown, B. Kaufman, and B. M. McGurty (eds.), *Proceedings of the conference on California herpetology*. Southwestern Herpetological Society, Van Nuys, CA.

Brattstrom, B. H. and D. F. Messer. 1988. *Current status of the southwestern pond turtle,* Clemmys marmorata pallida*, in southern California*. Final Report for California Department of Fish and Game, Contract C-2044.

Bury, R. B. 1963. Occurrence of Clemmys m. marmorata in north coastal California. *Herpetologica*. 18:283.

———.1970. Clemmys marmorata. *Catalogue of American Amphibians and Reptiles* 100:1–3.

———. 1972. Habits and home range of the Pacific pond turtle, Clemmys marmorata, in a stream community. Ph.D. Diss. Univ. California, Berkeley.

———. 1986. Feeding ecology of the turtle, Clemmys marmorata. *Journal of Herpetology* 20:515–521.

Carr, A. F. 1952. *Handbook of Turtles*. The turtles of the United States, Canada, and Baja, California. Comstock Publishing Associates, Ithaca, NY; Cornell University Press, Ithaca, NY.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. *Turtles of the United States and Canada*. Smithsonian Institution Press, Washington, D.C.

Evenden, G. G., Jr. 1948. Distribution of the turtles of western Oregon. *Herpetologica* 4:201–204.

Feldman, C. R., and J. F. Parham. 2002. Molecular phylogenetics of emydine turtles: Taxonomic revision and the evolution of shell kinesis. *Molecular Phylogenetic Evolution* 22:388–398.

Fisher, R. N., D. A. Wood, C. W. Brown, P. Q. Spinks, and A. G. Vandergast. 2013. *Phylogenetic and Population Genetic Analyses of the Western Pond Turtle (*Emys marmorata*), in Southern California*. January. Prepared for the California Department of Fish and Wildlife. San Diego, CA.

Goodman, R. H., Jr. 1997. The biology of the southwestern pond turtle (*Clemmys marmorata pallida*) in the Chino Hills State Park and the West Fork of the San Gabriel River. Master's Thesis, California State Polytechnic University, Pomona.

Goodman, R. H., and G. R. Stewart. 1998. *Clemmys marmorata pallida* (southwestern pond turtle). *Coprophagy. Herpetol. Rev.* 29(2):98.

Holland, D. C. 1988. *Clemmys marmorata* (Western Pond Turtle). Behavior. *Herpetological Review* 19:87–88.

———. 1991. A synopsis of the ecology and status of the western pond turtle (*Clemmys marmorata*) in 1991. Unpublished report prepared for the U.S. Fish and Wildlife Service. 141 pp.

———. 1994. The western pond turtle: habitat and history. U.S. Department of Energy, Bonneville Power Administration, Portland, OR. 11 chapters + appendices.

Holland, D. C., and R. H. Goodman Jr. 1996. *Clemmys marmorata* (western pond turtle). Terrestrial habitat use. *Herpetological Review* 27(4):198–199.

Irvine Ranch Conservancy (IRC). 2013. Proposed plan for sediment removal and prevention for the Shady Canyon Turtle Pond City of Irvine Open Space. Unpublished draft restoration plan.

———. 2015. Habitat Mitigation and Monitoring Plan: Lower Silverado Canyon. Prepared for the OCT A Measure M Freeway Mitigation and Resource Protection Program. Unpublished draft restoration plan.

Jennings, M. R., and M. P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California*. California Department of Fish and Game, Rancho Cordova, CA. 255 p.

Lovitch, J. E. 1999. Western Pond Turtle (*Clemmys marmorata*). Department of Biology, University of California, Riverside.

Pope, C. H. 1939. *Turtles of the United States and Canada*. Alfred A. Knopf., Inc. New York, NY.

Rathbun, G. B., N. Siepel, and D. Holland. 1992. Nesting behavior and movements of western pond turtles, *Clemmys marmorata*. *Southwest. Nat.* 37:319–324.

Reese, D. A. 1996. Comparative demography and habitat use of western pond turtles in northern California: The effects of damming and related alterations. Ph.D. dissertation, University of California, Berkeley. 253 pp.

Reese, D. A., and H. H. Welsh, Jr. 1988. Habitat use by western pond turtles in the Trinity River, California. *Journal of Wildlife Management* 62:842–853.

Spinks, P. Q., and H. B. Shaffer. 2009. Conflicting mitochondrial and nuclear phylogenies for the widely disjunct emys (Testudines: Emydidae) species complex, and what they tell us about biogeography and hybridization. *Systematic Biology* 58:1–20.

Spinks, P.Q., R.C. Thomson, and H.B. Shaffer. 2014. The advantages of going large; genome-wide SNPs clarify the complex population history and systematics of the threatened western pond turtle. Molecular Ecology 23: 2228-2241.

Stebbins, R. C. 1954. *Amphibians and Reptiles of Western North America*. McGraw Hill Book Co., New York, NY.

———. 1985. *A Field Guide to Western Reptiles and Amphibians*. 3rd edition. Houghton Mifflin Co., Boston, MA.

———. 2003. *A Field Guide to Western Reptiles and Amphibians*. 3rd edition. Houghton Mifflin Company, Boston, MA. 533 pp.

USDA Forest Service (USFS). 2006. Species Accounts: Animals. Available: <http://www.fs.fed.us/r5/scfpr/projects/lmp/read.htm>.

U.S. Fish and Wildlife Service (USFWS). 1992. Endangered and threatened wildlife and plants; 90-day finding and commencement of status reviews for a petition to list the western pond turtle and California red-legged frog. *Federal Register* 57:45761–45762.

———. 1993. Endangered and threatened wildlife and plants; notice of a 1-year petition finding on the western pond turtle. *Federal Register* 58:42717–42718.

Personal Communications

Holland, D. Herpetologist. 1992–2001—numerous personal communications with consultant team regarding pond turtle biology.

Cactus Wren

Campylorhynchus brunneicapillus

Legal Status:

Federal: Birds of Conservation Concern

State: DFW Species of Special Concern

Forest Service: Sensitive Species

Photo credit: Kylie Fischer

Recovery Plan: None

Species Description and Life History

The cactus wren (*Campylorhynchus brunneicapillus*) is a diurnal non-migratory bird that is highly dependent on stands of cactus associated with the coastal sage scrub plant community. The Plan covers all cactus wrens within Orange County, which also includes portions of the range for two subspecies (sandiegensis and anthonyi). The San Diego cactus wren (*C. brunneicapillus sandiegensis*) is a distinct subspecies of the more widely distributed cactus wren that is found from southern California south to southern Baja California, southern Nevada, southwestern Utah, western and south central Arizona, southern New Mexico, and central Texas south to Mexico (Terres 1980). The variation in plumage patterns and characters are used to distinguish the subspecies of the cactus wren. Eight subspecies are recognized, with the subspecies falling into roughly two groups: the *affinis* group (peninsular forms) and the *brunneicapillus* group (continental forms) (Proudfoot et al. 2000). The range of *C. b. cousei* is now geographically disjunct from interior desert populations as a result of urbanization of the corridor along the San Gorgonio Pass in Riverside County (Rea and Weaver 1990). Recent genetic studies conducted by the U.S. Geological Survey (USGS) examined the structure of the cactus wren population in coastal southern California (Barr et al. 2013, 2015). These two studies identified two populations within the Plan Area, the Central Orange County population and the Coastal Orange County population. The USGS studies estimated the effective population size and level of genetic diversity for each of the two populations. Although both populations had similar levels of genetic diversity with recent evidence of population bottlenecks likely attributed to wildfire events, the effective population size of the Central Orange County population was much larger (Barr et al. 2013, 2015). Nest sites are almost always associated with cactus thickets and are maintained throughout the year for both nesting and roosting purposes. The nests are described as hollow, football-shaped structures woven into tall stands of cactus usually placed horizontally 4–5 feet above the ground (Unitt 2004, Anderson and Anderson 1957). Two broods per season are common, and clutch sizes are typically 4–5 eggs, laid between March and June (Unitt 2004). Incubation is done by the female over a 15- to 18-day period, the average fledging time is 21 days, and the young are independent about 1 month after leaving the nest (Hensley 1959, Anderson and Anderson 1960).

Dispersal away from their breeding sites is minimal (Unitt 2004); young males often set up new territories just outside of their parental territory (Proudfoot et al. 2000). The average territory is 1.3 hectares, varying from 0.8–2 hectares (Rea and Weaver 1990). The home range may be the same as the territory (Anderson and Anderson 1963). Recent data from monitoring through the Nature Reserve of Orange County has documented larger dispersal distances than previously recorded from populations in San Diego, Los Angeles and Ventura Counties, with confirmed movements up to 5 miles from natal areas (Preston and Kamada 2012, Barr et al. 2013). Anderson and Anderson (1973) report an overall adult survival rate of 50.6% during a 6-year study. Maximum life expectancy for this species is unknown, but in one study a banded adult was re-trapped when it was 4 years old (Terres 1980).

Habitat Requirements and Ecology

Cactus wrens almost exclusively inhabit thickets of cholla (*Opuntia prolifera*) and prickly pear (*Opuntia littoralis* and *Opuntia oricola*) below 1,500 feet in elevation on mesas and lower south- and west-facing slopes of the Coast Ranges (Proudfoot et al. 2000). The species is rarely observed outside of this specialized habitat.

The annual diet of this species is composed of fruits, seeds, nectar, insects, and other invertebrates found on the ground and in low standing vegetation (Bent 1968, Anderson and Anderson 1973). They are primarily insectivorous and spend a majority of their time foraging on the ground under fallen debris and in low lying shrubs, and probing tree bark (Proudfoot et al. 2000). During the fall and winter months their diets are supplemented with cactus fruit (Rea and Weaver 1990). In warmer climates foraging behavior is often regulated by heat stress (Ricklefs and Hainsworth 1968), necessitating retreat from exposed sites into shade of shrubs and trees.

Species Distribution and Population Trends

Distribution

Zeiner et al. (1990) summarize the distribution, abundance, and seasonality of the cactus wren in California as follows. It is a locally common resident in the Mojave and Colorado deserts, north from the Mexican boundary to Inyo and Kern Counties. The coastal race is found in arid parts of westward-draining slopes from San Diego County northwest to Ventura County. It frequents desert succulent shrub, Joshua tree, and desert wash habitats. Historically, cactus wrens within coastal areas were found on the coastal slopes and lowlands of southern California in arid and semiarid regions with abundant cacti (Grinnell 1898, Grinnell and Miller 1944, Unitt 1984).

The range of the coastal cactus wren is very limited, extending from extreme northwestern Baja California (Valle de las Palmas) north through the coastal lowlands of San Diego County and into southern Orange County (Rea and Weaver 1990). Its northern limit is uncertain because of the lack of specimens from northwestern San Diego County and much of Orange County. Differences in song (slower frequency and lower pitch in *sandiegensis*) and visual assessments of birds in the field (Shuford and Gardali 2008) suggest that southern Orange County is the northern limit of the subspecies' range. The birds at Starr Ranch Sanctuary (Orange County) appear closer to *sandiegensis*, while those at Caspers Regional Park appear more intermediate, with features of *sandiegensis* being frequent. Specimens from extreme northern Orange County are *anthonyi* (Shuford and Gardali 2008). Most of the range of *sandiegensis* south of the Mexican border has been covered by the city of Tijuana, so the long-term viability of the population in Baja California is doubtful.

Within the Plan Area, San Diego cactus wrens are distributed in the following core habitat areas and linkages; Santa Ana Mountains, Northern Foothills, Southern Foothills (this area contains a core population for this species that supports at least 50% of the remaining San Diego cactus wren population), San Joaquin Hills (this area contains a core population for this species), Chino Hills (this area contains a core population for this species), West Coyote Hills (this area contains a core population for this species), and the Trabuco Creek Linkage (CBI 2009). With the exception of the North Coast and Coal Canyon, modeled habitat for this species is found within all core areas and linkages. Recent occurrence data since 2000 shows large concentrations in the San Joaquin Hills west of Laguna Canyon Road and along Highway 1, in the Northern Foothills near Foothill Ranch, and in the Southern Foothills around Bell Canyon (Figure C3-8, Cactus Wren Modeled Habitat). Towards the southern portion of the Plan Area cactus wren are widely distributed in the San Juan Creek and San Mateo Creek watersheds (USFWS 2007). This area of continuous habitat connectivity is important, as it provides a linkage between the populations on Marine Corps Base Camp Pendleton and conserved populations in the Central/Coastal portions of the Natural Reserve of Orange County. The San Diego Management and Monitoring Program (SDMMP) developed a cactus wren habitat suitability model for southern California (SDMMP 2015) that identifies potential suitable habitat within the Plan Area based on variables of maximum July temperature, elevation, northness and eastness, % coastal sage scrub, and prickly pear and California sagebrush habitat suitability predictions. The results of this model were similar to the cactus wren model used in the Plan (see Appendix C.3).

This species occurs on protected lands in many of the core habitat areas. However, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009); Santa Ana Mountains (Priority Conservation areas A and B), Northern Foothills (Priority Conservation area C), Southern Foothills (Conservation areas A–D), San Joaquin Hills (Priority Conservation area A), Chino Hills (Priority Conservation area A), and West Coyote Hills (Priority Conservation areas A–C).

Population Trends

Because of its restriction to stands of chollas and prickly pears, the San Diego cactus wren has always had a rather patchy range (Bancroft 1923). Lack of detailed historical information on birds in

Orange County prevents a definite statement on the cactus wren's past status there. Grinnell and Miller (1944) commented that "range on coastal slope of southern California now much restricted as compared with condition in 1880s and 1890s, owing to great reduction of requisite habitat."

Numbers of Cactus Wrens may be larger in Orange County than in San Diego County. Mock (1993) estimated 1,200–1,600 individuals in Orange County, though a large fraction of these may be genetically closer to *C. b. anthonyi* than to *sandiegensis*. Gallagher (1997) mapped the cactus wren as occurring in 44 of 110 atlas blocks (5 kilometers by 5 kilometers) in Orange County and listed 10 additional poorly covered blocks where the species could have been missed by the Orange County bird atlas effort. Only 10 of these 54 blocks, however, coincide with locations mapped as *sandiegensis* by Rea and Weaver (1990) (Shuford and Gardali 2008).

Recent (i.e., 2012) monitoring efforts conducted in the Natural Reserve of Orange County estimated 115 territories (230 adults) in the Central Reserve and 39 territories (80 adults) in the Coastal Reserve (Kamada and Mitrovich 2014). These monitoring efforts also determined that there has been effective reproduction in both populations, with 78 to 93.5 percent of pairs successfully producing offspring, and an average number of fledglings per breeding pair of 2.7±0.5 (Preston and Kamada 2012). Additional studies with these populations determined that the Central Orange County genetic cluster is the most robust and may play a key role in maintaining and restoring the genetic connectivity among the surrounding populations (Barr et al. 2013, 2015). Recent translocation efforts between the two populations have resulted in successful breeding (Kamada and Mitrovitch 2015).

Threats to the Species and Other Conservation Issues

Continued threats to the cactus wren include habitat loss and fragmentation from urbanization and agricultural development. For example, the Foothill Transportation Corridor in southern Orange County cut through one of the largest known populations and eliminated occupied habitat (Shuford and Gardali 2008).

Because of their need for large stands of tall cactus this species is especially vulnerable to fire—the chief limiting factor in the distribution of cacti in southern California (Rea and Weaver 1990, Benson 1969). Intense fires may kill cactus plants and eliminate habitat for the cactus wren. Fire history plays a large role in the fluctuation of cactus wren populations due to the slow growth and regrowth of the cactus patches after burn events (Mitrovitch and Hamilton 2007, Leatherman 2009, Barr et al. 2015). In addition to fire, invasive plant competition, grazing, weather patterns, and other natural and human-influenced disturbances, the re-establishment of cactus patches essential to this species may be reduced or prevented. An increasing pattern of habitat fragmentation and isolated populations also diminish the dispersal rates and success of the cactus wren and reduce the overall viability of the species (Mock 1993). The recommendations for protecting the cactus wren include protection and maintenance of large blocks of coastal sage scrub through fire suppression (Rea and Weaver 1990). In addition to restoring connectivity between populations, increasing and enhancing available habitat can increase local population sizes, making them less susceptible to population fluctuations, as well as building genetic diversity over time.

Literature Cited

Anderson, A. H., and A. Anderson. 1957. Life history of the cactus wren. Part I: Winter and pre-nesting behavior. *Condor* 59:274–296.

———. 1960. Life history of the cactus wren. Part III: The nesting cycle. *Condor* 62:351–369.

———. 1963. Life history of the cactus wren. Part IV: Competition and survival. *Condor* 65:29–43.

———. 1973. *The Cactus Wren*. Tucson, AZ: University of Arizona Press.Bancroft, G. 1923. Some geographic notes on the Cactus Wren. *Condor* 25:165–168.

Barr, K. R., A. G. Vandergast, and B. E. Kus. 2013. *Genetic Structure in the Cactus Wren in Coastal Southern California*. U.S. Geological Survey Report prepared for California Department of Fish and Wildlife.

Barr, K. R., B. E. Kus, K. L. Preston, S. Howell, E. Perkins, and A. G. Vandergast. 2015. Habitat fragmentation in coastal southern California disrupts genetic connectivity in the cactus wren (*Campylorhynchus brunneicapillus*). *Molecular Ecology* 24:2349–2363.

Benson, L. 1969. *The Native Cacti of California*. Stanford, CA: Stanford University Press.

Bent, A. C. 1968. Life histories of North American Nuthatches, Wrens, Thrashers, and their allies. *U.S. National Museum Bulletin* 195. Washington, D.C.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Gallagher, S. R. (ed.). 1997. *Atlas of Breeding Birds, Orange County, California*. Irvine, CA: Sea and Sage Audubon Press.

Grinnell, J. 1898. *Birds of the Pacific Slope of Los Angeles County*.

Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. *Pacific Coast Avifauna* 27.

Hensley, M. M. 1959. Notes on the nesting of selected species of birds of the Sonoran Desert. *Wilson Bulletin* 71:86–92.

Kamada, D., and M. J. Mitrovich. 2014. *Coastal Cactus Wren Survey and Monitoring for Post-Translocation and Arthropod Foraging Studies in 2013*. Prepared for California Department of Fish and Wildlife.

———. 2015. *Nature Reserve of Orange County: Coastal Cactus Wren Survey of Translocation Sites and Habitat Restoration Areas in 2014*. Prepared for California Department of Fish and Wildlife.

Leatherman BioConsulting. 2009. *Central Reserve CACW (*Campylorhynchus brunneicapillus*) Habitat Assessment and Survey 2008*. Prepared for Nature Reserve of Orange County.

Mitrovich, M.J. and Hamilton, R.A. 2007. *Status of the CACW (*Campylorhynchus brunneicapillus*) Within the Coastal Subregion of Orange County, California*. Prepared for Nature Reserve of Orange County.

Mock, P. J. 1993. *Population Viability Analysis for the Coastal Cactus Wren within the MSCP Study Area*. Prepared for Clean Water Program, City of San Diego. Prepared by Ogden Environmental and Energy Services Company, San Diego, CA.

Preston, K., and D. Kamada. 2012. *Nature Reserve of Orange County: Monitoring Coastal Cactus Wren Reproduction, Dispersal and Survival in 2011*. Prepared for California Department of Fish and Wildlife.

Proudfoot, G. A., D. A. Sherry, and S. Johnson. 2000. Cactus wren (*Campylorhynchus brunneicapillus*) No. 558. In A. Poole and F. Gill (eds.), *The Birds of North America*. Cornell Laboratory of Ornithology, New York, and The Academy of Natural Sciences, Washington D.C.

Rea, A. M., and K. L. Weaver, 1990. The taxonomy, distribution, and status of coastal California cactus wrens. *Western Birds* 21:81–126.

Ricklefs, R. E., and F. R. Hainsworth. 1968. Temperature dependent behavior of the cactus wren. *Ecology* 49:227–233.

San Diego Management and Monitoring Program (SDMMP). 2015. *Coastal Cactus Wren Habitat Suitability Model, Appendix C of South San Diego County Coastal Cactus Wren Habitat Conservation and Management Plan*. June 18. Prepared for San Diego Association of Governments, San Diego, CA.

Shuford. W. D., and T. Gardali. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. *Studies of Western Birds 1: Western Field Ornithologists*, Camarillo, CA, and California Department of Fish and Game, Sacramento, CA.

Terres, J. K. 1980. *The Audubon Society Encyclopedia of North American Birds*. New York, NY: Alfred A. Knopf.

Unitt, P. 1984. *The Birds of San Diego County*. San Diego, CA: San Diego Society of Natural History.

———. 2004. *San Diego County Bird Atlas*. Vista, CA: Sunbelt Publications.

U.S. Fish and Wildlife Service (USFWS). 2007. Biological Opinion for the Southern Orange Habitat Conservation Plan, Orange County, California. Carlsbad, CA: U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office.

Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White (eds.). 1990. *California's Wildlife*. *Volume 2. Birds.* State of California, Department of Fish and Game. Sacramento, CA.

Coastal California Gnatcatcher

Polioptila californica californica

Legal Status:

Federal: Threatened

State: DFW Species of Special Concern

Photo credit: K. Fischer

Recovery Plan: No

Species Description and Life History

The coastal California gnatcatcher (*Polioptila californica californica*) is the northern subspecies of a small gray, slender songbird, with a predominantly black tail below. There is a small amount of sexual dimorphism in this species. Males are slightly larger and display a black cap during the breeding season (Pyle and Unitt 1998). California gnatcatcher was originally described by Brewster (1881), but later considered conspecific with the black-tailed gnatcatcher (*Polioptila melanura*) by Grinnell (1926). Atwood (1980, 1988) concluded that the species was distinct from *P. melanura*, based on differences in ecology and behavior, and this was adopted by the American Ornithologists' Union Committee on Classification and Nomenclature (American Ornithologists Union 1957, 1989). Recent mitochondrial DNA sequencing confirmed the species-level recognition of the California gnatcatcher, which was calculated to differ from *P. melanura* by 4.0% (Zink and Blackwell 1998). Recent genetic work conducted across their known range determined that the population forms a single genetic cluster (i.e., genetic population), with four statistically distinguishable populations: (1) Palos Verdes, western Los Angeles County; (2) Coyote Hills, northern Los Angeles County; (3) Ventura County; and (4) all other individuals from the eastern Los Angeles Basin through southern San Diego County, including all birds sampled in San Bernardino, Orange and Riverside Counties. (Vandergast et al. 2014). This work indicates that gnatcatchers are moving between the majority of the patches of suitable habitat forming a linked metapopulation over the southern California range.

The breeding season for the coastal California gnatcatcher (gnatcatcher) extends from February through August with the peak months being March through June. During the nesting season territories become smaller and are more heavily defended. Both sexes participate in nest building and incubation of the eggs. Typical clutch size is 3 to 5 eggs, and eggs require approximately 14 days of incubation before the chicks hatch (Atwood 1990). As many as seven brood attempts may be made in a season, but no more than three broods have been recorded as successfully reared. In a 3-year study of a population in Rancho San Diego, productivity ranged from 1.61 to 4.3 fledglings per pair (Ogden Environmental and Energy Services 1992). Once hatched the young require another 9 to 15 days to fledge, and family groups may remain intact for 3 to 5 weeks after fledging.

Natal dispersal occurs in late summer and early fall. Juveniles typically move less than 3 kilometers; their longest documented dispersal distance is 20 kilometers (Unitt 2004). Dispersal can occur across both native and nonnative landscapes including major highways (Fischer pers. comm.). During the non-breeding season territories are expanded and incorporate a wider range of vegetation types. In one study, the average territory size for gnatcatchers was 8.42 acres during the breeding season, but it can expand to 60 acres during the non-breeding season (Braden and Powell 1994). Ogden (1993) and Preston et al. (1998) identified a pattern of increasing territory size with increasing distance from the coast and hypothesized that larger inland territories were a result of lower overall resource density. Additional studies have confirmed these observations, demonstrating territory sizes closer to the coast as small as 0.5 acre with inland locations as large as 22 acres (Mock 2004).

Habitat Requirements and Ecology

The coastal California gnatcatcher is a local, uncommon, obligate resident of the maritime and coastal climate zones of southern California, primarily below about 500 meters (1,600 feet), with records extending rarely to about 1,000 meters. These gnatcatchers are dependent upon, and occur in or near, sage scrub vegetation, which is a broad category that includes the following plant communities as classified by Holland (1986): Venturan coastal sage scrub, Diegan coastal sage scrub, maritime succulent scrub, Riversidean sage scrub, Riversidean alluvial fan sage scrub, southern coastal bluff scrub, and coastal sage-chaparral scrub. Coastal sage scrub is composed of relatively low-growing, dry-season deciduous and succulent plants. Characteristic plants of this community include California sagebrush (*Artemisia californica*), various species of sage (*Salvia* spp.), California buckwheat (*Eriogonum fasciculatum*), lemonadeberry (*Rhus integrifolia*), bush-sunflowers (*Encelia californica* and *E. farinosa*), and coastal cactuses (mainly *Opuntia* spp.). In a review of specimen data, 99% of all gnatcatcher records occurred at or below an elevation of 984 feet (Atwood 1990).

Activity budget data indicate that gnatcatchers are most active and vocal during the morning. A lull in activity usually occurs during mid-day, and activity increases again late in the day (Mock et al. 1990).

The gnatcatcher is primarily an insectivorous species. They glean prey from foliage, primarily while moving slowly and methodically through the brush. The diet of gnatcatchers, based on fecal analyses, includes leaf- and plant hoppers and spiders as dominant prey, with true bugs, wasps, bees, and ants as minor components of their diet (Burger et al. 1999).

Species Distribution and Population Trends

Distribution

Currently, the subspecies is known to occur on coastal slopes of southern California, ranging from southern Ventura County southward through Palos Verdes Peninsula in Los Angeles County through Orange, Riverside, San Bernardino, and San Diego Counties into Baja California to El Rosario, Mexico, at about 30 degrees north latitude (Atwood 1991). At the time of federal listing in 1993, the USFWS estimated that approximately 2,562 pairs of gnatcatchers remained in the United States. Of these, 30 pairs occurred in Los Angeles County, 757 pairs occurred in Orange County, 261 pairs occurred in Riverside County, and 1,514 pairs occurred in San Diego County. Since listing, the distribution of California gnatcatcher south of Ventura County has remained consistent, with many of the largest populations protected through conservation and management efforts such as regional NCCP/HCP reserves (USFWS 2007). In addition to the conservation efforts that have occurred on these lands the interconnectedness between many of the populations have been or will be protected through existing or planned linkages and corridors. Within the Plan Area coastal California gnatcatchers are distributed in the following core habitat areas and linkages: Santa Ana Mountains (this area is part of the designated critical habitat for this species), Northern Foothills (this area contains a core population for this species), Southern Foothills (this area contains a core population for this species and is part of the designated critical habitat for this species), San Joaquin Hills (this area contains a core population for this species and is part of the designated critical habitat for this species), Chino Hills (this area contains a core population for this species and is part of the designated critical habitat for this species), West Coyote Hills (this area contains a core population for this species and is part of the designated critical habitat for this species), Upper Santa Ana River (this area is part of the designated critical habitat for this species), Bolsa Chica, Santa Ana River Mouth, Upper Newport Bay, Irvine Linkage, and the Trabuco Creek and San Juan Creek Linkages (these areas are part of the designated critical habitat for this species). Modeled habitat for this species is found within all core areas and linkages with the exception of the North Coast and Irvine Linkage. Occurrence data since 2000 show large concentrations in all of the core habitats and linkages except for Seal Beach and the Irvine Linkage (Figure C3-9, Coastal California Gnatcatcher Modeled Habitat). Surveys conducted from 1999–2004 for the Nature Reserve of Orange County found significant variation in the number of occupied territories, with the lowest numbers observed in 2004 (Hamilton 2004). More recent surveys conducted within the Plan Area found the distribution to be highly skewed towards the Coastal Reserve where 24 of the 34 occupied plots were located (Leatherman BioConsulting 2012). This distribution is most likely the result of the 2007 fires that burned around 75% of the inland, Central Reserve areas.

This species occurs on protected lands in many of these core habitat areas; however, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Santa Ana Mountains (Priority Conservation areas A and B), Northern Foothills (Priority Conservation areas A and C), Southern Foothills (Priority Conservation areas A and B), San Joaquin Hills (Priority Conservation areas A–C), Chino Hills (Priority Conservation areas A–C), West Coyote Hills (Priority Conservation areas A–C), Upper Santa Ana River (Priority Conservation area A), Bolsa Chica (Priority Conservation area J), Santa Ana River Mouth (Priority Conservation areas A–D), Upper Newport Bay (Priority Conservation area F), and the Trabuco Creek and San Juan Creek Linkages (Priority Conservation areas A–E, and G).

Population Trends

The gnatcatcher was considered locally common in the 1930s, but by the 1960s this subspecies had declined substantially in the United States owing to widespread destruction of its habitat (Atwood 1990). The overall historic range is similar to that today, extending from southern Ventura County southward into Baja California, Mexico, to approximately 30 degrees north latitude near El Rosario (Atwood 1990). A detailed analysis of elevational limits associated with gnatcatcher locality records reveals that a significant portion, 65 to 70% of the historic range of this subspecies, may have been located in southern California rather than Baja California (65 FR 5945; February 7, 2000).

Threats to the Species and Other Conservation Issues

The primary threat to gnatcatchers is the loss and degradation of coastal sage scrub habitat. Habitat loss is exacerbated by fragmentation, including edge effects, environmental variability, and the risks of small population size (Wilcox and Murphy 1985, Soule et al. 1988, ERCE 1991, Salata 1991, Ogden 1992). In addition brown-headed cowbird brood parasitism has increased in frequency in California gnatcatchers (Unitt 1984, Atwood 1990, Bontrager 1991, Salata 1991). Impacts on gnatcatchers from cowbirds are most substantial near favored cowbird habitat, such as riparian areas, golf courses, and stables (Atwood 1990, Monroe et al. 1992). Altered fire cycles can affect gnatcatcher habitat (Rea and Weaver 1990, ERCE 1991, Tutton 1991). On Camp Pendleton, where fire frequency has been accelerated, Tutton found 81% of gnatcatcher localities to be areas that had not burned in at least 16 years, although gnatcatchers are known to occasionally occupy sage scrub in as little as 4 to 5 years after fires. Recent studies have shown that California gnatcatchers are more likely to colonize burned areas adjacent to high and very high quality habitat versus moderate to low quality (Winchell and Doherty 2014).

Literature Cited

American Ornithologists' Union. 1957. *Checklist of North American Birds.* 5th edition. Washington, D.C.: American Ornithologists' Union.

———. 1989. Thirty-seventh supplement to the American Ornithologists' Union Check-list of North American birds. *Auk* 106:532–538.

Atwood, J. L. 1980. The United States distribution of the California black-tailed gnatcatcher. *Western Birds* 11:65–78.

———. 1988. Speciation and geographic variation in the black-tailed gnatcatchers. *Ornithological Monographs* 42:74.

———. 1990. *Status review of the California gnatcatcher (*Polioptila californica*)*. Unpubl. tech. rep., Manomet Bird Observatory, Manomet, MA.

———. 1991. Subspecies limits and geographic patterns of morphological variation in California gnatcatchers (*Polioptila californica*). *Bulletin Southern California Academy of Sciences* 90(3):118–133.

Bontrager, D. R. 1991. *Habitat Requirements, Home Range and Breeding Biology of the California Gnatcatcher (*Polioptila californica*) in South Orange County, California*. Prepared for Santa Margarita Company, Rancho Santa Margarita, CA.

Braden, G. and S. Powell. 1994. *Draft Report: Nesting biology of the Coastal California Gnatcatcher (*Polioptila californica californica*) in Western Riverside County*. Prepared for the Southwestern Riverside Multiple Species Reserve Management Committee.

Brewster, W. 1881. On the affinities of certain Polioptilae, with a description of a new species. *Bulletin of the Nuttall Ornithological Club* 6:101–107.

Burger, J. C., M. A. Patten, J. T. Rotenberry, and R. A. Redak. 1999. Foraging ecology of the California gnatcatcher deduced from fecal samples. *Oecologia* (Berlin) 120:304–310.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

ERC Environmental and Energy Services Co. (ERCE). 1991. *Focused California Gnatcatcher Resource Study for the City of Poway*. Prepared for City of Poway Planning Department, Poway, CA.

Grinnell, J. 1926. A critical inspection of the gnatcatchers of the Californias. *Proceedings of the California Academy of Sciences*, 4th ser., 15:493–500.

Hamilton, R. 2004. Target Bird Monitoring Study Nature Reserve of Orange County 2004. Report prepared for the Nature Reserve of Orange County.Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA.

Leatherman BioConsulting. 2012. *Central and Coastal Reserve California Gnatcatcher Study 2011*. Prepared for Nature Reserve of Orange County.

Mock, P. 2004. California Gnatcatcher (*Polioptila californica*). In J. Lovio (ed.), *The Coastal Scrub and Chaparral Bird Conservation Plan: a Strategy for Protecting and Managing Coastal Scrub and Chaparral Habitats and Associated Birds in California*. Stinson Beach, CA: PRBO Conservation Science.

Mock, P. J., B. L. Jones, and J. Konecny. 1990. *California Gnatcatcher Survey Guidelines*. ERC Environmental and Energy Services Company.

Monroe, J., W. D. Wagner, J. Carr, and F. Smith. 1992. *Multi-Species Habitat Conservation Plan for Southwestern Riverside County, California*. Riverside Habitat Conservation Agency and Metropolitan Water District of Southern California.

Ogden Environmental and Energy Services. 1992. *Baldwin Otay Ranch Wildlife Corridor Studies*. Prepared for the Otay Ranch Project Team, San Diego, CA.

———. 1993. *Population Viability Analysis for the California Gnatcatcher within the MSCP Study Area*. Prepared for the Clean Water Program, City of San Diego. February.

Preston, K. L., M. A. Grishaver, and P. J. Mock. 1998. California gnatcatcher vocalization behavior. *Western Birds* 29:258–268.

Pyle, P., and P. Unitt. 1998. Molt and plumage variation by age and sex in the California and Black-tailed gnatcatchers. *Western Birds* 29:280–289.

Rea, A. M., and K. L. Weaver. 1990. The taxonomy, distribution and status of the coastal California cactus wren. *Western Birds* 21:81–126.

Salata, L. 1991. *A Status Review of the California Gnatcatcher*. U. S. Fish and Wildlife Service. Soule, M. E., D. T. Boulger, A. C. Alberts, J. Wright, M. Sorice, and S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral requiring birds in urban habitat islands. *Conservation Biology* 2:75–92.

Tutton, J. 1991. *A survey of the California gnatcatcher and cactus wren on Camp Pendleton, San Diego County, California*. November. Unpublished report, prepared for the U.S. Marine Corps, Environmental and Natural Resources Management Office, Camp Pendleton, CA, by the U.S. Fish and Wildlife Service, Southern California Field Station Laguna Niguel Office.

Unitt, P. 1984. *The Birds of San Diego County*. San Diego, CA: San Diego Society of Natural History.

———. 2004. *San Diego County Bird Atlas*. Vista, CA: Sunbelt Publications.

U.S. Fish and Wildlife Service (USFWS). 2007. Biological Opinion for the Southern Orange Habitat Conservation Plan, Orange County, California. Carlsbad, CA: U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office.

Vandergast, A. G, B. E. Kus, K. R. Barr, and K. L. Preston. 2014. *Genetic Structure in the California Gnatcatcher in Coastal Southern California and Implications for Monitoring and Management*. U.S. Geological Survey Data Summary Report. Prepared for California Department of Fish and Wildlife.

Wilcox, B. and D. Murphy. 1985. Conservation strategy: the effects of fragmentation on extinction. *The American Naturalist* 125:8789–997.

Winchell, C. S., and P. F. Doherty. 2014. Effects of habitat quality and wildfire on occupancy dynamics of Coastal California Gnatcatcher (*Polioptila californica californica*). *The Condor* 116(4):538–545.

Zink, R. M., and R. C. Blackwell. 1998. Molecular systematics and biogeography of arid land gnatcatchers (Genus Polioptila) and evidence supporting species status of the California gnatcatcher (*Polioptila californica*). *Molecular Phylogenetics and Evolution* 9:26–32.

Personal Communications

Fischer, Kylie, Senior Biologist with ICF. 2008—regarding California gnatcatcher movement in southern California.

Least Bell's Vireo

Vireo bellii pusillus

Legal Status:

Federal: Endangered

State: Endangered

Photo credit: K. Fischer

Recovery Plan: No

Species Description and Life History

The least Bell's vireo (*Vireo bellii pusillus*) is a small (4.75-inch length, 7-inch wingspan), plain gray vireo with faint white spectacles and eyeline and a single white wingbar. The least Bell's vireo is one of four subspecies of Bell's vireo, in the avian family Vireonidae. The four subspecies have been recognized by the American Ornithologists Union (1957) based on morphological differences and geographic separation (Hamilton 1962).

The breeding season for this migratory species is mid-March through August (USFWS 1986). Males arrive first and establish breeding territories prior to the arrival of females. Males often return to the same site year after year (Greaves 1987). Nest locations are typically near openings or edges of dense riparian vegetation and within 1 meter (3.3 feet) of the ground in willows (*Salix* spp.), wild rose (*Rosa californica*), mule fat (*Baccharis salicifolia*), and other understory vegetation (Franzreb 1989). The most critical structural component to least Bell's vireo breeding habitat is a dense shrub layer at 2 to 10 feet above the ground (Goldwasser 1981, Franzreb 1989). Soon after the nest is built the female will lay 2 to 5 eggs. Incubation is about 14 days and the young fledge about 12 to 14 days after hatching (Zeiner et al. 1990). This species will usually have one clutch per season, but instances of four or five attempts in a single season have been reported (Franzreb 1989, USFWS 1998). Upon fledging the young remain under parental care for several weeks before dispersing from the parental breeding territory (USFWS 1998).

Departure to their winter range begins in early fall, taking place from mid-August to late September (Unitt 2004). The species as a whole winters from southern Baja and southern Sonora south along the west coast of Mexico and Central America to Honduras and northern Nicaragua. They have also been reported from the eastern coast of Central America from Veracruz south to Honduras (Brown 1993).

Habitat Requirements and Ecology

Least Bell's vireo is a riparian species typically associated with southern willow scrub, cottonwood forest, mule fat scrub, sycamore alluvial woodland, coast live oak riparian forest, arroyo willow riparian forest, and California blackberry (*Rubus ursinus*), or mesquite (*Prosopis* spp.) in desert localities. Some nesting occurs in other natural communities where immediately adjacent to suitable riparian vegetation, such as chaparral. They prefer areas with dense cover within 2 meters above the ground and a dense, stratified canopy (USFWS 1986). Their range is limited to the vicinity of watercourses, mostly below about 457 meters (1,500 feet) elevation, though breeding records extend up to about 1,250 meters (4,100 feet) (USFWS 1986, Small 1994).

Typical of songbirds, the least Bell's vireo exhibits year-round diurnal activity and is known to be a nocturnal migrant (Brown 1993). They typically forage in riparian habitat, but will also use adjacent scrub, chaparral, and woodland habitat. These adjacent upland foraging habitats become relatively more important late in the breeding season. They are known to feed primarily on insects and spiders (Chapin 1925, Bent 1950, Terres 1980).

Species Distribution and Population Trends

Distribution

Least Bell's vireo formerly was a common and widespread summer resident below about 600 meters (2,000 feet) throughout the Sacramento and San Joaquin valleys and in the coastal valleys and foothills from Santa Clara County south into northern Mexico. Least Bell's vireo also was present east of the Sierra Nevada below about 1,200 meters (4,000 feet) in the Owens and Benton valleys and along the Mojave River and other streams of the western to central deserts (Zeiner et al. 1990, Grinnell and Miller 1944).

Within the Plan Area least Bell's vireo is distributed in the following core habitat areas and linkages: Santa Ana Mountains, Northern Foothills, Southern Foothills, San Joaquin Hills, Chino Hills, West Coyote Hills, upper Newport Bay, Irvine Linkage, Trabuco Creek and San Juan Creek Linkages, and upper Santa Ana River (this area contains a core population for this species downstream from Prado Basin). The latter area supports the largest intact patch of riparian habitat south of the Kern River Preserve and the second largest population of least Bell's vireo (National Audubon Society 2009).

Within the Plan Area it is likely that any drainage with suitable habitat will support least Bell's vireo (Galvin pers. comm.). To date, a current Plan Area-wide population assessment has not been conducted, although occurrences are known from San Diego Creek, Rattlesnake Reservoir, Siphon Reservoir, Irvine Lake, Peter's Canyon, Trabuco Creek, San Joaquin Marsh, Sand Canyon, Aliso Creek, San Juan Creek, Gobemadora Creek, lower Arroyo Trabuco, Chiquita Creek, lower Christianitos Creek, and in Prima Deshecha (Galvin pers. comm.; USFWS 2007). From 2000 to 2006 27–34 least Bell's vireo pairs and 3–5 unpaired males were documented within the southern portion of the Plan Area (USFWS 2007). More recent data found 29 territories in Irvine Regional Park (SAWA 2012), 46 territories in the Santiago Creek subwatershed (SAWA 2012), 65 territories in Santa Ana River (SAWA 2012), 25 territories adjacent to Rattlesnake Reservoir (Harmsworth 2014a, 2014b), and 24 territories in San Diego Creek (Harmsworth 2014b).

Modeled habitat for this species is found within all core areas and linkages. Recent occurrence data since 2000 shows large concentrations in the upper Santa Ana River/Coal Canyon Linkage, Carbon Canyon in Chino Hills, Weir Canyon and Peters Canyon in the Northern Foothills, Upper Newport Bay, William Mason Regional Park, San Diego Creek, Aliso Woods Regional Park, Trabuco Creek, San Juan Creek, and the Southern Foothills (Figure C3-10, Least Bell's Vireo Modeled Habitat).

This subspecies occurs on protected lands in many of these core habitat areas; however, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Southern Foothills (Priority Conservation Area B), San Joaquin Hills (Priority Conservation Area B), Chino Hills (Priority Conservation Areas A and C), Upper Santa Ana River (Priority Conservation Area B), and Trabuco Creek and San Juan Creek Linkages (Priority Conservation Areas D and G).

Population Trends

The increase of, and parasitism by, the brown headed cowbird combined with clearing of riparian vegetation decimated the subspecies' populations. By the early 1980s the subspecies total number within the United States was estimated at 300 pairs (Unitt 2004). The subspecies was listed as endangered by both the CDFW and the USFWS in 1980 and 1986, respectively. Numbers increased from 300 pairs in 1986 to 1,500 pairs in 1996, primarily due to management of cowbird populations (Kus 1997).

Since its listing in 1986 the vireo population in the U.S. has increased more than 10 times, from an estimated 291 to 2,968 known territories (USFWS 2007). The population has shown steady growth over each of the 5-year periods with a slowdown in growth over the last 10 years. The largest populations and the populations that have seen the greatest growth are in San Diego (along the Santa Margarita River on Marine Corps Base Camp Pendleton) and Riverside Counties, though significant increases have also been seen in Orange, Ventura, San Bernardino, and Los Angeles counties (USFWS 2007). These trends indicate that individuals are dispersing to conserved habitat patches and colonizing newly restored suitable habitat patches in the Plan Area.

Threats to the Species and Other Conservation Issues

Least Bell's vireo have experienced habitat losses throughout their historic range, resulting in small fragmented, widely dispersed subpopulations. As their preferred riparian habitat gets fragmented and more exposed their susceptibility to cowbird parasitism increases. In addition to nest parasitism by brown headed cowbirds, least Bell's vireo nests are known to be predated by western scrub jay (*Aphelocoma californica*), Virginia opossum (*Didelphis virginiana*), gopher snake (*Pituophis catenifer*), Argentine ant (*Linepithema humile*), and domestic cats (*Felis domesticus*) (Franzreb 1989). Well-documented stressors of vireo habitat quality include: (1) impoundments of water and diverting water to canals and agriculture thereby altering water supplies to riparian systems; (2) flood control projects and river channelization; (3) overgrazing; (4) exposure to road noise and pollutants; and (5) invasion by nonnative plants such as giant reed (*Arundo donax*), tamarisk (*Tamarix* spp.), and pampas grass (*Cortaderia selloana*) (Brown 1993, USFWS 1998).

Literature Cited

Printed References

American Ornithologists' Union. 1957. *Checklist of North American Birds*. 5th edition. Baltimore, MD: Lord Baltimore Press.

Bent, A. C. 1950. Life Histories of North American Wagtails, Shrikes, Vireos, and their Allies. U*.S. National History Museum Bulletin* 197.

Brown, B. T. 1993. Bell's Vireo. In A. Poole, P. Stettenheim, and F. Gill, (eds.), *The Birds of North America*, No. 34. Philadelphia: The Academy of Natural Sciences; Washington D.C.: The American Ornithologists' Union.

Chapin, E. A. 1925. Food Habits of the Vireos. *Bulletin 1355, U.S. Department of Agriculture*, Washington, D.C.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Franzreb, K. E. 1989. *Ecology and Conservation of the Endangered Least Bell's Vireo. Biological Report* 89(1). U.S. Dept. Of the Interior, USFWS, Sacramento, CA.

Goldwasser, S. 1981. *Habitat Requirements of the Least Bell's Vireo*. Final Report. California Department of Fish and Game, Job IV-38.1.

Greaves, J. M. 1987. Nest-site tenacity of Least Bell's Vireos. *Western Birds* 18:50-54.

Grinnell, J., and A. H. Miller. 1944. *The Distribution of the Birds of California*. Pacific Coast Avifauna Number 27. Reprinted by Artemisia Press, Lee Vining, CA, 1986.

Hamilton, T. 1962. Species Relationships and Adaptations for Sympatry in the Avian Genus Vireo. *Condor* 64:40–48.

Harmsworth Associates (Harmsworth). 2014a. Report on Least Bell's Vireo Protocol Surveys in Planning Area 6 2014. Prepared for The Irvine Company.

———. 2014b. Report on Bird Surveys in Planning Areas 18 and 39 2014. Prepared for The Irvine Company.

Kus, B. E. 1997. *Recovery of the endangered least Bell's vireo: where are we, and where should we go?* Abstract of paper presented at The Wildlife Society Western Section annual meeting, San Diego, CA. February.

National Audubon Society. 2009. Important bird areas in the U.S.: Santa Ana River Valley. Available: http://www.audubon.org/bird/iba.

Santa Ana Watershed Association (SAWA). 2012. Status and Management of the Least Bell's Vireo and Southwestern Willow Flycatcher in the Santa Ana River Watershed, 2012 and Summary Data by Site and Watershed-wide, 2000-2012. Prepared for Orange County Water District and U.S. Fish and Wildlife Service.

Small, A. 1994. *California Birds: Their Status and Distribution*. Ibis Publishing Company: Vista, CA.

Terres, J. K. 1980. *The Audubon Society Encyclopedia of North American Birds*. New York, NY: Alfred A. Knopf.

Unitt, P. 2004. San Diego County Bird Atlas. Vista, CA: Sunbelt Publications.

U.S. Fish and Wildlife Service (USFWS). 1986. Endangered and threatened wildlife and plants; determination of endangered status for the least Bell's vireo. Final Rule. *Federal Register* 51: 16474–16482.

———. 1998. Draft Recovery Plan for the Least Bell's Vireo (Vireo bellii pusillus). United States Fish and Wildlife Service, Region 1, Portland, OR.

———. 2006. Least Bell's Vireo (*Vireo bellii pusillus*) 5-Year Review Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California.

———. 2007. Biological Opinion for the Southern Orange Habitat Conservation Plan, Orange County, California. Carlsbad, CA: U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office.

Zeiner, D. C., W., F. Laudenslayer, Jr., K. E. Mayer, and M. White (eds.). 1990. *California's Wildlife. Volume 2. Birds*. State of California, Department of Fish and Game. Sacramento, California. 731 pp.

Personal Communications

Galvin, Paul. Vice President/Senior Biologist. Harmsworth and Associates. September 15, 2015—email to Christine Beck, California Department of Fish and Wildlife.

Terp, Jill. U.S. Fish and Wildlife Service. 2002—telephone calls regarding documented least Bell's vireo nest sites in 2001 in southern California.

Southwestern Willow Flycatcher
Empidonax traillii extimus

Legal Status:

Federal: Endangered

State: Endangered

Photo credit: Stephen Dowlan CalPhotos (permission pending)

Recovery Plan: Yes

Species Description and Life History

The southwestern willow flycatcher (*Empidonax traillii extimus*) is one of the largest (5.75-inch length, 8.5-inch wingspan) flycatchers in its genus. This species is a drab brown color with a long, broad bill, a weak eye ring, and two drab, brownish wing-bars. The flycatcher's appearance is overall greenish or brownish gray above with a white throat that contrasts with a pale olive breast. There are four willow flycatcher subspecies, distinguished by primary song, subtle differences in color and morphology, and segregated breeding ranges, with the southwestern subspecies the most strongly distinguished among the four (Unitt 1987, Sedgwick 2001).

Males of this subspecies typically arrive in southern California from late April to mid-May and females arrive approximately 1 week later. Males establish breeding territories and begin pairing up with females 10 to 14 days after their spring arrival. Territory sizes range from 0.24 to 0.45 hectare (0.6 to 1.1 acre) and can be densely packed in suitable habitat; the documented maximum is six females and five males in 4.4 hectares (10.9 acres) (San Diego Natural History Museum 1995). Nest building is done by the female, begins within 1 week of pairing, and usually takes 3 to 8 days (Unitt 2004). In California, nests are often located in willows or oaks (Unitt 2004). In southern California they are known to breed in Owens Valley, the south fork of the Kern River, the Los Angeles Basin, the Santa Ynez River, the Prado Basin, and the Santa Margarita and San Luis Rey rivers (USFWS 2013). They typically have one clutch of 1 to 4 eggs per breeding season. After hatching, nestlings take 12 to 15 days to leave the nest and then another 26 to 30 days before they disperse from the parental territory (USFWS 1993, San Diego Natural History Museum 1995).

The migration routes and winter range of the southwestern willow flycatcher are not well understood. The species has been reported to sing and defend winter territories in Mexico and Central America. The southwestern willow flycatcher most likely winters in Mexico, Central America, and perhaps northern South America; however, habitats it uses in migration and on the wintering grounds are unknown (USFWS 1993).

Habitat Requirements and Ecology

Southwestern willow flycatchers use dense riparian habitat along streams and rivers with mature stands of willows, cottonwoods, oaks, or spring-fed boggy areas with willows or alders (Sedgwick and Knopf 1992). Suitable flycatcher habitat is most likely to develop in more extensive areas along low gradient streams with wide floodplains dominated by willows, although there are exceptions to this habitat characterization (e.g., occupied areas of San Luis Rey River in San Diego County are oak-dominated) (USFWS 2002). However, most apparently suitable areas are currently unoccupied, suggesting other limiting factors may be present. Suitable habitat is less likely to occur in steep, confined streams characteristic of narrow canyons (USFWS 2002).

The southwestern willow flycatcher is active throughout the day and will begin singing well before dawn (San Diego Natural History Museum 1995). They are insectivorous and forage within and adjacent to dense riparian vegetation, taking insects on the wing or gleaning from the foliage (USFWS 1993).

Species Distribution and Population Trends

Distribution

The currently known breeding range for the southwestern willow flycatcher within California includes Owens Valley, the south fork of the Kern River, the Los Angeles Basin (Unitt 1987, Zeiner et al. 1990), the Santa Ynez River near Buellton, the Prado Basin in Riverside County, the Santa Margarita and San Luis Rey Rivers in San Diego County, Middle Peak in the Cuyamaca Mountains, and near Imperial Beach (Small 1974). Breeding populations also exist in southern Nevada, Arizona, and New Mexico (Garrett and Dunn 1981).

Data from the 2001 breeding season identified a minimum of 986 flycatcher territories over its entire range (USFWS 2002, Rourke et al. 2004). This number increased to 1,299 territories over the entire species' range in 2007 (Durst et.al. 2008). The number of territories in California (194 territories) represents approximately 20 percent of the entire population (Kus et al. 2003). From 1999–2001, 90% of flycatcher population sites in California were found in five main populations (with populations ranging from 1 to 50 territories in size). The two largest are the Santa Margarita and San Luis Rey River populations (outside Plan Area) and likely serve as a population source for the smaller outlying areas in coastal southern California (Kus et al. 2003). Within the Plan Area southwestern willow flycatchers have occurred in the following core habitat areas: Southern Foothills and Upper Santa Ana River (the latter area contained a core population for this species). This species habitat occurs on protected lands in many of these core habitat areas. However, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Upper Santa Ana River (Priority Conservation Area B). Modeled habitat for this species is found within all core areas and linkages. Recent occurrence data since 2000 shows a concentration in the Southern Foothills between Wagon Wheel Canyon and San Juan Creek. Additional data from before 2000 shows them along the Santa Ana River in Coal Canyon and Laguna Canyon (Figure C3-11, Southwestern Willow Flycatcher Modeled Habitat).

Population Trends

Once considered a common summer resident throughout southern California, the southwestern willow flycatcher has declined precipitously throughout its range during the last 50 years (Unitt 1987). Previously found wherever extensive willow thickets occurred, this species now occupies riparian natural communities that are widely separated by vast expanses of relatively arid, unsuitable lands (Unitt 1987). Unlike those of some other riparian-nesting birds in southern California (e.g., least Bell's vireo, *Vireo bellii pusillus*), current population trends remain sharply downward.

The Plan Area overlaps with the southern portion of the Coastal California Recover Unit and the northern portion of the San Diego Management Unit. Recent studies identified 28 territories in the Santa Ana Management Unit of the Coastal California Recover Unit (Durst et al. 2008). Throughout the Coastal California Recover Unit 120 territories were present as of 2007, with only two sites found within the Plan Area. The most recently documented breeding pair within the Plan Area was found in the San Juan Creek-Canada Gobernadora location until 2009 (Howell pers. comm.). Although this was the last confirmed recording for breeding southwestern willow flycatcher in the Plan Area there is still a great deal of extant potential habitat present including San Diego Creek upstream of the I-405; Rattlesnake Reservoir, Siphon Reservoir, San Joaquin Marsh, Peter's Canyon, Irvine Park Dam, and Arroyo Trabuco Creek (Galvin pers. comm.).

Threats to the Species and Other Conservation Issues

According to the USFWS (1995) the major threats to the species can be summarized as follows: the current or future destruction, modification, or degradation of its habitat and nest parasitism by the brown-headed cowbird. Loss and modification of southwestern riparian communities have occurred due to urban and agricultural development, water diversion and impoundment, channelization, livestock grazing, off-road vehicle and other recreational uses, and resulting hydrological and water quality changes from these and other land uses. It is estimated that 91% of historic riparian communities have been lost in California. As part of the 2002 recovery plan, within Orange County cowbird trapping and habitat restoration and conservation efforts have been undertaken in the Prado Basin and contiguous reaches of the Santa Ana River since 1996.

Another likely factor in the loss and modification of southwestern willow flycatcher habitat in California is invasion by nonnative plants, especially tamarisk (*Tamarix sp.*) and arundo (*Arundo donax*). These species have spread rapidly along the watercourses in the southwestern region, typically at the expense of native riparian vegetation (USFWS 1995).

Literature Cited

Printed References

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Durst, S. L., M. K. Sogge, S. D. Stump, H. A. Walker, B. E. Kus, and S. J. Sferra. 2008. *Southwestern Willow Flycatcher Breeding Sites and Territory Summary—2007: U.S. Geological Survey Open-File Report 2008-1303*.

Garrett, K. and J. Dunn. 1981. *Birds of Southern California*, *Status and Distribution*. Los Angeles, CA: Los Angeles Audubon Society.

Kus, B., P. Beck, and J. Wells. 2003. Southwestern willow flycatcher populations in California: distribution, abundance, and potential for conservation. *Studies in Avian Biology* 26:12–19.

Rourke, J.W., B.E. Kus and M.J. Whitfield. 2004. *Distribution and Abundance of the Southwestern Willow Flycatcher at Selected Southern California Sites in 2001*. Prepared for the California Department of Fish and Game, Species Conservation and Recovery Program Report 2004-05, Sacramento, California.

San Diego Natural History Museum. 1995. *Empidonax extimus traillii* in California: The Willow Flycatcher Workshop. November 17.

Sedgwick, J. A. 2001. Geographic variation in the song of Willow Flycatchers. I. Differentiation between *Empidonax traillii adastus* and *E. t. extimus*. *Auk* 118:366–379.

Sedgwick, J, A., and F. L. Knopf. 1992. Describing willow flycatcher habitats: scale perspectives and gender differences. *Condor* 94:720–733.

Small, A. 1974. *The Birds of California*. New York, NY: Winchester Press.

Unitt, P. 1987. Empidonax traillii extimus; An endangered subspecies. *Western Birds* 18:137–162.

———. 2004. San Diego County Bird Atlas. Vista, CA: Sunbelt Publications.

U.S. Fish and Wildlife Service (USFWS). 1993. Endangered and Threatened Wildlife and Plants; Proposed Rule to List the Southwestern Willow Flycatcher as Endangered with Critical Habitat. *Federal Register* 58:39495–39519.

———. 1995. *Internal Biological Opinion on the Proposed Issuance of Recovery Permits to Take the Endangered Southwestern Willow Flycatcher*.

———. 2002. *Final Southwestern Willow Flycatcher Recovery Plan*. U.S. Fish and Wildlife Service, Albuquerque, NM.

———. 2013. Endangered and threatened wildlife and plants; designation of critical habitat for southwestern willow flycatcher. *Federal Register* 78: 343–534. .

Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White (eds.). 1990. *California's Wildlife*. *Volume 2. Birds.* State of California, Department of Fish and Game. Sacramento, CA.

Personal Communications

Galvin, Paul. Vice President/Senior Biologist. Harmsworth and Associates. April 21, 2016—email to Christine Beck, California Department of Fish and Wildlife.

Howell, Scarlett. Ecologist. U.S. Geological Survey. May 12, 2015—email to Christine Beck, California Department of Fish and Wildlife.

Bobcat

Lynx rufus

Legal Status:

Federal: None

State: None

Photo credit: Kailash Mozumder

Recovery Plan: None

Species Description and Life History

The bobcat (*Lynx rufus*) is a medium-sized member of the cat family and a permanent resident throughout most of California. It has a small head, heavy body, long legs, and large padded paws. Its fur is pale brown to reddish with black spots. The bobcat's sharp-pointed ears are tipped with dark tufts of hair. Placed in genus *Felis* by some authors, others (e.g., Jones et al. 1992, Wozencraft 1993, and Larivière and Walton 1997) include the bobcat in the genus *Lynx*. The latter is now widely accepted, and the bobcat is generally listed as *Lynx rufus* in current taxonomy sources.

Breeding typically begins in winter; however, females are known to go through multiple estrus cycles in a year. Dens are located in rock cavities, hollow logs, snags, or dense brush. The young are most typically born in spring, though they may be born any month of the year, with a usual litter size of three. The young start traveling alone after 6 months and permanently disperse before the next litter is born. Females become sexually mature in their first year and males in their second, though for males this is more dependent on body weight. In captivity bobcats have lived up to 32 years; however, average life expectancy in the wild is 10 to 14 years.

Bobcats are non-migratory and known to travel distances up to 6.2 miles in a 24-hour period (Larivière and Walton 1997). The longest dispersal efforts are made by newly independent young. For example, two young males dispersed 182 and 158 kilometers (Larivière and Walton 1997). This solitary, territorial species shows very little overlap among female territories, whereas male territories heavily overlap with those of other males and females. Scent marking is heavily used to delineate territories, reducing the need for actual contact, and fighting is rare.

A number of studies of movement patterns have been conducted within the Plan Area and adjacent lands (Riley et al. 2003, Lyren et al. 2006, Lyren et al. 2008a and 2008b, Ordenana et al. 2010, Ruell et al. 2012, Tracey et al. 2013, Alonso et al. 2014, Poessel et al. 2014). These studies have determined that bobcats in southern California are known to have home range sizes ranging from 0.50-5.17 square miles, with male bobcats having larger home ranges than females (0.80-5.17 square miles and 0.50-1.77 square miles, respectively).

Habitat Requirements and Ecology

Bobcats are most closely associated with rocky and brushy areas near springs or other perennial water sources, primarily in foothills comprised of chaparral habitats. Bobcats prefer areas with adequate cover in the form of rock cavities, snags, stumps, and dense brush (Zeiner et al. 1990), but they occur in any sizable area of relatively undisturbed scrub habitat (Montgomery pers. comm.). Habitat preferences of the bobcat strongly reflect prey abundance (Larivière and Walton 1997).

This species is active year round, being mostly nocturnal and crepuscular with some diurnal activity. Bobcats are opportunistic, solitary ambush predators with a majority of their diet consisting of rabbits and hares; however, they are known to eat squirrels, woodrats, kangaroo rats, mice, muskrats, young deer, birds, reptiles, fish, and insects (Larivière and Walton 1997). They may also consume substantial amounts of vegetation, mostly fruits and some grass (Provost et al. 1973, Fritts and Sealander 1978).

Species Distribution and Population Trends

Distribution

Bobcats occur throughout California, making use of nearly all vegetation types and successional stages. Optimal habitat includes all stages of chaparral and low- to mid-elevation forests dominated by conifers, oak, riparian vegetation, or junipers. The availability of water may limit their distribution in more arid areas.

Within the Plan Area bobcats are distributed in the following core habitat areas and linkages (CBI 2009): Santa Ana Mountains, Northern Foothills, Southern Foothills, San Joaquin Hills (the bobcat population here is genetically distinct from inland populations; see Lyren et al. 2008a, 2008b), Chino Hills, Upper Santa Ana River, Upper Newport Bay, Irvine Linkage, Coal Canyon Linkage, Trabuco Creek and San Juan Creek Linkages. Modeled habitat for this species is found in Chino Hills, Santa Ana Mountains, Northern Foothills, Southern Foothills, San Joaquin Foothills, Upper Santa Ana River, Coal Canyon Linkage, Irvine Linkage, Trabuco Creek Linkage, and San Juan Creek Linkage (Figure C3-13, Bobcat Modeled Habitat). Recent genetic studies demonstrate that there is still some genetic exchange between coastal and inland populations; however, the coastal populations are experiencing a reduction in genetic diversity. These findings emphasize the need for landscape-level connectivity between important habitat areas (e.g., Weir Canyon, Lonas/Limestone Canyon/Whiting Ranch, and North Irvine Ranch) (Lyren et al. 2006, Lyren et al. 2008b, Ruell et al. 2012, Lee et al. 2012).

This species occurs on protected lands in many of these areas (CBI 2009). However, it is currently not protected where it occurs in Santa Ana Mountains (Priority Conservation Areas A and B), Northern Foothills (Priority Conservation Areas A–C), Southern Foothills (Priority Conservation Areas A–D), San Joaquin Hills (Priority Conservation Areas A–C), Chino Hills (Priority Conservation

Areas A–C), Upper Santa Ana River (Priority Conservation Areas A–C), Trabuco Creek, and San Juan Creek Linkages (Priority Conservation Areas A–G).

Population Trends

Population density ranges reported by Larivière and Walton (1997) include one bobcat per 3.6 to 4.1 square kilometers in Arizona, one per 0.7 to 0.9 square kilometers in California, one per 11 square kilometers in Oklahoma, and one per 23.3 square kilometers in Utah. Densities vary based on the availability of prey and are typically lower in more arid environments.

Threats to the Species and Other Conservation Issues

Bobcats are threatened by loss of habitat, habitat fragmentation, and disease. Viable populations rely heavily on large, undisturbed blocks of habitat. Habitat fragmentation caused by roads and urban development poses a great threat to wide ranging species like bobcats (Lyren et al. 2006, 2008a; 2008b; Alonso et al. 2014). Adequate linkages between these large blocks are a key requirement for the long-term persistence of this species. They are an apex predator, but the young may be susceptible to predation by large birds of prey and mountain lions (Jackson 1961, Young 1958).

Early radiotelemetry studies of bobcats by Bradley and Fagre (1988) provided some relevant observations for management of the species. These studies suggested that bobcats can coexist successfully with humans as long as the human activities do not reduce habitat and prey resources or increase mortality rates (i.e., harvesting or vehicular collisions). Recent studies have found that bobcats avoid urbanized landscapes and that roads act as barriers to movement (Lyren et al. 2006; Ordenana et al. 2010; Tracey et al. 2013, Poessel et al. 2014). Bobcats are highly susceptible to collisions with vehicles; this threat is a concern within the Plan Area and has been shown to be a primary cause for bobcat mortality statewide (Lyren et al. 2008b). Within the Plan Area, collisions with vehicles are a concern because both primary and secondary roads cross most of the known bobcat territories (Lyren et al. 2006; Ordenana et al. 2010; Tracey et al. 2013). Road crossings designed appropriately for safe use by bobcats and larger mammals such as mule deer (e.g., culverts measuring 10–20 feet in width and providing for unobstructed visual contact from end to end) should be installed along primary wildlife movement routes to reduce the threat of vehicle collisions. In addition, fencing along roadways near movement linkages to funnel bobcats into the wildlife crossing and reduce vehicular collisions should be used.

Literature Cited

Printed References

Alonso, R. S., L. M. Lyren, E. E. Boydston, C. D. Haas, and K. R. Crooks. 2014. Evaluation of road expansion and connectivity mitigation for wildlife in southern California. *The Southwestern Naturalist* 59(2):181–187.

Bradley, L. C., and Fagre, D. B. 1988. Movements and habitat use by coyotes and bobcats on a ranch in southern Texas. *Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies* 42:411–430.

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Fritts, S. H., and J. A. Sealander. 1978. Diets of bobcats in Arkansas with special reference to age and sex differences. *Journal of Wildlife Management* 42:533–539.

Jackson, H. H. T. 1961. *Mammals of Wisconsin*. Madison, WI: University of Wisconsin Press.

Jones, J. K., Jr., R. S. Hoffman, D. W. Rice, C. Jones, R. J. Baker, and M. D. Engstrom. 1992. Revised checklist of North American mammals north of Mexico, 1991. *Occasional Papers, The Museum, Texas Tech University*, 146:1–23.

Larivière, S. and L.R. Walton. 1997. *Lynx rufus*. In *Mammalian Species* 564:1–8. The American Society of Mammalogists.

Lee, J. S., E. W. Ruell, E E Boydston, L. M. Lyren, R. S. Alonso, J. L. Troyer, K. R. Crooks, and S. VandeWoude. 2012. Gene flow and pathogen transmission among bobcats (*Lynx rufus*) in a fragmented urban landscape. *Molecular Ecology* 21:1617–1631.

Lyren L. M., G. M. Turschak, E. S. Ambat, C. D. Haas, J. A. Tracey, E. E. Boydston, S. A. Hathaway, R. N. Fisher, and K. R. Crooks. 2006. *Carnivore Activity and Movement in a Southern California Protected Area, the North/Central Irvine Ranch*. U.S. Geological Survey Technical Report.

Lyren, L.M., R. S. Alonso, K. R. Crooks, and E. E. Boydston. 2008a. *Evaluation of Functional Connectivity for Bobcats and Coyotes Across the Former El Toro Marine Base, Orange County, California*. Administrative report.

———. 2008b. *GPS Telemetry, Camera Trap, and Mortality Surveys of Bobcats in the San Joaquin Hills, Orange County, California*. Administrative report.

Ordenana, M. A., K. R. Crooks, E. E. Boydston, R. N. Fisher, L. M. Lyren, S. Siudyla, C. D. Haas, S. Harris, S. A. Hathaway, G. M. Turschak, A. K. Miles, and D. H. Van Vuren. 2010. Effects of urbanization on carnivore species distribution and richness. *Journal of Mammalogy* 91(6):1322–1331.

Poessel, R. A., C. L. Burdett, E. E. Boydston, L. M. Lyren, R. S. Alonso, R. N. Fisher, and K. R. Crooks. 2014. Roads influence movement and home ranges of a fragmentation sensitive carnivore, the bobcat, in an urban landscape. *Biological Conservation* 180:224–232.

Provost, E. E., C. A. Nelson, and D. A. Marshall. 1973. Population Dynamics and Behavior in the Bobcat. In R. L. Eaton (ed.), *The World's Cats. Vol. 1. Ecology and Conservation*. Winston, OR: World Wildlife Safari.

Riley, S. P . D., R. M. Sauvajot, T. K. Fuller, E. C. York, D. A. Kamradt, C. Bromley, and R. K. Wayne. 2003. Effects of urbanization and habitat fragmentation on bobcats and coyotes in southern California. *Conservation Biology* 17:566–576.

Ruell, E. W., S. P. D. Riley, M. R. Douglas, M. F. Antolin, J. R. Pollinger, J. A. Tracey, L. M. Lyren, E. E. Boydston, R. N. Fisher, and K. R. Crooks. 2012. Urban habitat fragmentation and genetic population structure of bobcats in coastal southern California. *American Midland Naturalist* 168:265–280.

Tracey, J. A., J. Zhu, E. Boydston, L. Lyren, R. N. Fisher, and K. R. Crooks. 2013. Mapping behavioral landscapes for animal movement: a finite mixture modeling approach. *Ecological Application* 23:654–669.

Wozencraft. 1993. Bobcat. In Wilson and Reeder (eds.), Mammal Species of the World. Smithsonian Institute Press.

Young, S. P. 1958. *The Bobcat of North America*. Washington, D.C.: Wildlife Management Institute.

Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White. 1990. *California Wildlife*. *Vol. III, Mammals.* California Statewide Wildlife Habitat Relationships System. Department of Fish and Game, Sacramento, California.

Personal Communications

Montgomery, S. August 31 and September 28, 1998—fax communication to the U.S. Fish and Wildlife Service.

Mountain Lion
Puma concolor

Photo credit: San Diego Natural History Museum

Legal Status:

Federal: None

State: California Specially Protected Mammal

Recovery Plan: None

Species Description and Life History

The mountain lion (*Puma concolor*), also known as cougar, puma, or panther, is a large predatory cat that ranges in color from a tawny or rufous brown to dusky or slate gray. Thirty subspecies of mountain lions have been described. Preliminary genetic studies using both mitochondrial DNA and nuclear microsatellites as molecular markers, however, have determined that North American populations of mountain lions have relatively low genetic variation (Culver et al. 1996). This finding is significant for conservation planning because reintroduction programs need have only limited concern about introducing individuals from genetically distinct populations.

Females may give birth any time of year, but most births occur in the spring. Dens are located in caves, thickets, and other natural cavities. Typical litters have 2 to 3 young that do not become independent from the mother until their second year. Females become sexually mature from their second to fourth year and will produce a new litter every 2 years. The average life expectancy is 8 to 12 years (Young and Goldman 1946).

Mountain lions are non-migratory at larger scales but will make seasonal movements within a fixed range in response to prey movement patterns. Studies of general activity patterns of lions suggest that lions have peaks of activity around sunset and sunrise (Laundré et al. 1996, Van Dyke et al. 1986). Laundré et al. (1996) found that lions in south-central Idaho and northwestern Utah moved approximately 10 miles (males) to 12 miles (females) per day and that most of the day was spent in low-level activities of walking and feeding. A study of dispersal by juvenile mountain lions in the Santa Ana Mountains showed that dispersal is initiated by the mother abandoning her cub of about 18 months at the edge of her range (Beier 1995). The cubs dispersed to the urban-wildlife interface farthest from their natal range and used temporary home ranges near this interface. Beier (1995) also observed dispersing individuals using corridors along well-covered travel routes, an underpass, areas lacking artificial lighting, and areas with low residential densities (<1 dwelling unit/16 hectares).

Habitat Requirements and Ecology

Mountain lions use rocky areas, cliffs, and ledges that provide cover within open woodlands and chaparral, as well as riparian areas that provide protective habitat connections for movement among fragmented core habitat areas. A study of diurnal bedding habitat in northeast Oregon suggests that lions also need both vertical and horizontal cover components, such as rocks and downed logs, to feel secure enough to bed (Akenson et al. 1996).

Mountain lions tend to avoid each other, but there is little evidence that they regularly defend a territory (Maser et al. 1981). Male home ranges usually are a minimum of 40 square kilometers (15 square miles) (Russell 1978). Female home ranges usually are 8 to 32 square kilometers (3 to 12 square miles). In Idaho, Hornocker (1970) found home ranges of males varying from 65 to 250 square kilometers (25 to 96 square miles); those of females varied from 13 to 52 square kilometers (5 to 20 square miles). Home ranges of females may overlap completely with those of other females, or with males. However, females with young usually occupy distinct areas (Sitton and Wallen 1976). Males usually occupy areas distinct from each other, and they are tolerant of transients of both sexes. Young adults establish home ranges as vacancies occur (Seidensticker et al. 1973).

Mountain lions are solitary predators that prefer to stalk their prey. Mule deer make up the majority (60 to 80%) of their annual diet (Currier 1983). They are also known to prey on rabbits and hares, porcupines, skunks, coyotes, grouse, turkey, fish, insects, grass, berries, and occasionally domestic stock (Spalding and Lesowski 1971, Russell 1978, Currier 1983). Recent movement and modeling studies in southern California found their habitat selection patterns to match those of their chief prey, mule deer, which favor oak woodlands, pine forest, riparian areas and grasslands (Burdett et al. 2010).

Species Distribution and Population Trends

Distribution

The mountain lion is a widespread, uncommon species known to inhabit areas from sea level to alpine meadows. Though most abundant in riparian areas, they utilize nearly all of the vegetation types in California except some of the driest regions of the Mojave and Colorado deserts. Studies by the California Department of Fish and Game and others (see Sitton and Wallen 1976, Koford 1977), suggest that 2,500 to 5,000, or more, mountain lions currently live in California. Numbers appear to be increasing. Dr. Winston Vickers at the University of California Davis and his collaborators are studying mountain lion movement and mortality in the Santa Ana Mountains.

Within the Plan Area mountain lions are distributed in the following core habitat areas and linkages: Santa Ana Mountains, Northern Foothills, Southern Foothills, Chino Hills, Upper Santa Ana River, and Coal Canyon Linkage. Modeled habitat for this species is found in Chino Hills, Santa Ana Mountains, Northern Foothills, Southern Foothills, San Joaquin Foothills, Upper Santa Ana River, Coal Canyon Linkage, Irvine Linkage, Trabuco Creek Linkage, and San Juan Creek Linkage (Figure C3-13, Mountain Lion Modeled Habitat).

This species occurs on protected lands in many of these areas. However, it is currently not protected where it occurs in the following priority conservation areas (CBI 2009): Santa Ana Mountains (Priority Conservation Areas A and B), Northern Foothills (Priority Conservation Areas A–C), Southern Foothills (Priority Conservation Areas A–D), Chino Hills (Priority Conservation Areas A–C), and the Upper Santa Ana River (Priority Conservation Areas A–C).

Population Trends

Historically this species had the widest distribution of any native American mammal, occurring from Canada south to southern Chile and southern Argentina and from the Pacific to Atlantic coasts. Across North America, they are currently restricted mainly to mountainous, relatively unpopulated areas and from sea level to about 4,500 meters (14,800 feet) elevation. Habitat fragmentation in southern California is the primary factor effecting the population trends for the species. The isolation of populations from one another such as the animals found in the Santa Ana Mountains from those in the Palomar Mountains are critical conservation issues (Beier 1993, Morrison and Boyce 2009). As development increases the habitat available to these animals has become increasingly restricted to the protected areas in southern California (Burdett et al. 2010).

Threats to the Species and Other Conservation Issues

Mountain lions have few predators other than humans, although large hawks, eagles, and bears take a few young (Russell 1978). Potential competitors (based on dietary overlap) include bobcats, coyotes, bears, and wolverines (Russell 1978). Fragmentation of habitat by spread of human developments and associated roads, power transmission corridors, and other support facilities, restricts movements and increases interactions with humans. Movement studies from southern California found that mountain lion home ranges rarely overlap with suburban and urban areas (Burdett et al. 2010). These changes are clearly detrimental to mountain lion populations as the expansion of developed areas present a critical population limiting factor.

Mountain lions are at risk to a variety of diseases, including feline immunodeficiency virus, feline leukemia virus, feline infectious peritonitis, canine distemper, panleukopenia, and rabies (Foley 1996). Mortality from diseases is a potential catastrophe for small, isolated populations.

The primary threats to the mountain lion are habitat fragmentation, loss of large areas of undeveloped land, road mortality, indiscriminate shooting, animal control measures, and loss of or declines in natural prey base. The risk of extinction increases in smaller areas in the absence of immigration. For example, Beier (1993) estimated that the mountain lion population of about 20 adults in the Santa Ana Mountains in an area of 2,070 square kilometers was demographically unstable and that a movement corridor connection to the Palomar Mountain Range to the east will be important for sustaining this population.

Vickers et al (2015) published results of a study using radio collared mountain lions with complimentary multi-generational genetic analyses to inform mountain lion conservation in southern California. Despite protection from hunting, annual survival for radio collared mountain lions was surprisingly low (55.8%), and humans caused the majority of mountain lion deaths. The most common sources of mortality where vehicle collisions (28% of deaths), and mortalities resulting from depredation permits issues after mountain lions killed domestic animals (17% of deaths). Other human-caused mortalities included illegal shootings, public safety removals, and human-caused wildfire. As noted by Vickers et al (2015), conserving core habitat areas and functional wildlife corridors has been the main focus of conservation efforts for mountain lions in southern California and coordinated regional action in the form of targeted investment in habitat protection is especially urgent to maintain viability of the Santa Ana Mountains population. However, their analysis highlights that land protection alone will not be sufficient to ensure mountain lion persistence in the region. Also, important will be directed focus on improving road infrastructure to facilitate safe wildlife crossings, and reducing depredation conflicts (through land owner outreach and education) that precipitate mountain lion deaths.

Literature Cited

Akenson, J., M. Henjum, and T. Craddock. 1996. Diurnal bedding habitat of mountain lions in northeast Oregon. [Abstract]. Fifth Mountain Lion Workshop. Organized by the California Department of Fish and Game and the Southern California Chapter of the Wildlife Society, San Diego, CA. February 27–March 1, 1996.

Beier, P. 1993. Determining minimum habitat areas and habitat corridors for cougars. *Conservation Biology* 7:94–108.

———. 1995. Dispersal of juvenile cougars in fragmented habitat. *Journal of Wildlife Management* 59:228–237.

Burdett C.L., Crooks K.R., Theobald D.M., Wilson K.R., Boydston E.E., Lyren L.M., et al. Interfacing models of wildlife habitat and human development to predict the future distribution of puma habitat. Ecosphere. 2010;1(1): 1–21. doi: 10.1890/es10-00005.1

Conservation Biology Institute (CBI). 2009. *Conservation Assessment of Orange County*. December. Prepared for Orange County Transportation Authority.

Culver, M., M. Raymond, W. Johnson, M. Roelke, and S. O'Brien. 1996. Characterization of genetic variation in the puma (*Puma concolor*). [Abstract]. Fifth Mountain Lion Workshop. Organized by the California Department of Fish and Game and the Southern California Chapter of the Wildlife Society, San Diego, CA, February 27–March 1, 1996.

Currier, M. J. P. 1983. *Felis concolor*. *Mammalogy Species No. 200*. 7 pp.

Foley, J. 1996. The role of infectious disease in population control and regulation of western mountain lions. [Abstract]. Fifth Mountain Lion Workshop. Organized by the California Department of Fish and Game and the Southern California Chapter of the Wildlife Society, San Diego, CA, February 27–March 1, 1996.

Hornocker, M. G. 1970. An analysis of mountain lion predation upon mule deer and elk in the Idaho Primitive Area. *Wildlife Monograph* No. 21. 39 pp.

Koford, C. B. 1977. Status and welfare of the puma (*Felis concolor*) in California, 19731976. Final Report, University of California, Berkeley. 57 pp.

Laundré, J. W., C. A. López-González, and K. B. Altendorf. 1996. Daily and hourly summer activity levels of free roaming mountain lions. [Abstract]. Fifth Mountain Lion Workshop. Organized by the California Department of Fish and Game and the Southern California Chapter of the Wildlife Society, San Diego, CA, February 27–March 1, 1996.

Maser, C., B. R. Mate, J. F. Franklin, and C. T. Dyrness. 1981. Natural history of Oregon coast mammals. Pacific Northwest Forest and Range Experiment Station, USDA Forest Service General Technical Report, PNW-133. 496 pp.

Morrison, S. A., and W. M. Boyce. 2009. Conserving connectivity: some lessons from mountain lions in southern California. Conservation Biology 23:275–285.

Russell, K. R. 1978. Mountain lion. Pages 207–225 in J. L. Schmidt and D. L. Gilbert (eds.), *Big Game of North America*. Stackpole Books, Harrisburg, PA. 494 pp.

Seidensticker, J. C., IV, M. G. Hornocker, W. V. Wiles, and J. P. Messick. 1973. Mountain lion social organization in the Idaho Primitive Area. *Wildlife Monograph* No. 35. 60 pp.

Sitton, L. W., and S. Wallen. 1976. California mountain lion study. DFG, Sacramento. 40 pp.

Spalding, D. J., and J. Lesowski. 1971. Winter food of the cougar in south-central British Columbia. *Journal of Wildlife Management.* 35:378–381.

Van Dyke, F. G., R. H. Brocke, H. G. Shaw, B. B. Ackerman, T. P. Hemker, and F. G. Lindzey. 1986. Reactions of mountain lions to logging and human activity. *Journal of Wildlife Management* 50:95–102.

Vickers T.W., Sanchez J.N., Johnson C.K., Morrison S.A., Botta R., Smith T., et al. (2015) Survival and Mortality of Pumas (Puma concolor) in a Fragmented, Urbanizing Landscape. PLoS ONE 10(7): e0131490. doi:10.1371/journal.pone.0131490

Young, S. P., and E. A. Goldman. 1946. The puma, mysterious American cat. American Wildlife Institute, Washington, D.C. 358 pp.

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Appendix C.3

Covered Species Models

Purpose of Species Distribution Modeling

Regional conservation planning relies on landscape-scale data, because it is time consuming and often infeasible to collect detailed, site-specific information on a large scale typical of multiple habitat and species plans. Therefore, species habitat distribution modeling has been a major component of many NCCP/HCP planning efforts in California. The role of species and habitat modeling in the conservation planning process is to provide an objective way of analyzing and evaluating biological information across the Plan Area. Although species habitat modeling is not a replacement for field data, this approach is an important part of the conservation planning process because of the following:

- Lack of comprehensive species data within the Plan Area
- Difficulty of conducting supplemental surveys on private land
- Need for prediction and extrapolation in areas lacking adequate data
- Need for synthesis and analysis of multiple data sources across the entire Study Area

Habitat modeling and analysis are used to extrapolate biological data in a consistent and comprehensive manner across a study area. Extrapolation of these data avoids the geographic bias often inherent in field data. Habitat modeling also is used to predict species distribution within a study area. Species distribution models, used in parallel with field data for known species locations, guide conservation planning analysis and decisions.

Approach to Species Distribution Modeling

There are two relatively common geographic information system (GIS)-based approaches to species distribution modeling for use in NCCP/HCPs: statistical modeling approaches and expert-based modeling approaches. Statistical modeling approaches are preferred when sufficient species occurrence data are available.

Statistical species distribution modeling uses species occurrence data (presence/absence as well as presence only data) to identify statistical correlations between any number of GIS data layers. The statistical analysis of correlation patterns takes the statistical interaction of data layers into account (e.g., correlation of soils and vegetation) to avoid over-inflation of the statistical significance of the resulting patterns of predicted distribution of species habitat. The output of statistical species distribution models is a quantitative probability of occurrence at any given location, which has the benefit of quantifying the uncertainty of the models' predictions. Statistical species distribution modeling typically requires a minimum of 50 occurrence data points that are relatively well distributed in suitable habitat across a plan area, and performs best with substantially higher numbers of data points. Therefore, species distribution modeling using the statistical modeling approach is typically not possible for all but the most studied species within an NCCP/HCP plan area. Statistical species distribution modeling was not used for any species in this NCCP/HCP.

Expert-based species distribution modeling has been used successfully in many NCCP/HCPs and is the modeling approach used for all species in this NCCP/HCP. Expert-based species distribution modeling uses the same GIS data layers expected to have meaningful correlations with the distribution of each species. However, the decisions regarding how these data are related to the distribution of each species are made through expert knowledge and opinion. Most expert-based models use Boolean "and/or" relationships to identify the habitat distribution. For example, a species would be predicted to occur in an area if it had the vegetation community *AND* the soil type, *AND* the correct elevation range where the species is known to occur. The primary source of expert knowledge is the scientific literature, and additional consultation with species experts and review of draft model results may provide additional insight and refinements to the selection of the best criteria to model the distribution of each species habitat.

Species Distribution Models for the Natural Community Conservation Plan/Habitat Conservation Plan

For this NCCP/HCP, the expert-based species distribution models were developed based on the species profiles, and, when available, on models created for the same species for other conservation programs in or near the Plan Area. In all cases the model parameters and criteria for modeling the species distribution were considered in relationship to the habitat associations in the species profiles and criteria in other existing models. The draft predicted species distribution model result was then evaluated relative to the distribution of known occurrences in the Plan Area to test the accuracy of the model. When known occurrences were located in areas not predicted by the draft model, the GIS data layers were examined in these areas to identify any additional species-habitat relationship that could be included in the model to improve the accuracy. Such changes to the draft model were only made when the change was generally consistent with known species' habitat requirements as described in the species profile.

The model for each species is described in Table C.3-1, and the resulting species distribution model figures are presented in Figures C.3-1 through C.3-13.

Table C.3-1. NCCP/HCP Species Distribution Models

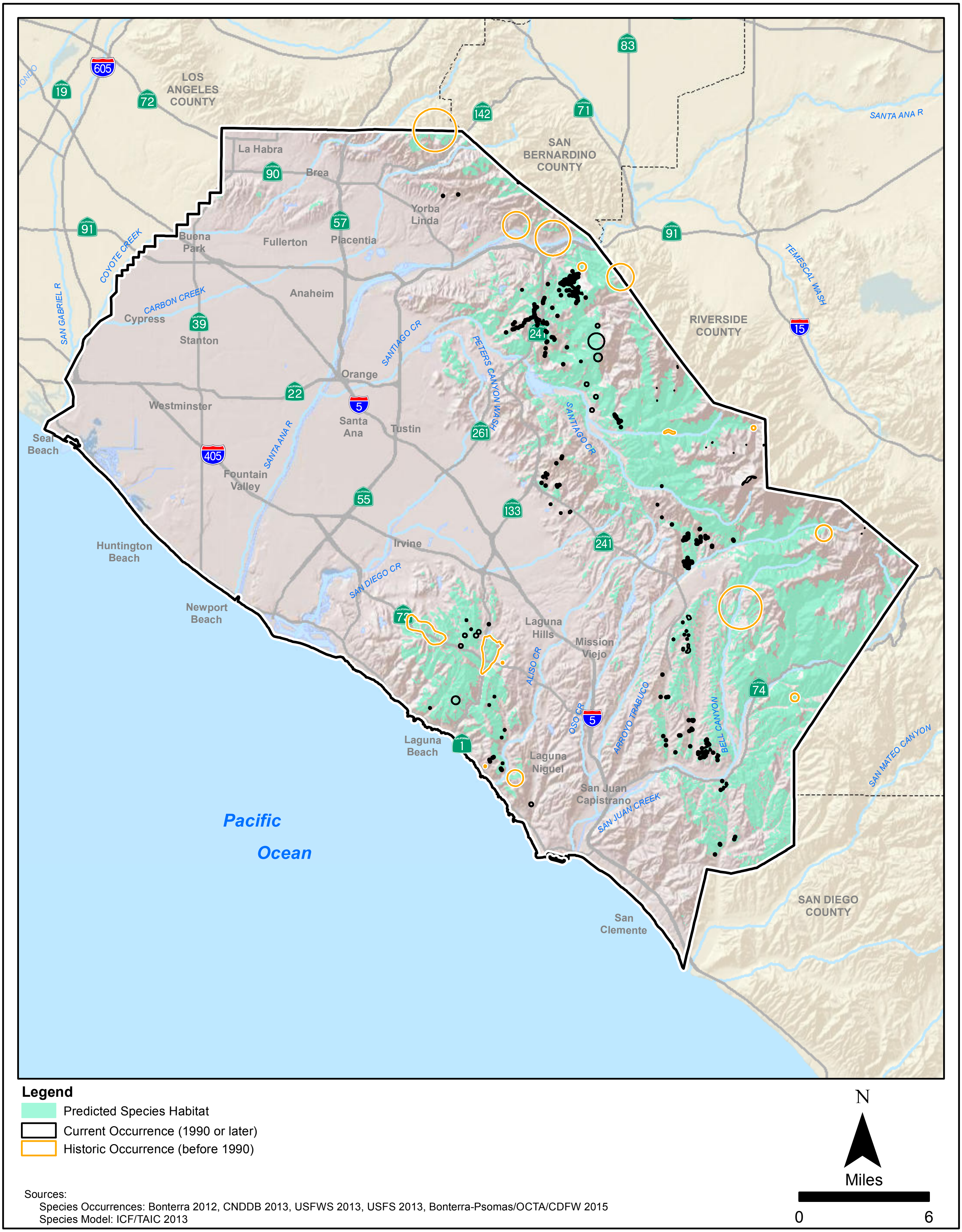
Species	Habitat Relationship	GIS Model Parameter
Plants		
Intermediate mariposa lily	This species occurs on dry, rocky, open slopes in coastal sage scrub, chaparral, and valley and foothill grassland communities between 105 and 855 meters (350 to 2,800 feet).	Slope: All slope categories except flat areas ***and*** Vegetation selected for the species, consisting of: Chaparral (general); Scrub (general); Grassland ***and*** Rock outcrops from soils data layer ***and*** Elevation: Above 350 feet and below 2,800 feet
Many-stemmed dudleya	Includes areas within open chaparral, coastal sage scrub, and valley and foothill grasslands, often on heavy, clay soils from 15 to 790 meters (50 to 2,600 feet). Populations appear to thrive in relatively thinly vegetated habitat such as clay barrens, sparse grasslands, and openings in coastal sage scrub.	Slope: Flat; Moderate ***and*** Vegetation selected for the species, consisting of: Scrub (general); Chaparral (general); Grassland ***and*** Soil Texture:—Clay; Clay (assumed); Clay loam; Coarse sandy loam—Loam; Loam (assumed); Loamy sand; Sandy loam; Silty clay loam; Very fine sandy loam ***and*** Landforms: Alluvial plain remnants; Alluvial plains; Hills ***and*** Elevation: Above 50 feet and below 2,600 feet
Southern tarplant	Occurs at the margins of marshes and swamps, in vernally mesic (saline) valley and foothills grasslands, and vernal pools below 427 meters (3,000 feet).	Slope: Flat ***and*** Vegetation selected for the species, consisting of: Grassland; Wet Meadow/Marsh ***and*** Elevation: Below 3,000 feet ***and*** Excludes Core Areas 1 through 3 (not known/expected to occur in these areas)
Fish		
Arroyo chub	Slow moving or backwater sections of warm to cool streams with substrates of sand or mud and depth greater than 40 cm (16 inches). Clean, clear pools and flowing streams with cobble and riffles.	5-foot buffer around National Hydrography Dataset (NHD) streams known to contain the arroyo chub (model extends across portions of the Plan Area that is mapped as developed)
Reptiles		
Coast horned lizard	Known to use a wide variety of vegetation types, including chaparral, coastal sage scrub,	Soil with a texture class either of the following: Sand; Loamy sand; Coarse sand; Coarse sandy loam; Sandy loam; Fine sandy

Species	Habitat Relationship	GIS Model Parameter
	grassland, oak woodland, riparian woodland, and coniferous forest. In inland areas this species will typically use areas with open microhabitats that can be caused by either natural or anthropogenic disturbances (i.e., floods, fires, roads, grazed areas, fire breaks). Important habitat features include loose, fine soil with high sand fraction, abundance of native ant species, open areas with limited overstory for basking, and areas with low, dense shrubs for refuge.	loam ***and*** Not in areas of (vegetation NV_CAT): Wet Meadows/Marsh; Water; Dev/Non-Native; Agriculture; Barren ***and*** Tree Density: Sparse; Open; Not Applicable (non-tree)
Orangethroat whiptail	Known to occupy open, sparsely covered land often with well drained loose soils and rocks. Most strongly associated with coastal scrub, but oak woodland and chaparral communities have significant value to the species.	Vegetation selected for the species, consisting of any of the following: Chaparral (aggregated category); Grassland (aggregated category); California Sagebrush (detailed type); Riversidean Alluvial Scrub (detailed type); Buckwheat (detailed type); Canyon Live Oak (detailed type); Coast Live Oak (detailed type) ***and*** Tree Density (applies to oaks); Sparse; Open; Moderate ***and*** Landforms selected for the species: Alluvial features (fans, plains, remnants); Fans; Terraces ***and*** Elevation: Below 3,750 feet
Western pond turtle	Known to use both permanent and intermittent water sources ranging from rivers and lakes to ponds, streams, and irrigation ditches. Preferred habitat is pools within streams with a rocky or muddy bottom and a predominance of aquatic vegetation. Upland habitat is also an important factor because these areas are used to lay eggs and overwinter, and for dispersal.	Wetland features defined as: Freshwater Pond (National Wetlands Inventory [NWI]); Freshwater Emergent Wetland (NWI); Riverine (NWI); Freshwater Forested/Shrub Wetland (NWI); LakePond (NHD Waterbody; StreamRiver (NHD flowline); CanalDitch (NHD flowline); StreamRiver (NHD Area); CanalDitch (NHD Area); Wash (NHD Area) ***and*** Upland: 500 feet surrounding wetland areas but not on Developed land defined as: Ag (general); Dev/Non-native (general) ***and*** Slope: Flat and Moderate ***and not*** Marine defined as: Estuarine and Marine Deepwater (NWI); Estuarine and Marine Wetland (NWI)

Species	Habitat Relationship	GIS Model Parameter
Birds		
Cactus wren	Almost exclusively inhabit thickets of cholla (*Opuntia prolifera*) and prickly pear (*Opuntia littoralis* and *Opuntia oricola*) below 1,500 feet in elevation on mesas and lower south- and west-facing slopes of the coast ranges.	Vegetation selected for the species, consisting of any of the following: Scrub (general category) ***and*** Elevation: Below 1,750 feet
Coastal California gnatcatcher	Obligate resident of the maritime and coastal climate zones of southern California, primarily below 1,000 feet, with records extending rarely to about 1,000 meters (3,280 feet). Dependent upon the following plant communities: Venturan coastal sage scrub, Diegan coastal sage scrub, maritime succulent scrub, Riversidean sage scrub, Riversidean alluvial fan sage scrub, southern coastal bluff scrub, and coastal sage-chaparral scrub. Coastal sage scrub is composed of relatively low-growing, dry-season deciduous, and succulent plants. Characteristic plants of this community include California sagebrush (*Artemisia californica*), various species of sage (Salvia spp.), California buckwheat (*Eriogonum fasciculatum*), lemonadeberry (*Rhus integrifolia*), bush-sunflowers (*Encelia californica* and *E. farinosa*), and coastal cactuses (mainly *Opuntia* spp.)	Because the California gnatcatcher is such a high priority species within the Plan Area, the California gnatcatcher model has been developed with additional refinements to rank the relative value of modeled habitat based on nesting habitat value to the gnatcatcher. The criteria for determining habitat value were patch size and shape, slope, and climate, all of which were shown to be correlated with use by the California gnatcatcher. This model is consistent with the model used by USFWS (in Winchell 2005, described below) for conservation planning and population monitoring for the California gnatcatcher throughout coastal southern California. The model includes: Scrub (general) consisting of: Buckwheat; California Sagebrush; Coastal Bluff Scrub; Coastal Cactus; Coyote Brush; Riversidean Alluvial Scrub; Scalebroom; and Soft Scrub Mixed Chaparral ***and*** Core and satellite patch algorithm as developed for the USFWS model. Minimum core size is dependent on the climate zone. Slope: Maximum slope of 40% Climate zone breakpoints: Minimum monthly temperature (5°C); Average monthly precipitation (13.25 inches) consistent with the USFWS model "For the purpose of designing a reserve network in San Diego County a habitat model was developed to qualify areas as low, medium, high and very high quality habitat (Technology Associates International Corporation (TAIC) 2002) for California gnatcatchers. This model suggested that occupancy rates increased with these categories. The model used presence only data collected without considering closure, detection probability or probability-based sampling issues, and modeled these presences as a function of a number of

Species	Habitat Relationship	GIS Model Parameter
		parameters, namely vegetation type (sagebrush presence or absence), patch size, slope, temperature and precipitation. It is important to note that data recorded on lands surveyed where gnatcatchers were not observed were not used in developing this habitat model. This model weights each point in space as an accumulation of scores with higher values indicating gnatcatcher preference. To begin, every point containing California sagebrush received a 1. All other points received a 0. For patch size, if a point is located in a sagebrush patch ≥ 10.12 ha along the coast or ≥ 20.23 ha inland or within 487.68 m of these areas it received a 1, otherwise a 0. For slope, if a point was located on a ≤ 40 percent slope, a 1 was scored, otherwise a 0. Climate was categorized into a matrix consisting of warm/cold combined with dry/wet. If a point received a climate rating warm (≥ 5°C average January minimum temperature) and dry (≤ 33.66 cm average annual rainfall) it received a 2. If a point received a climate rating of cold and wet it received a score of 0. Otherwise the point's climate was scored a 1. When these scores were summed, a total score of 0 or 1 was considered low quality, a score of 2 was considered a moderate quality, a 3 was considered high, and a 4 was very high quality gnatcatcher habitat." (Winchell 2005) Winchell, C. 2005. Estimation of California Gnatcatcher Pair Abundance and Occupancy Rates. Report prepared for CDFG. 16 December.
Least Bell's vireo	Typically associated with southern willow scrub, cottonwood forest, mule fat scrub, sycamore alluvial woodland, coast live oak riparian forest, arroyo willow riparian forest, California blackberry, or mesquite in desert localities. Prefer areas with dense cover within 2 meters above the ground and a dense, stratified canopy. Range is limited to the vicinity of watercourses, mostly below about 457 meters (1,500 feet) elevation, though breeding records extend up to about 1,250 meters (4,100 feet).	Vegetation selected for the species, consisting of: Riparian (general) AND tree density is not sparse ***or*** Types from the National Wetland Inventory: Palustrine Forest Wetlands (PFO) ***and*** Elevation: Below 2,000 feet

Species	Habitat Relationship	GIS Model Parameter
Southwestern willow flycatcher	Use dense riparian habitat along streams and rivers with mature stands of willows, cottonwoods, oaks, or spring-fed boggy areas with willows or alders. Habitat is most likely to develop in more extensive areas along low gradient streams with wide floodplains dominated by willows, although there are exceptions to this habitat characterization (e.g., occupied areas of San Luis Rey River in San Diego County are oak-dominated).	Vegetation selected for the species, consisting of: Riparian (general) ***or*** Types from the National Wetland Inventory: PFO
Mammals		
Bobcat	Most closely associated with rocky and brushy areas near springs or other perennial water sources, primarily in foothills comprised of chaparral habitats. Bobcats prefer areas with adequate cover in the form of rock cavities, snags, stumps, and dense brush, but they occur in any sizable area of relatively undisturbed scrub habitat.	Natural Vegetation defined as NOT: Water (general); Ag (General); Dev/Non-native (general) ***and*** Core and Linkage Areas: Within selected core areas (1–6); All linkages
Mountain lion	Use rocky areas, cliffs, and ledges that provide cover within open woodlands and chaparral, as well as riparian areas that provide protective habitat connections for movement among fragmented core habitat areas. A study of diurnal bedding habitat in northeast Oregon suggests that mountain lions also need both vertical and horizontal cover components, such as rocks and downed logs, to feel secure enough to bed.	Suitable Vegetation defined as NOT: Water (general; Ag (General); Grassland (general); Dev/Non-native (general) ***and*** Core and Linkage Areas: Within selected core areas including Santa Ana Mountains, Northern Foothills, Southern Foothills, and Chino Hills and linkages including Coal Canyon, Trabuco Creek, and San Juan Creek.



OCTA

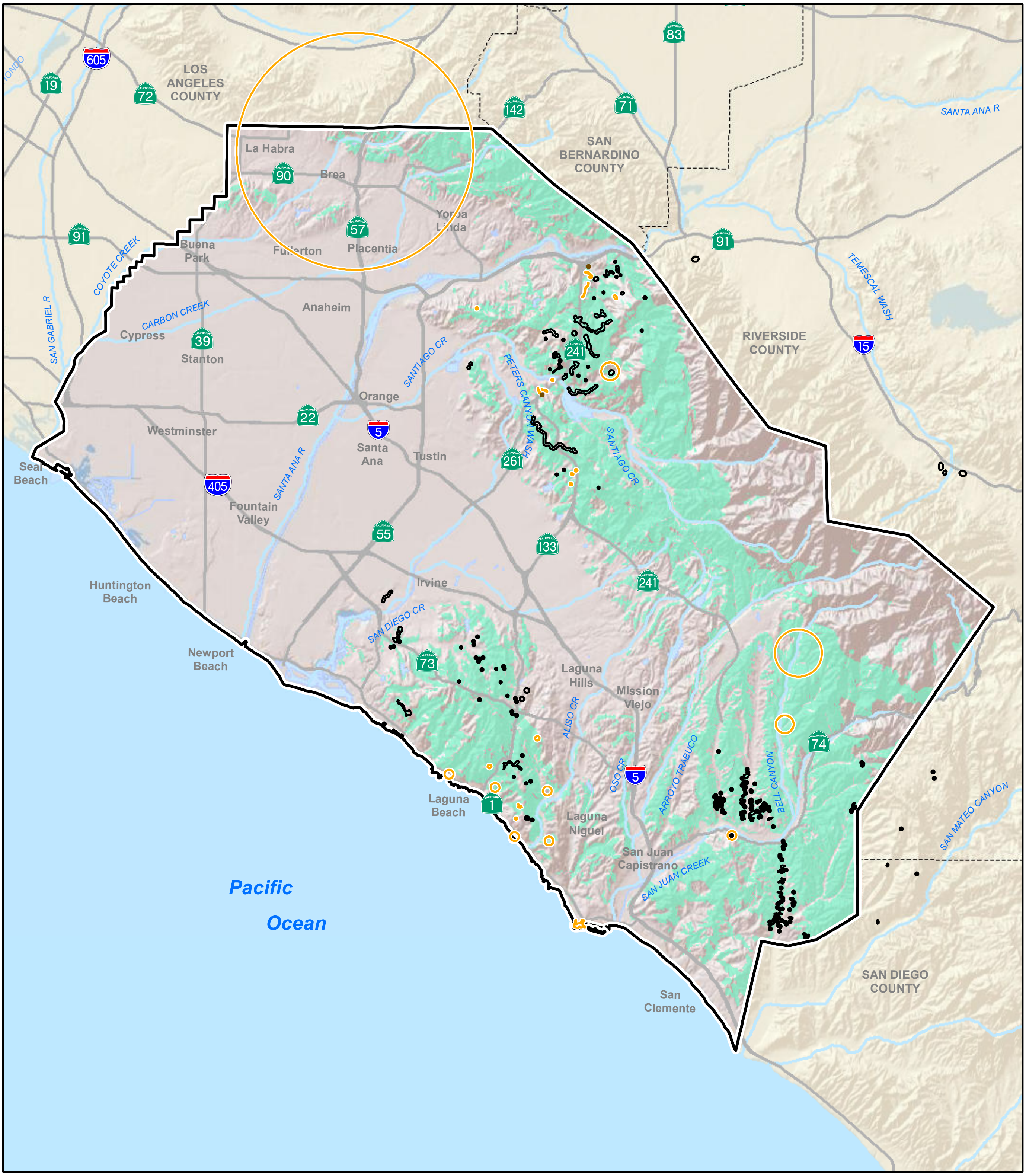
Intermediate Mariposa Lily

Calochortus weedii var. *intermedius*

Figure C.3-1

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Figure C.3-1 Intermediate Mariposa Lily.mxd

Date: 9/27/2016



Legend

Predicted Species Habitat

Current Occurrence (1990 or later)

Historic Occurrence (before 1990)

N

Miles

0 6

Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2013

OCTA

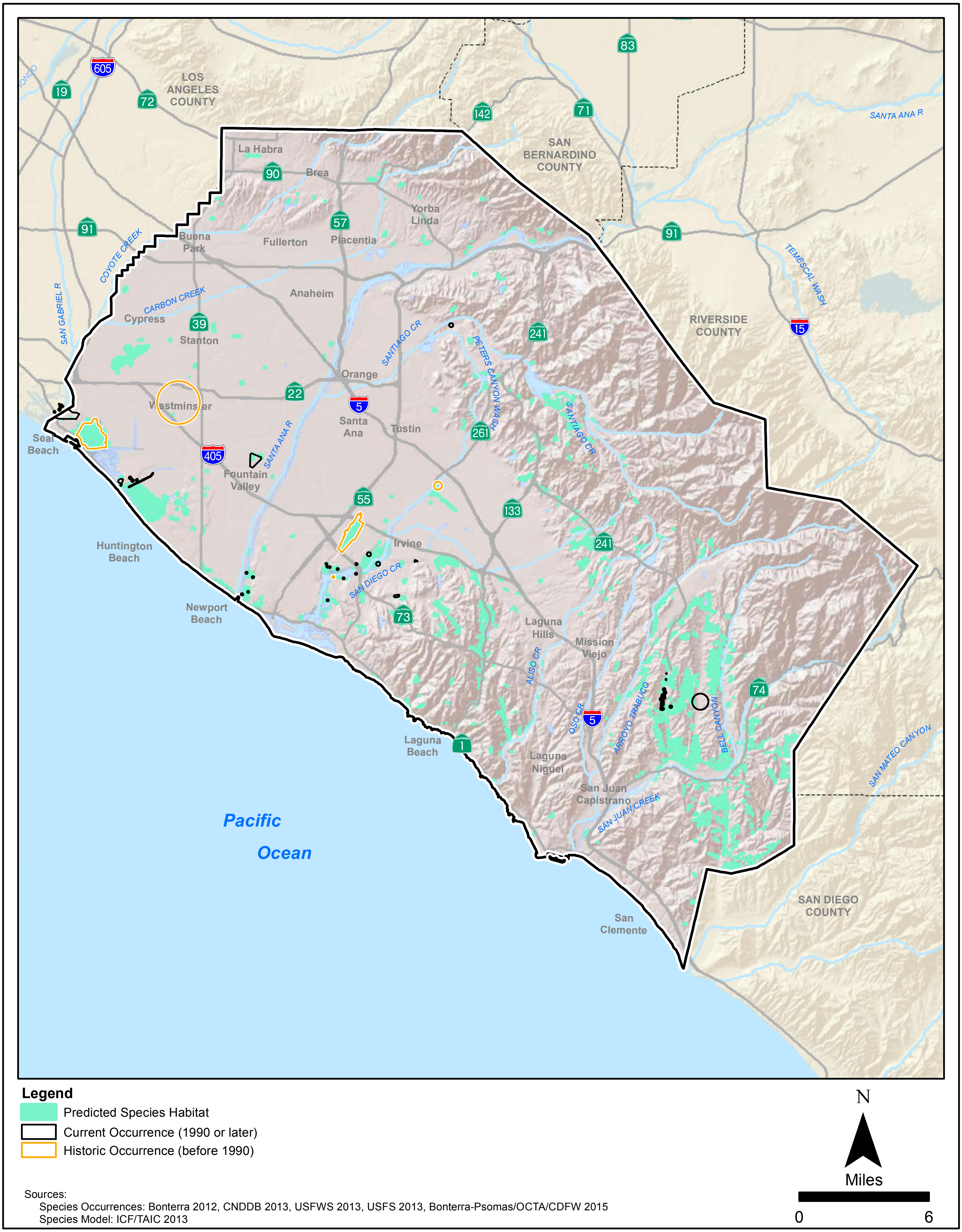
Many-Stemmed Dudleya

Dudleya multicaulis

Figure C.3-2

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Figure C.3-2 Many Stemmed Dudleya.mxd

Date: 9/27/2016

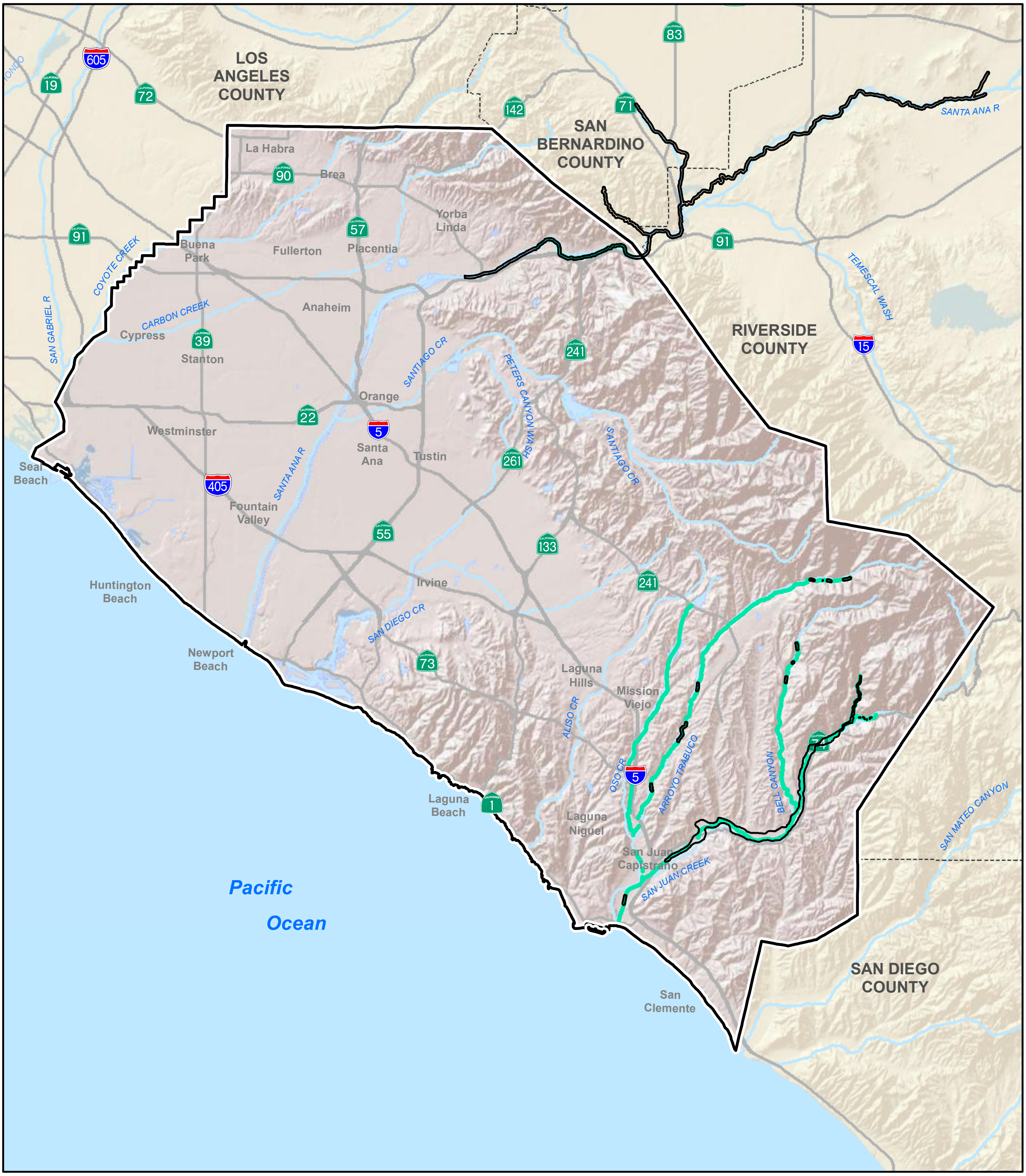


OCTA

Southern Tarplant

Centromadia parryi ssp. *australis*

Figure C.3-3



Legend

Predicted Species Habitat

Current Occurrence (1990 or later)

N

Miles

0 6

Sources:

Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015

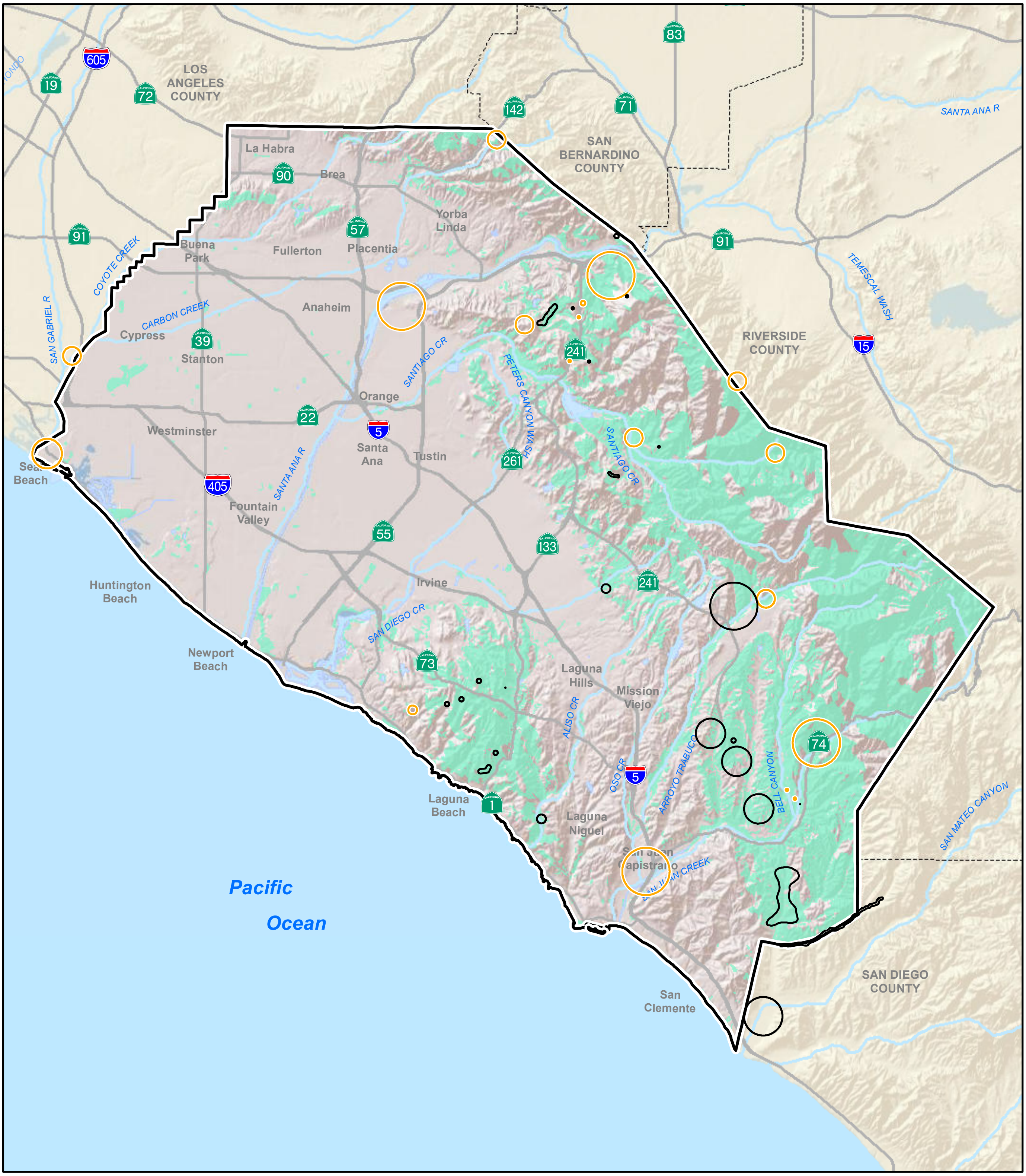
Species Model: ICF/TAIC 2015

OCTA

Arroyo Chub

Gila orcutti

Figure C.3-4



Legend

Predicted Species Habitat

Current Occurrence (1990 or later)

Historic Occurrence (before 1990)

N

Miles

0 6

Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2013

OCTA

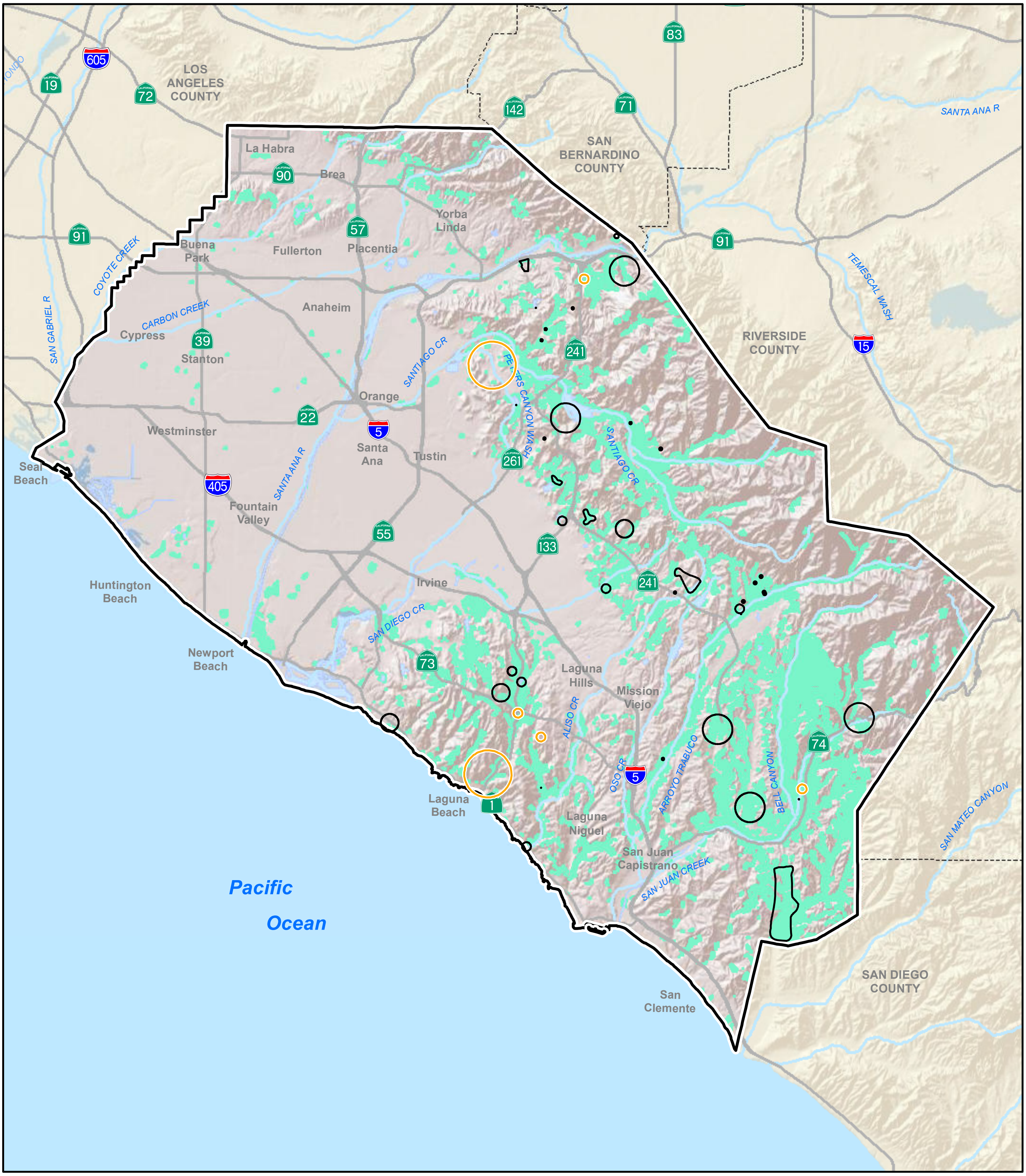
Coast Horned Lizard

Phrynosoma blainvillii

Figure C.3-5

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Figure C.3-5 Coast Horned Lizard.mxd

Date: 9/27/2016



Legend

- Predicted Species Habitat
- Current Occurrence (1990 or later)
- Historic Occurrence (before 1990)

N

Miles

0 6

Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2013

OCTA

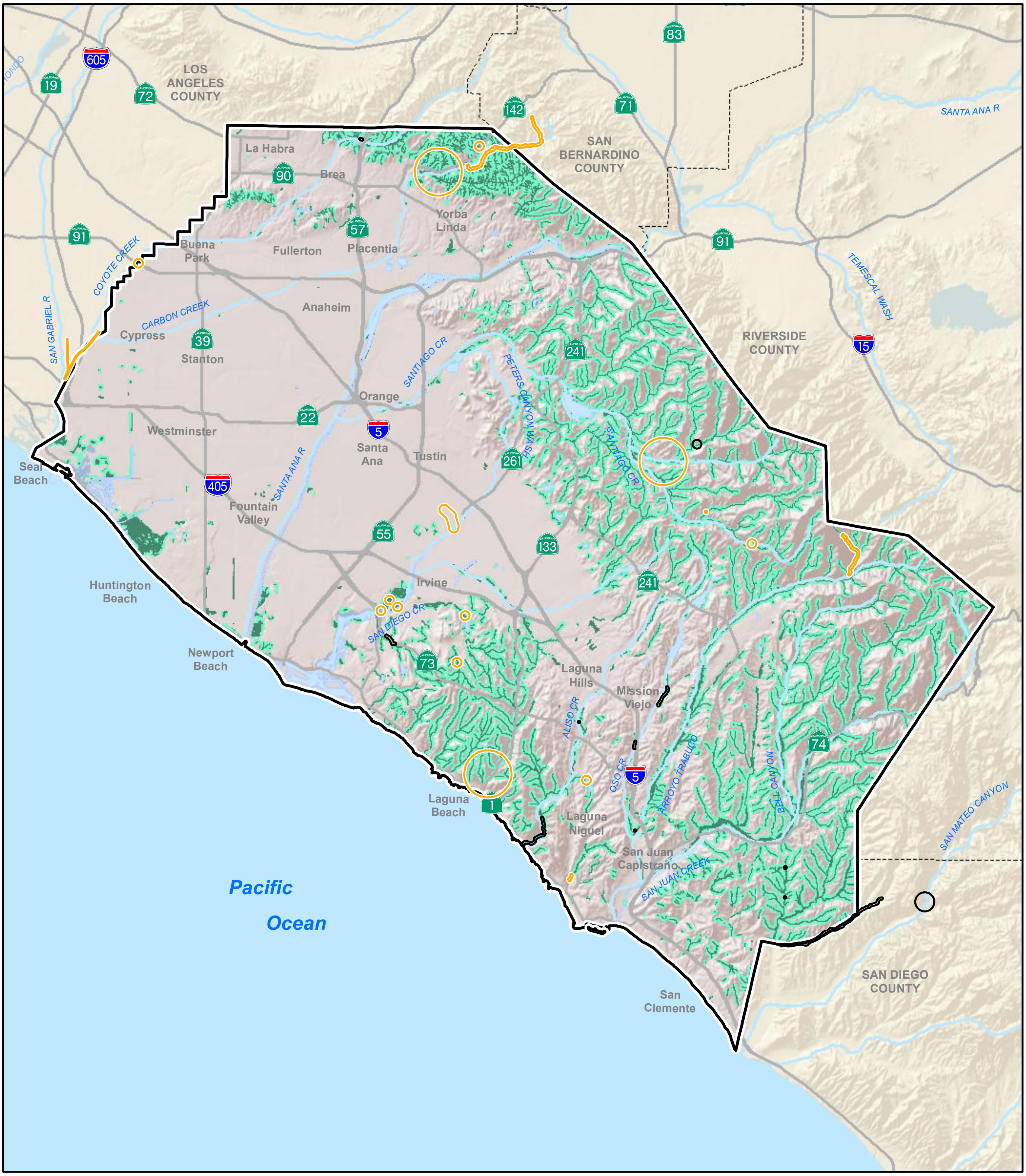
Orangethroat Whiptail

Aspidoscelis hyperythra

Figure C.3-6

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Figure C.3-6 Orangethroat Whiptail.mxd

Date: 9/27/2016



Legend

- Aquatic Habitat
- Upland Habitat
- Current Occurrence (1990 or later)
- Historic Occurrence (before 1990)

N

Miles

0 6

Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2013

OCTA

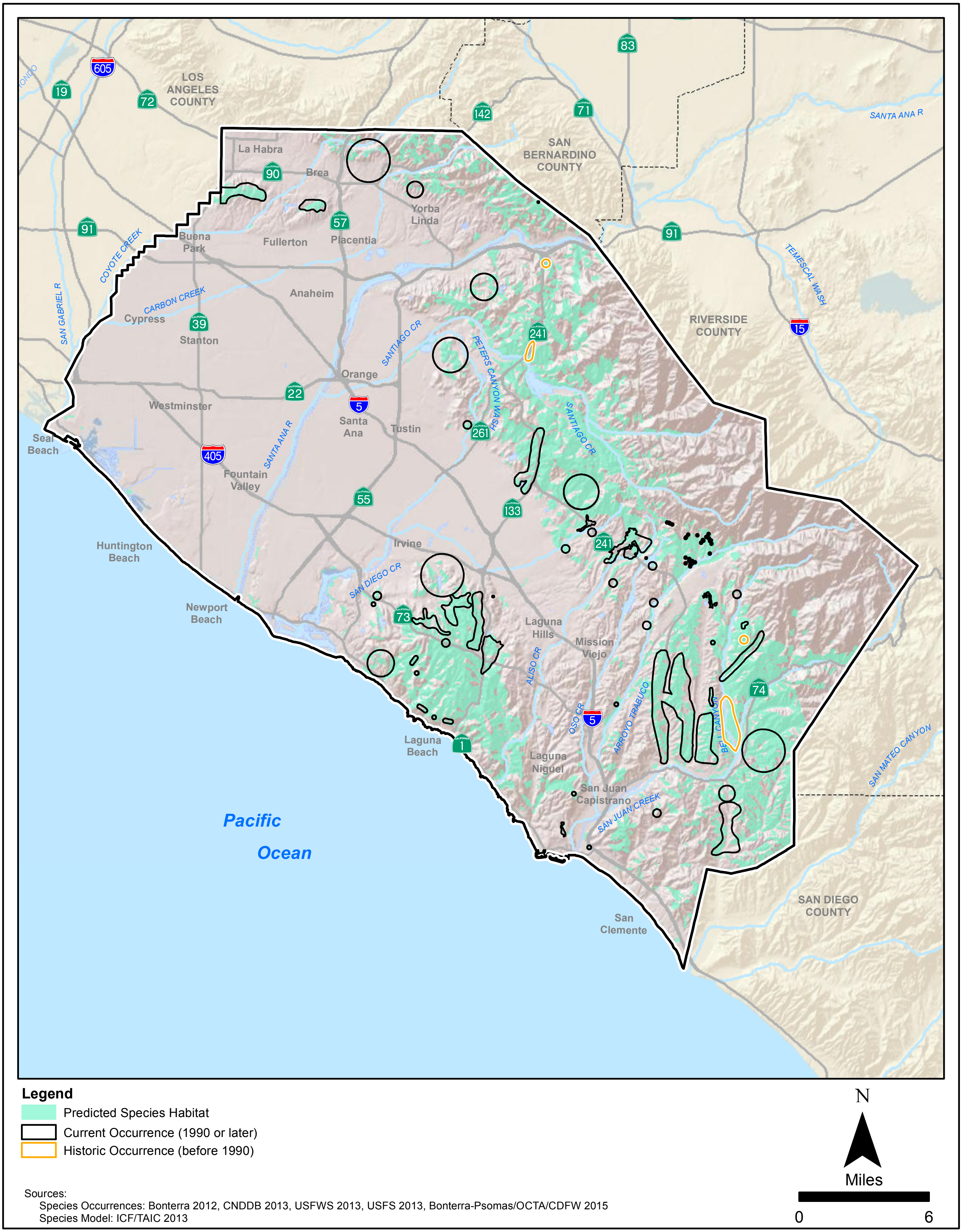
Western Pond Turtle

Emys marmorata

Figure C.3-7

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Figure C.3-7 Western Pond Turtle.mxd

Date: 9/27/2016



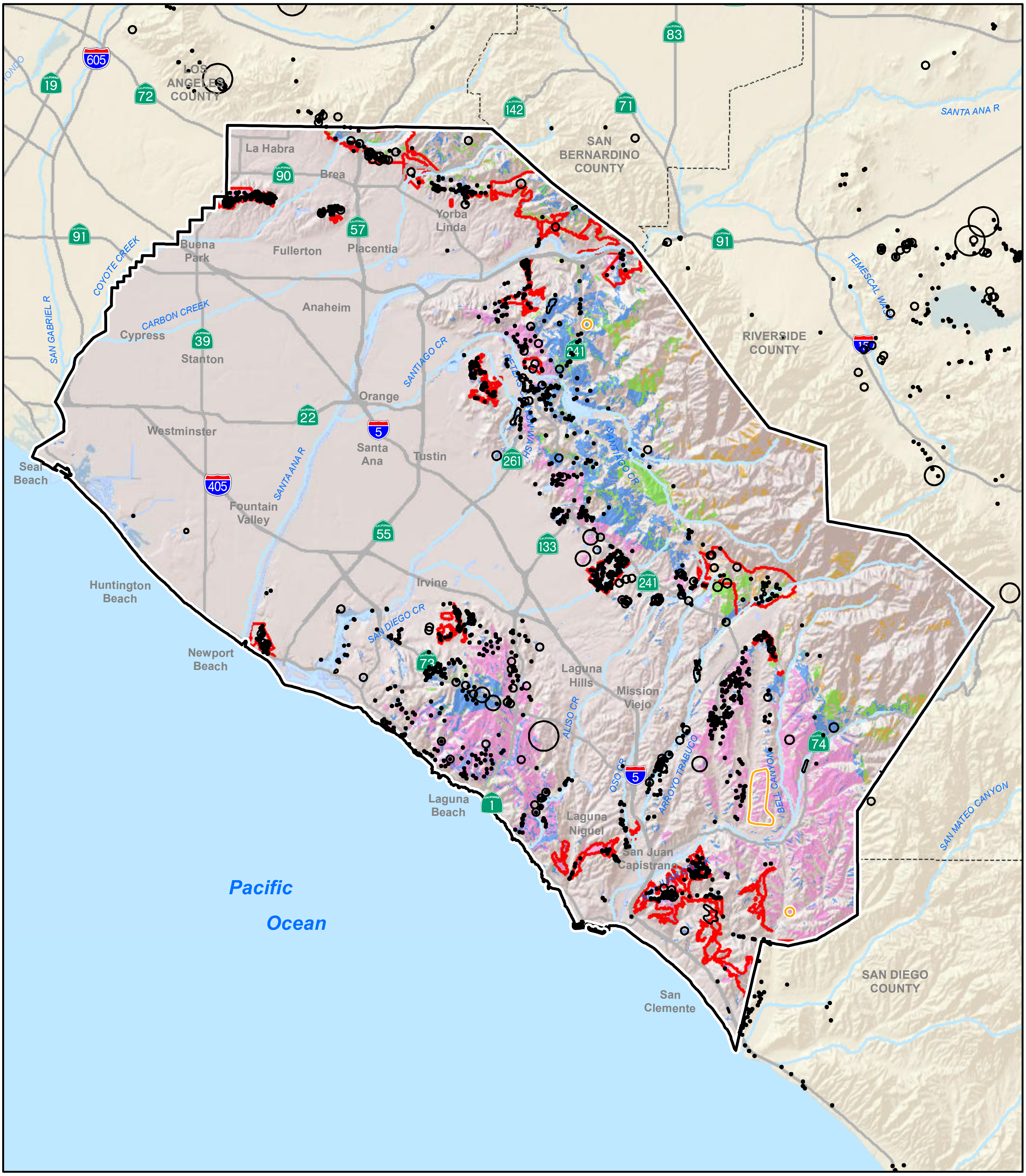
Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2013

OCTA

Cactus Wren

Campylorhynchus brunneicapillus

Figure C.3-8



Legend

Habitat Suitability

- Very High
- High
- Moderate
- Low

- Current Occurrence (1990 or later)
- Historic Occurrence (before 1990)
- Critical Habitat

N

Miles

0 6

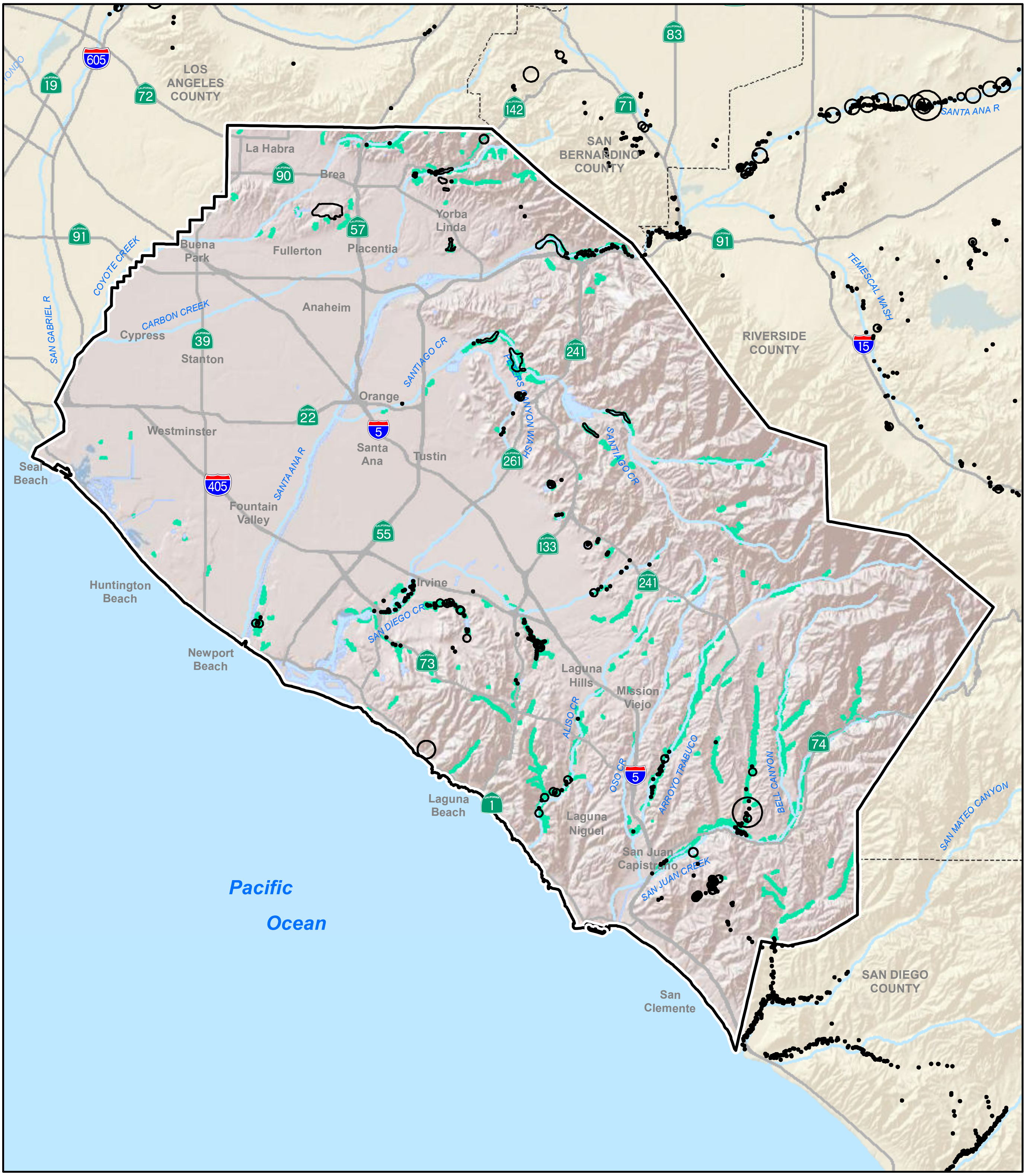
Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2015

OCTA

Coastal California Gnatcatcher

Polioptila californica californica

Figure C.3-9



Legend

Predicted Species Habitat

Current Occurrence (1990 or later)

N

Miles

0 6

Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2013

OCTA

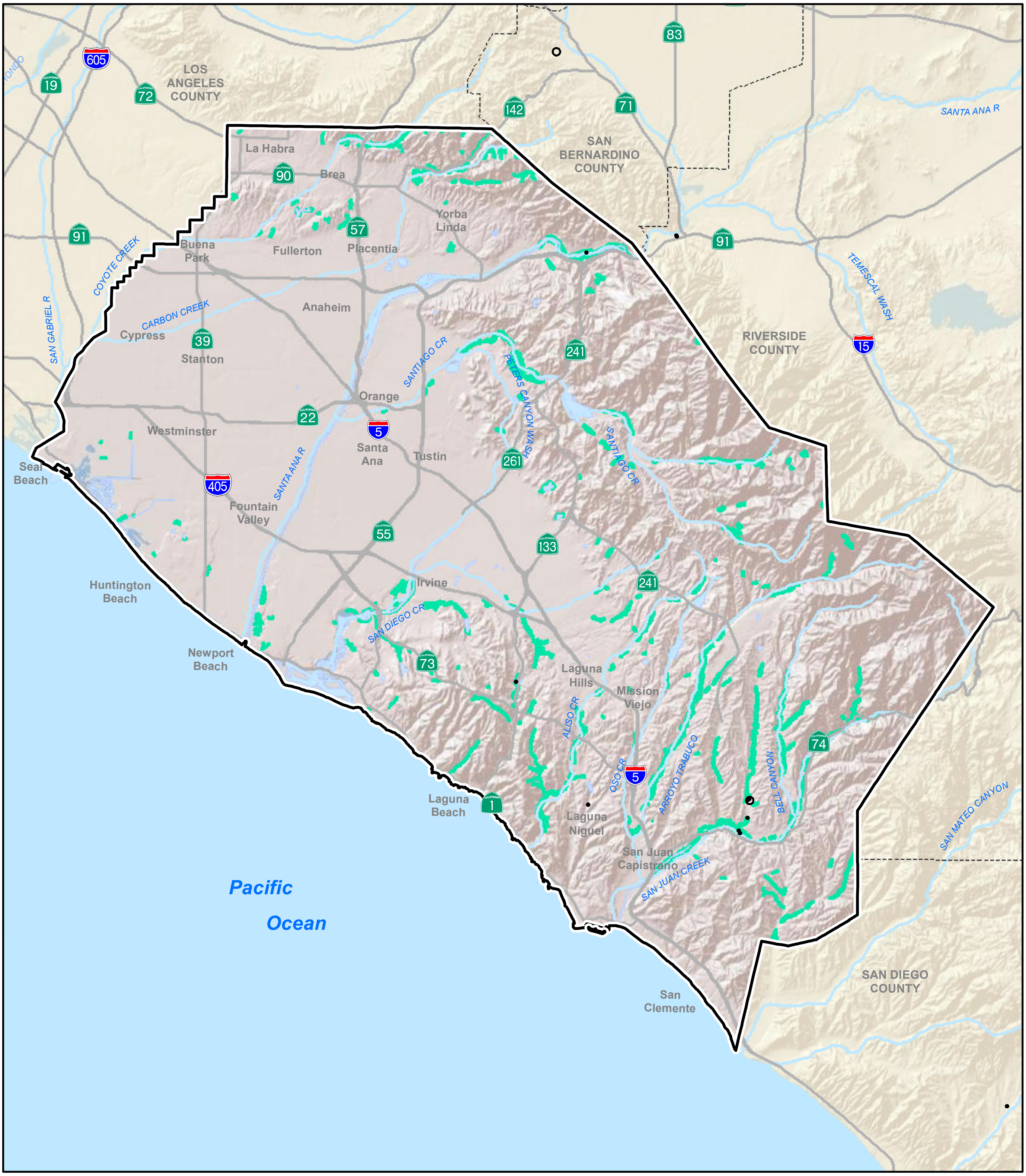
Least Bell's Vireo

Vireo bellii pusillus

Figure C.3-10

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Figure C.3-10 Least Bells Vireo.mxd

Date: 9/27/2016



Legend

Predicted Species Habitat

Current Occurrence (1990 or later)

N

Miles

0 6

Sources:
Species Occurrences: Bonterra 2012, CNDDB 2013, USFWS 2013, USFS 2013, Bonterra-Psomas/OCTA/CDFW 2015
Species Model: ICF/TAIC 2013

OCTA

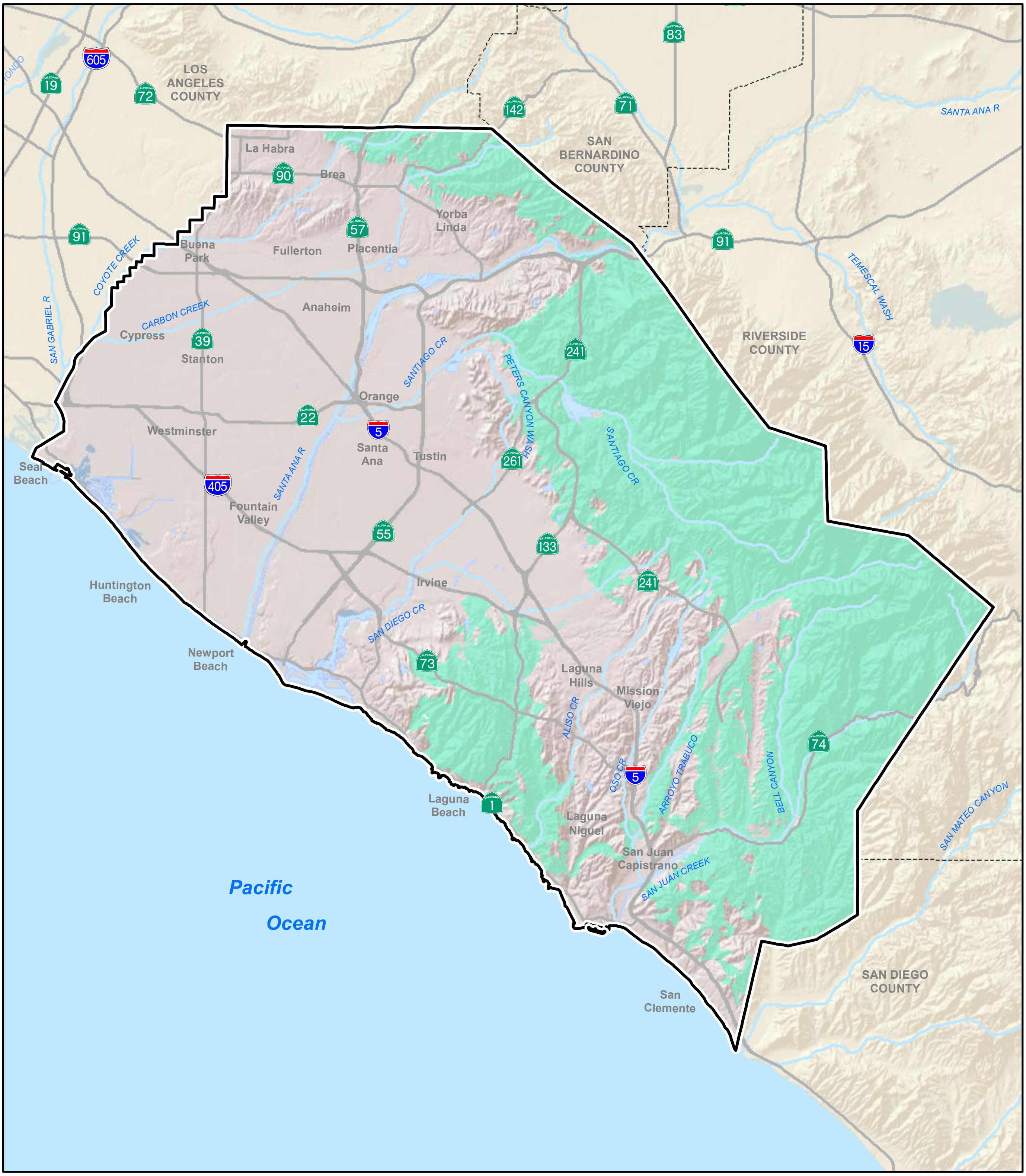
Southwestern Willow Flycatcher

Empidonax traillii extimus

Figure C.3-11

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Figure C.3-11 Southwestern Willow Flycatcher.mxd

Date: 9/27/2016



Legend

Predicted Species Habitat

N

Miles

0 6

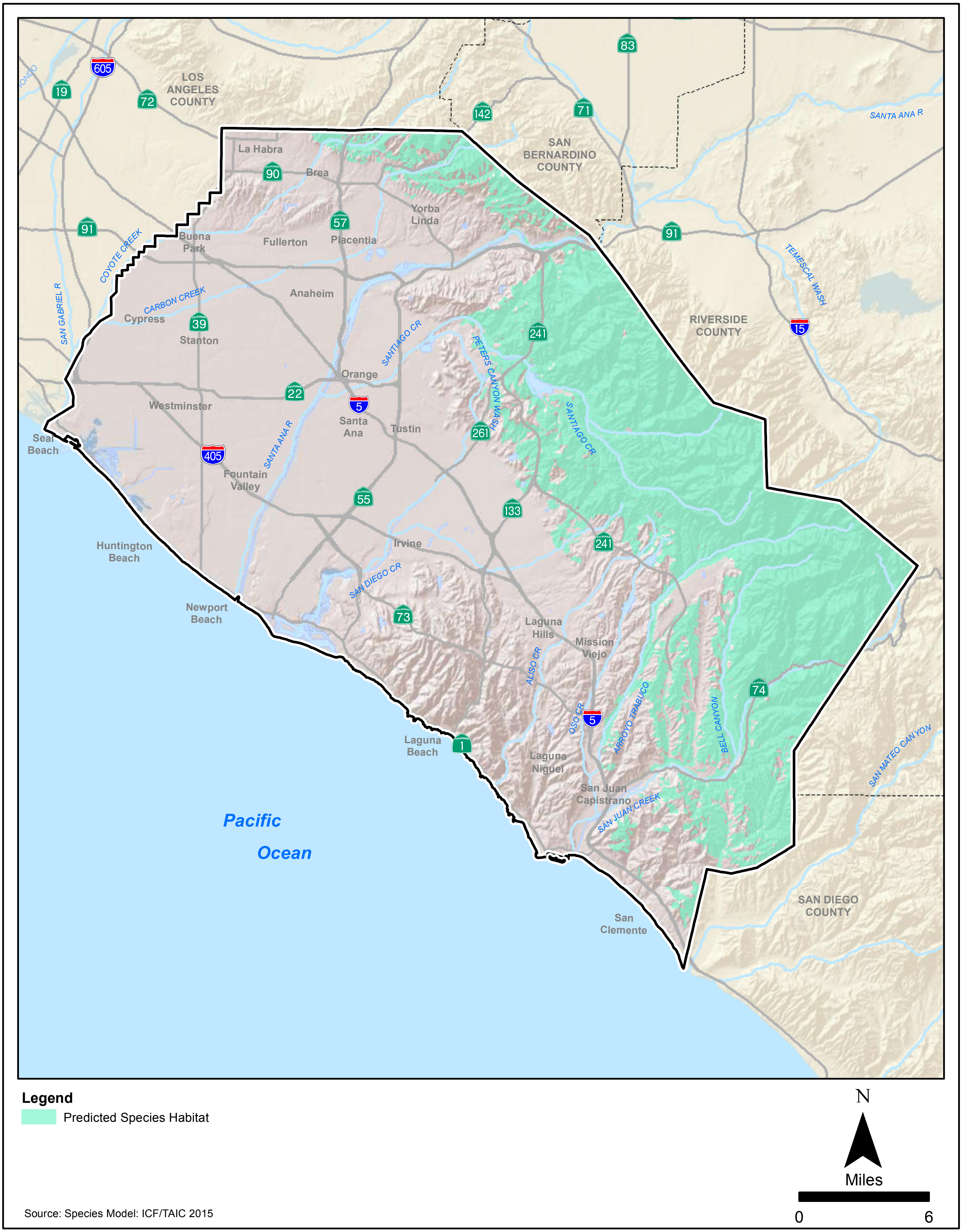
Sources: Species Model: ICF/TAIC 2013

OCTA

Bobcat

Lynx rufus

Figure C.3-12



OCTA

Mountain Lion

Puma concolor

Figure C.3-13

File: K:\San Diego\projects\OCTA\NCCP_00536_10\octa_nccp\plots\Figures\Appendix C3 Species Models\Mountain Lion.mxd

Date: 4/13/2016

Appendix C.4

Covered Species Evaluation and Selection

Special-Status Species in the Plan Area

Introduction

This appendix describes the process developed to identify special-status plant and animal species that are likely to occur within the Plan Area and that should be considered for coverage under the NCCP/HCP.

Definitions Used in Determining Special-Status Species

Special-status species are generally defined as plants and animals that are legally protected under the federal Endangered Species Act (ESA), California Endangered Species Act (CESA), or other regulations and species that are considered sufficiently rare by the scientific community to qualify for such listing. In addition to those with listings as described above, any species that is likely to be listed within the duration of the permit (assumed to be 30 years for this analysis) will be considered special-status for coverage under the NCCP/HCP.

Special-status plants are defined for the purposes of the NCCP/HCP as those species with one or more of the following characteristics:

- Listed or proposed for listing as threatened or endangered under ESA.
- Candidates for possible future listing as threatened or endangered under ESA.
- Species of concern under ESA.
- Listed or candidates for listing by the State of California as threatened or endangered under CESA.
- Listed as rare under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.).
- Determined to meet the definitions of rare or endangered under CEQA.
- Considered by the California Native Plant Society (CNPS) to be “rare, threatened or endangered in California” (Lists 1B and 2).
- Listed by CNPS as plants about which more information is needed to determine their status and plants of limited distribution (Lists 3 and 4) that may be included on the basis of local significance or recent biological information.

Special-status animals are defined for the purposes of the NCCP/HCP as those species with one or more of the following characteristics:

- Listed or proposed for listing as threatened or endangered under ESA.

- Candidates for possible future listing as threatened or endangered under ESA; listed or candidates for listing by the State of California as threatened or endangered under CESA (California Code of Regulations (CCR), title 14, section 670.5).
- Wildlife species of special concern to CDFW.
- Fully protected under the California Fish and Game Code.
- Determined to meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380).
- Considered sensitive by the U.S. Department of Agriculture (USDA) Forest Service.

Special-Status Species List Development

The Plan Area includes a range of biophysiographic conditions that support a wide variety of rare, endangered, and sensitive species, including numerous species listed under state and federal endangered species protection laws. The list of species reflects the outcome of a thorough and comprehensive process to determine the appropriate range of species for consideration under the NCCP/HCP. The species on the final list are recommended to be pursued for coverage based on a number of criteria. Species that do not meet all of these criteria are not recommended for coverage. The criteria and methods used for developing and refining the special-status species list are discussed in the following sections. The complete list of species evaluated for coverage is included in Table C.4-1; the rational for retaining or removing each species in included in Table C.4-2.

Criteria

The criteria discussed below were used to create a list of species that will be proposed for coverage under the NCCP/HCP. The species proposed for coverage will meet all of the following criteria.

1. **Special-Status**. The species falls into one of the following categories: (1) listed under ESA as threatened or endangered, or proposed for listing; (2) listed under CESA as threatened or endangered or a candidate for such listing, or listed under the Native Plant Protection Act as rare; (3) expected to be listed under ESA or CESA within the permit term (assumed 30 years). Potential for listing during the assumed 30-year permit term is based on current listing status, consultation with experts and wildlife agency staff, evaluation of species population trends and threats, and best professional judgment.
2. **Range**. The species is known to occur or is expected to occur within the Plan Area based on a review of species locality and range data, a review of the species literature, and input from species experts. (Species not currently known to occur in the Plan Area but expected to occur in the Plan Area during the permit term [e.g., through range expansion or reintroduction to historic range] were reviewed.)
3. **Species Occurrence Data.** Sufficient scientific data exists on the species' life history, habitat requirements, and occurrence in the Plan Area to adequately evaluate impacts on the species and to develop conservation measures to mitigate these impacts to levels specified by regulatory standards. Using information on the species' biology, distribution, and threats or limiting factors, a defensible conservation strategy will be developed to justify coverage under the NCCP/HCP. If there are insufficient data available on a species, justification for coverage under the NCCP/HCP cannot be given; therefore, species with insufficient data will not be considered for coverage at this time.

4. **Impact**. The species or its habitat would be adversely affected by covered activities or projects that may result in take of the species.
5. **Feasibility**. In addition to the criteria discussed above, the overall feasibility of conserving each species will be considered. The cost of conservation relative to the benefit of conservation will be weighed as will whether other conservation actions are in place or planned and likely to be implemented to address the needs of the species.

Note that if a species is eliminated from consideration based on the first three criteria, then criteria 4 and 5 need not be considered.

Methods

The initial list of 22 species was developed using the NCCP/HCP Planning Agreement (California Department of Fish and Game 2009[1]). This list was developed by OCTA, USFWS, and DFG based on species addressed in other NCCPs or HCPs in or near Orange County. To ensure that all special-status species within the Plan Area were included for evaluation and consideration as potential covered species, a detailed GIS-based search of Orange County was conducted using the comprehensive species occurrence database assembled for this NCCP/HCP (see Chapter 4, "Impact Assessment and Level of Take"). The GIS database search resulted in a list that included 9 plant species, 4 invertebrates, 4 fish, 2 amphibians, 4 reptiles, 12 birds, and 7 mammals. The status of each of the 38 species was updated based on USFWS, DFG, and CNDDB information.

Using the covered species selection criteria outlined above, this list was reviewed and refined down to a final list of 13 species. Table C.4-1 includes the full list of 38 species and the results of the application of each criterion. The final review of the criteria as applied to each species was reviewed in a workshop with OCTA, USFWS, and DFG, and the final determination to pursue coverage or not was made at this time. The notes, comments, and rationale for the decision for each species are documented in Table C.4-2. The use of each evaluation criterion is discussed in more detail following the tables.

[1] California Department of Fish and Game. 2009. Planning Agreement by and among Orange County Transportation Authority, California Department of Transportation, California Department of Fish and Game, and United States Fish and Wildlife Service for the Orange County Transportation Authority Natural Community Conservation Plan (NCCP)/Habitat Conservation Plan (HCP). April 2009.

Table C.4 -1. Species Considered for Inclusion in the NCCP/HCP

Common Name	Scientific Name	Federal Listing	State Listing	Other Listing	G Rank	S Rank	Rank	Possible in Study Area	Indicated in Study Area by GIS range or point data	Overlaps with M2 Projects M=Model	Overlaps with NON–M2 Projects; M=Model	Sufficient Data for Evaluation	Proposed for Coverage
Plants													
Big-leaved crownbeard	*Verbesina dissita*	FT	ST	1B.1	G2G3	S1.1	1	Yes	Yes	Y, Y - M	Y, Y - M	Yes	
Braunton's Milk-Vetch	*Astragalus brauntonii*	FE	--	1B.1	G2T2	S2.1	1	Yes	Yes	Y - CH, Y - M	Y, Y - M	Yes	
California orcutt grass	*Orcuttia californica*	FE	SE	1B.1	G2	S2.1	1	Yes	Yes	Y, Y - M	Y - M	Yes	
Coulter's matillija poppy	*Romneya coulteri*	--	--	4.2	G3	S3.2	4	Yes	Yes			Yes	
Intermediate mariposa lily	*Calochortus weedii var. intermedius*	--	--	1B.2	G3G4T2	S2.2	3	Yes	Yes	Y	Y	Yes	Yes
Laguna Beach dudleya	*Dudleya stolonifera*	FT	ST	1B.1	G1	S1.1	1	Yes	Yes	Y, Y - M	Y, Y - M	Yes	
Many-stemmed dudleya	*Dudleya multicaulis*	--	--	1B.2	G2	S2	3	Yes	Yes	Y, Y - M	Y, Y - M	Yes	Yes
Salt marsh bird's-beak	*Cordylanthus maritimus ssp. maritimus*	FE	SE	1B.2	G4?T2	S2.1	1	Yes	Yes	Y, Y - M	Y - M	Yes	

Common Name	Scientific Name	Federal Listing	State Listing	Other Listing	G Rank	S Rank	Rank	Possible in Study Area	Indicated in Study Area by GIS range or point data	Overlaps with M2 Projects M=Model	Overlaps with NON-M2 Projects; M=Model	Sufficient Data for Evaluation	Proposed for Coverage
Southern tarplant	*Centromadia parryi* ssp. *australis*	--	--	1B.1	G4T2	S2.1	3	Yes	Yes	Y	Y	Yes	Yes
Invertebrates													
Quino checkerspot butterfly	*Euphydryas editha quino*	FE	--	XERCES:CI	G5T1	S1	1	Yes	Yes		Y	Yes	
Riverside fairy shrimp	*Streptocephalus woottoni*	FE	--	IUCN:EN	G1	S1	1	Yes	Yes	Y - M		Yes	
San Diego fairy shrimp	*Branchinecta sandiegonensis*	FE	--	IUCN:EN	G1	S1	1	Yes	Yes	Y - M	Y - M	Yes	
Vernal pool fairy shrimp*	*Branchinecta lynchi*	FT	--	IUCN:VU	G3	S2S3	1	Yes	Yes	Y - M			
Fish													
Arroyo chub	*Gila orcuttii*	--	--	AFS:VU, DFG:SSC, USFS:S	G2	S2	2	Yes	Yes	Y - M		Yes	Yes
Santa Ana speckled dace	*Rhinichthys osculus*	--	--	AFS:TH, DFG:SSC, USFS:S	G5T1	S1	2	Yes	Yes	Y - M	Y - M		
Santa Ana sucker	*Catostomus santaanae*	FT	--	AFS:TH, DFG:SSC, IUCN:VU, USFS:S	G1	S1	1	Yes	Yes	Y - CH, Y - M	Y - CH	Yes	Yes

Common Name	Scientific Name	Federal Listing	State Listing	Other Listing	G Rank	S Rank	Rank	Possible in Study Area	Indicated in Study Area by GIS range or point data	Overlaps with M2 Projects M=Model	Overlaps with NON–M2 Projects; M=Model	Sufficient Data for Evaluation	Proposed for Coverage
Tidewater goby	*Eucyclogobius newberryi*	FE	SSC	AFS:EN, DFG:SSC, IUCN:VU	G3	S2S3	1	Yes	Yes	Y		Yes	Yes
Amphibians													
Arroyo toad	*Anaxyrus californicus*	FE	--	DFG:SSC, IUCN:EN	G2G3	S2S3	1	Yes	Yes	Y - CH, Y - M	Y, Y - M	Yes	Yes
Western spadefoot	*Spea hammondii*	--	--	BLM:S, DFG:SSC, IUCN:NT	G3	S3	2	Yes	Yes	Y - M	Y - M	Yes	
Reptiles													
Coast horned lizard	*Phrynosoma coronatum (blainvillii population)*	--	--	DFG:SSC, IUCN:LC, USFS:S	G4G5	S3S4	2	Yes	Yes	Y - M	Y - M	Yes	Yes
Northern red-diamond rattlesnake	*Crotalus ruber ruber*	--	--	DFG:SSC	G4T3T4	S2?	2	Yes	Yes	Y - M	Y - M	Yes	
Orangethroat whiptail	*Aspidoscelis hyperythra*	--	--	DFG:SSC, IUCN:LC	G5T4T5	S2	2	Yes	Yes	Y - M	Y - M	Yes	Yes
Western pond turtle	*Emys marmorata*	--	--	BLM:S, DFG:SSC, IUCN:VU, USFS:S	G3G4T2 T3Q	S2	2	Yes	Yes	Y - M		Yes	Yes

Common Name	Scientific Name	Federal Listing	State Listing	Other Listing	G Rank	S Rank	Rank	Possible in Study Area	Indicated in Study Area by GIS range or point data	Overlaps with M2 Projects M=Model	Overlaps with NON–M2 Projects; M=Model	Sufficient Data for Evaluation	Proposed for Coverage
Birds													
Belding's savannah sparrow	*Passerculus sandwichensis beldingi*	--	SE		G5T3	S3	1	Yes	Yes	Y	Y	Yes	
Bell's Sage Sparrow	*Amphispiza belli belli*	--	CSC	MBTA, ABC:WLBCC, DFG:WL, USFWS:BCC	G5T2T4	S2?	3	Yes	Yes	Y - M	Y - M		
Burrowing Owl	*Athene cunicularia*	--	--	BLMS, MBTA, DFG:SSC, IUCN:LC, WSFWS:BCC	G4	S2	2	Yes	Yes	Y - M	Y - M	Yes	
Cactus wren	*Campylorhynchus brunneicapillus sandiegensis*	--	--	DFG:SSC, USFS:S, USFWS:BCC	G5T3Q	S3	2	Yes	Yes	Y - M	Y - M	Yes	Yes
California Black Rail	*Laterallus jamaicensis coturniculus*	--	ST	MBTA, ABC:WLBCC, DFG:FP, IUCN:NT, USFWS:BCC	G4T1	S1	1	Yes	Yes	Y, Y - M	Y, Y - M	Yes	
Coastal California gnatcatcher	*Polioptila californica californica*	FT	--	ABC:WLBCC, DFG:SSC	G3T2	S2	1	Yes	Yes	Y - CH, Y - M	Y - CH, Y - M	Yes	Yes

Common Name	Scientific Name	Federal Listing	State Listing	Other Listing	G Rank	S Rank	Rank	Possible in Study Area	Indicated in Study Area by GIS range or point data	Overlaps with M2 Projects M=Model	Overlaps with NON–M2 Projects; M=Model	Sufficient Data for Evaluation	Proposed for Coverage
Grasshopper Sparrow	*Ammodramus savannarum*	--	--	MBTA, DFG:SSC, IUCN:LC	G5	S2	2						
Large-billed savannah sparrow	*Passerculus sandwichensis rostratus*	--	--	MBTA, DFG:SSC	G5T2T3	S2?	2	Yes	Yes				
Least Bell's vireo	*Vireo bellii pusillus*	FE	SE	ABC:WLBCC, IUCN:NT, USFWS:BCC	G5T2	S2	1	Yes	Yes	Y, Y - M	Y, Y - M	Yes	Yes
Light-footed clapper rail	*Rallus longirostris levipes*	FE	SE	ABC:WLBCC, DFG:FP	G5T1T2	S1	1	Yes	Yes	Y	Y	Yes	
Southern California rufous-crowned sparrow	*Aimophila ruficeps canescens*	--	--	DFG:WL	G5T2T4	S2S3	3	Yes	Yes	Y - M	Y - M	Yes	
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE	SE	ABC:WLBCC	G5T1T2	S1	1	Yes	Yes	Y - M	Y - M	Yes	Yes
Mammals													
Big free-tailed bat	*Nyctinomops macrotis*	--	--	DFG:SSC, IUCN:LC, WBWG:MH	G5	S2	2	Yes	Yes	Y - M		Yes	Yes

Common Name	Scientific Name	Federal Listing	State Listing	Other Listing	G Rank	S Rank	Rank	Possible in Study Area	Indicated in Study Area by GIS range or point data	Overlaps with M2 Projects M=Model	Overlaps with NON–M2 Projects; M=Model	Sufficient Data for Evaluation	Proposed for Coverage
Bobcat	*Lynx rufus*	--	--	--	G5	S5	4	Yes	Yes			Yes	Yes
Long-eared myotis bat	*Myotis evotis*	--	--	BLM:S, IUCN:LC, WBWG:M	G5	S4?	3	Yes				Yes	Yes
Mountain lion	*Puma concolor*	--	--	--	G5	S5	4	Yes	Yes			Yes	Yes
Pallid bat	*Antrozous pallidus*	--	--	BLM:S, DFG:SSC, IUCN:LC, USFS:S, WBWG:H	G5	S3	2	Yes	Yes	Y - M	Y - M	Yes	Yes
Western small-footed myotis bat	*Myotis ciliolabrum*	--	--	BLM:S, IUCN:LC, WBWG:M	G5	S2S3	3	Yes	Yes	Y - M	Y - M	Yes	Yes
Yuma myotis bat	*Myotis yumanensis*	--	--	BLM:S, IUCN:LC, WBWG:LM	G5	S4?	3	Yes	Yes			Yes	Yes

Table C.4-2. Final Recommendations for Inclusion

Species	Notes, Comments, and Species List Decision for Species List Review Workshop with USFWS and CDFG	Final Recommendation	Species on Planning Agreement
Plants			
Big-leaved crownbeard	Model and known location impacted by M2 & Other projects. Check accuracy of data point to assess likelihood. /check /TAIC provide screenshot of overlap of model/locations vs. projects /Modeled habitat abuts project footprint and within 300 ft buffer. Review decision with OCTA and wildlife agencies. However, no known locations near covered freeway improvement projects.	No	No
Braunton's milk-vetch	Model and critical habitat impacted by M2 & Other projects. /check /TAIC provide screenshot of overlap of model/locations vs. projects /No saltmarsh overlap with projects.	No	Yes
California orcutt grass	Model and known location impacted by M2 & Other projects. Check accuracy of data point to assess likelihood. /check /TAIC provide screenshot of overlap of model/locations vs. projects /Minor overlap of CH with 300ft project buffer. CNDDB location nearby. Impact unlikely. CDFG indicated ok to drop from list.	No	No
Coulter's matillija poppy	Lower sensitivity ranking and no indication of potential project impacts. /	No	Yes
Intermediate mariposa lily	More wide spread. Projects likely to impact, but mitigation likely to conserve. Listing unlikely. /Retain on list due to NCCP multiple species standards	Yes	Yes
Laguna Beach dudleya	Model and known location impacted by M2 & Other projects. Check accuracy of data point to assess likelihood. /check /TAIC provide screenshot of overlap of model/locations vs. projects /Model is way over-predicting. Potential habitat is widespread. No known locations near projects. Don't add to list.	No	No
Many-stemmed dudleya	More wide spread. Projects likely to impact, but mitigation likely to conserve. Listing unlikely. /Retain on list due to NCCP multiple species standards	Yes	Yes
Salt marsh bird's-beak	Model and known location impacted by M2 & Other projects. Check accuracy of data point to assess likelihood. /Is salt marsh affected anywhere? /TAIC provide screenshot of overlap of salt marsh habitat vs. projects /No saltmarsh overlap with projects.	No	No
Southern tarplant	Projects likely to impact, but mitigation likely to conserve. Listing unlikely. /Retain on list due to NCCP multiple species standards	Yes	Yes

Species	Notes, Comments, and Species List Decision for Species List Review Workshop with USFWS and CDFG	Final Recommendation	Species on Planning Agreement
Invertebrates			
Quino checkerspot butterfly	Locality impacted by M2 & Other projects. Check spatial accuracy of locality. /Historic point. Not likely in County. /	No	No
Riverside fairy shrimp	Vernal pool species. Model over predicts distribution. Actual take unlikely. Not planning to cover any vernal pool species. /No coverage needed. /	No	No
San Diego fairy shrimp	Vernal pool species. Model over predicts distribution. Actual take unlikely. Not planning to cover any vernal pool species. /No coverage needed. /	No	No
Vernal pool fairy shrimp*	Vernal pool species. Model over predicts distribution. Actual take unlikely. Not planning to cover any vernal pool species. /No coverage needed. /	No	No
Fish			
Arroyo chub	Proposed covered	Yes	Yes
Santa Ana speckled dace	Model is known occupied stream reaches (P. Moyle data). Review impact location to assess actual potential for impact. /Probably add, but check GIS for better spatial accuracy in overlap. /TAIC provide screenshot of overlap of model/locations vs. projects /All but one overlaps are artifacts where no habitat remains. Project J at county line has Santa Ana River within 300ft buffer. However, project will not impact Santa Ana River, so ok to drop species from list.	No	No
Santa Ana sucker	Proposed covered	Yes	Yes
Tidewater goby	Model is known occupied stream reaches (P. Moyle data). Review impact location to assess actual potential for impact. /Check data /TAIC provide screenshot of overlap of model/locations vs. projects /	Yes	No
Amphibians			
Arroyo toad	Potential impact critical habitat, model, and known localities from covered and non-covered freeway improvement projects. Only one stream reach where feasible conservation opportunities exist. Assess the benefit of coverage against the cost of achieving conservation goals when options are limited. /Critical habitat is main issue. Coverage warranted to streamline this issue. /Apply USFWS Arroyo toad model to Plan Area /	Yes	No
Western spadefoot	Potential impact to modeled habitat. Consider likelihood of species listing. Conservation of other scrub/grassland species where breeding pools nearby will benefit the species. Is benefit of coverage worth species-specific monitoring obligations? /unlikely to be listed. /	No	No

Species	Notes, Comments, and Species List Decision for Species List Review Workshop with USFWS and CDFG	Final Recommendation	Species on Planning Agreement
Reptiles			
Orangethroat whiptail	Potential impact to modeled habitat. Consider likelihood of species listing. Conservation of other scrub/grassland species will benefit the species. Is benefit of coverage worth species-specific monitoring obligations? /More common. Costs of monitoring not worth assurances. Drop /Retain on list due to NCCP multiple species standards	Yes	Yes
Coast horned lizard	Potential impact to modeled habitat. Consider likelihood of species listing. Conservation of other scrub/grassland species will benefit the species. Is benefit of coverage worth species-specific monitoring obligations? /Sensitivity doesn't warrant coverage. However, useful indicator spp. for landscape integrity. Drop from Covered Spp. list. Keep as planning/indicator species for preserve monitoring framework and preserve community composition integrity indicator (i.e., edge effects on ant community). /Retain on list due to NCCP multiple species standards	Yes	Yes
Northern red-diamond rattlesnake	Important indicator species for upland habitats. Indicates patch size and connectivity sufficient to support a sustainable prey base. /Drop from Covered Spp. list. Keep as planning/indicator species for preserve monitoring framework and preserve community composition integrity indicator. /	No	Yes
Western pond turtle	Important indicator species for freshwater/upland ecosystem. /	Yes	Yes
Birds			
Belding's savannah sparrow	Known location impacted by M2 & Other projects. Check accuracy of data point to assess likelihood. Saltmarsh/estuary impacts? Are there feasible conservation opportunities? /Check for any real saltmarsh impacts. Check location accuracy. Probably not covered. /TAIC provide screenshot of overlap of salt marsh vs. projects /No saltmarsh overlap with projects.	No	No
Bell's sage sparrow	Not proposed for coverage. Low likelihood of listing.	No	No
Burrowing owl	Model impacted by M2 & Other projects. /Consider as planning species. Larger grassland habitats. /Include in new NCCP/HCP category of Planning/Indicator species. /Add as Planning Species Only	No	No

Species	Notes, Comments, and Species List Decision for Species List Review Workshop with USFWS and CDFG	Final Recommendation	Species on Planning Agreement
California black rail	Model and known location impacted by M2 & Other projects. Check accuracy of data point to assess likelihood. .Saltmarsh/estuary impacts? /Check for any real saltmarsh impacts. Check location accuracy. Probably not covered. /TAIC provide screenshot of overlap of salt marsh vs. projects /No saltmarsh overlap with projects.	No	No
Grasshopper Sparrow	Check known locality database before final decision. /check /TAIC provide screenshot of overlap of model/locations vs. projects /No known localities near projects. Only overlap with general WHR range map. Don't add to list	No	No
Large-billed savannah sparrow	Salt marsh impact? /Saltmarsh issue /TAIC provide screenshot of overlap of salt marsh vs. projects /No saltmarsh overlap with projects.	No	No
Least Bell's vireo	Proposed covered.	Yes	Yes
Light-footed clapper rail	Known location impacted by M2 & Other projects. Check accuracy of data point to assess likelihood. Saltmarsh/estuary or near riparian impacts? Are there feasible conservation opportunities? /Check for any real saltmarsh impacts. Check location accuracy. Probably not covered. /TAIC provide screenshot of overlap of salt marsh vs. projects /No saltmarsh overlap with projects.	No	No
Cactus wren	Proposed covered.	Yes	Yes
Coastal California gnatcatcher	Proposed covered.	Yes	Yes
Southern California rufous-crowned sparrow	What was the driver behind putting this species on the draft covered species list? Listing likely? Coverage worth monitoring costs? /Drop /Dropping species per Species List Review Workshop decision	No	Yes
Southwestern willow flycatcher	Proposed covered.	Yes	Yes
Mammals			
Big free-tailed bat	Listing likely? Coverage worth monitoring costs? /Consider general bat management strategy rather than species specific coverage. Planning/management species. /Drop from covered species list as part of bat species evaluation	No	No

Species	Notes, Comments, and Species List Decision for Species List Review Workshop with USFWS and CDFG	Final Recommendation	Species on Planning Agreement
Bobcat	Listing likely? Coverage worth monitoring costs? No, but important to include as a planning species, use for considering wildlife movement corridor connectivity. /Planning species for connectivity /Retain on list due to NCCP multiple species standards	Yes	Yes
Long-eared myotis bat	Listing likely? Coverage worth monitoring costs? /Consider general bat management strategy rather than species specific coverage. Planning/management species. /Drop from covered species list as part of bat species evaluation	No	Yes
Mountain lion	Listing likely? Coverage worth monitoring costs? No, but important to include as a planning species, use for considering wildlife movement corridor connectivity. /Planning species for connectivity /Retain on list due to NCCP multiple species standards	Yes	Yes
Pallid bat	Listing likely? Coverage worth monitoring costs? /Waiting for CDFG bat expert input. /Cara to follow up with bat expert. /Drop from covered species list as part of bat species evaluation.	No	Yes
Small-footed myotis bat	Listing likely? Coverage worth monitoring costs? /Consider general bat management strategy rather than species specific coverage. Planning/management species. /Drop from covered species list as part of bat species evaluation	No	Yes
Yuma myotis bat	Listing likely? Coverage worth monitoring costs? /Consider general bat management strategy rather than species specific coverage. Planning/management species. /Drop from covered species list as part of bat species evaluation	No	Yes

Species Range Evaluation Process

Species data sources were reviewed to further modify the species list based on a species' narrow distribution, location in a small number of specific localities, or presence only outside the Plan Area. These sources include range/distribution sources, location sources, and species experts.

Range/Distribution Sources

Databases detailing species range and distribution information were used to display species ranges in an interactive display environment and on hardcopy maps. Biologists used this species range and distribution information to determine the likelihood of a species occurring within the Plan Area. The ranges provide rationale for inclusion on the list based on the potential for a species to occur in the vicinity of the Plan Area. Range and distribution sources include the following.

- **CNPS quads.** A database containing U.S. Geological Survey (USGS) 7.5-minute quadrangles for which plant species are known to occur.
- **CalJep ranges.** A database containing distributions for plant species based on suitable habitat. In addition to known distributions, this database provides possible distributions for each species based on potential habitat.
- **Critical and proposed habitat.** As issued by the USFWS, proposed and designated critical habitats for plant and wildlife species are identified by GIS specialists within the Plan Area. Critical habitats represent important areas of habitat that should be protected to ensure recovery of threatened and endangered species.
- **Wildlife Habitat Relationship (WHR) ranges.** A database containing distributions for California wildlife species. Ranges are given only for the species level; subspecies are not recognized in this database.
- **Online databases.** Biologists used other available online databases to gather information on selected species to determine their distribution. This is especially useful when GIS data for specific species were unavailable.

Occurrence Sources

Occurrence data sources provide documentation of known locations for individual species. These locations are based on confirmed sightings of a species is a specific area. They were combined with known or predicted ranges to further refine the draft species list. Location sources include the following.

- **CNDDB locations.** Location database containing confirmed species locations for both plant and wildlife species.
- **USFWS points.** Point location database containing confirmed species points for both plant and wildlife species.
- **Supplemental species locality database.** A database compiled by Technology Associates GIS specialists based on several local data sources of confirmed species points for both plant and wildlife species.

Species Data Evaluation Process

Sufficient biological and ecological data and information must be available for each species proposed for coverage to be able to evaluate the potential effects of covered activities on the species. Without sufficient data, a justified conservation strategy cannot be developed and the species is removed from the final species list. Species accounts and other available information were reviewed to determine the extent of known scientific data relevant to each species. Detailed species profiles summarizing life history, distribution, and threats and limiting factors were created for each of the 18 species remaining on the list and for which enough information appears to be available (Appendix C.2). Conservation strategies specific to each species will be developed using the information in the species profiles.

Feasibility Evaluation Process

The final step in the refinement process is evaluating the overall feasibility of conserving a species. This evaluation may come later in the NCCP/HCP process, once draft conservation strategies are developed. Overall feasibility is based on the cost of implementing a conservation strategy relative to the benefit of conservation. If it is determined that the effort to implement a conservation strategy outweighs the benefit gained for that species or that it would disproportionately reduce available resources for other high-priority species, the species might be removed from the list.

Bat Species Evaluation

A total of five bat species were evaluated in more detail for inclusion on the covered species list. However, bats were ultimately not included in the final species list for the following reasons:

- The primary impacts to bats likely to occur as a result of covered freeway improvement projects would be to roosting sites and maternity colonies in bridge structures, and impacts to bat foraging habitat would be minimal and incremental. While the Plan conservation actions (Preserve acquisitions, habitat restoration projects) provide for the conservation of bat foraging habitat, no known roosting habitat were documented in these areas.
- Regional species distribution models are insufficient to identify and link impacts and conservation actions for individual bat species. Information sources to estimate the distribution of individual bat species are lacking; therefore, estimates of impacts and conservation for individual bat species needs to be determined through site specific surveys.
- Bats exhibit strong site fidelity and often come back to the same roost sites throughout their life. For this reason, the typical mitigation of impacts to bat roosting habitat involves implementation of measures that provide options for roosting habitat in close proximity to the impacted habitat. These measures are determined on a case-by-case basis which makes it difficult to design an upfront mitigation solution that is not site-specific.

Final Species List

The criteria and methods described above allowed the NCCP/HCP team of biologists and wildlife agency staff to develop and refine the list of species pursued for coverage under the NCCP/HCP. After the completion of this review process, the final list of covered species was revised to include a total of 13 taxa (Table C.4-3). This list includes 13 of the original 22 planning agreement species (indicated by the asterisk next to the species common name).

Table C.4-3. Final List of Taxa included as Covered Species in the Plan.

Common Name	Scientific Name
Plants	
Intermediate mariposa lily*	*Calochortus weedii* var. *intermedius*
Many-stemmed dudleya*	*Dudleya multicaulis*
Southern tarplant*	*Centromadia parryi* ssp. *australis*
Fish	
Arroyo chub*	*Gila orcutti*
Reptiles	
Coast horned lizard*	*Phrynosoma blainvillii*
Orangethroat whiptail*	*Aspidoscelis hyperythra*
Western pond turtle*	*Emys marmorata*
Birds	
Cactus wren*	*Campylorhynchus brunneicapillus*
Coastal California gnatcatcher*	*Polioptila californica californica*
Least Bell's vireo*	*Vireo bellii pusillus*
Southwestern willow flycatcher*	*Empidonax traillii extimus*
Mammals	
Bobcat*	*Lynx rufus*
Mountain lion*	*Puma concolor*

* Species is one of the 22 taxa originally proposed for coverage in the M2 NCCP/HCP Planning Agreement.

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Appendix C.5

CBI Conservation Assessment Summary

Appendix C.5
CBI Conservation Assessment Summary

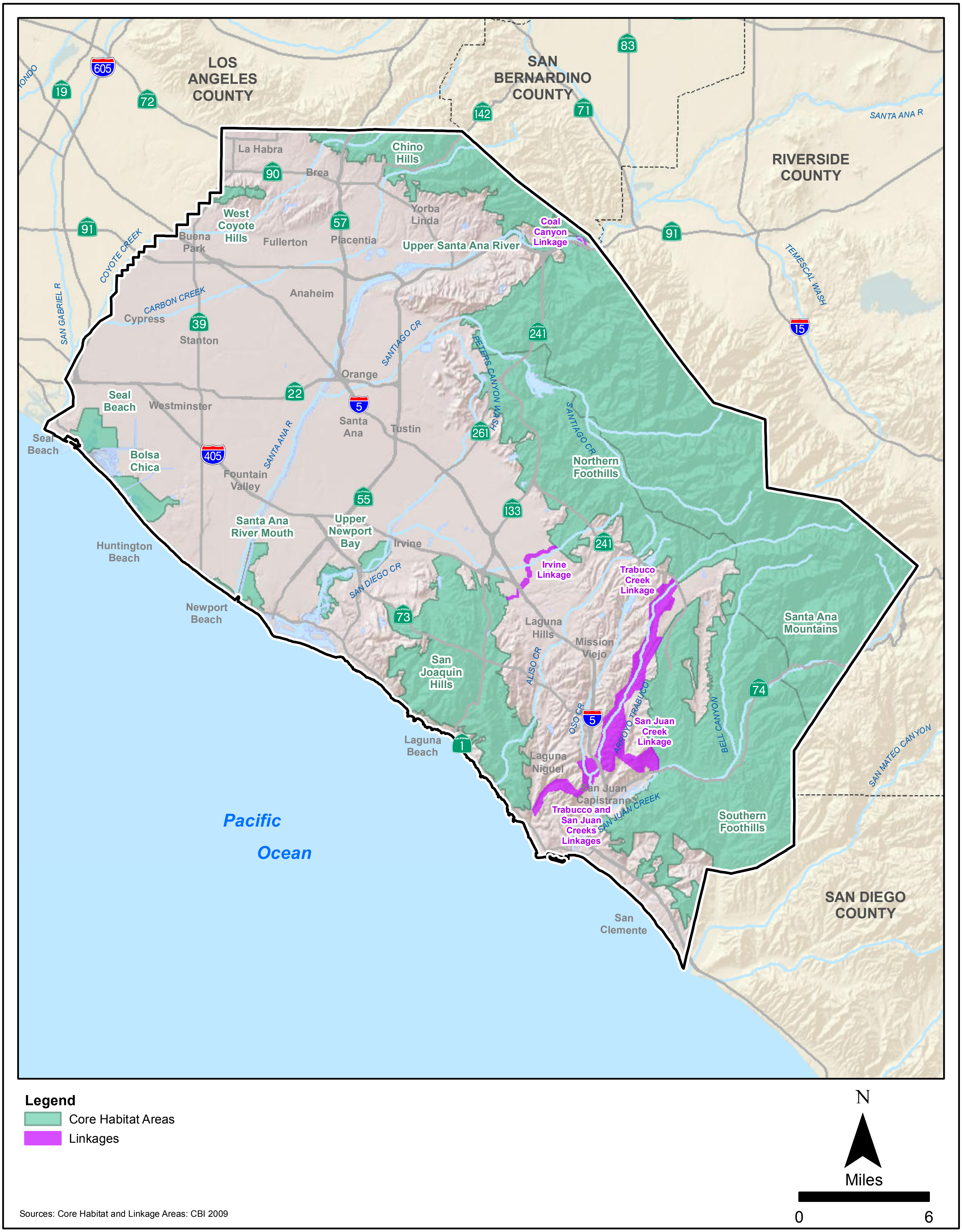
Introduction

CBI conducted a formal conservation assessment to identify key areas of natural habitat in the Plan Area (CBI 2009). The assessment's objectives were as follows.

- Develop an objective, science-based process for focusing decision-making on regional conservation priorities.
- Using existing data and applying NCCP tenets of conservation planning, map the distribution of conservation values of undeveloped lands in Orange County, including both protected and unprotected lands. Protected lands are properties in public or private ownership that will be maintained as open space for the purposes of maintaining natural ecosystems.
- Identify components of a regional reserve network, focusing on adding to existing reserve areas to build large core habitat areas with habitat linkages between them to enhance their persistence.
- Develop specific conservation objectives to maximize conservation values for each core and linkage area.
- Based on these objectives, identify areas where conservation of biological resources should be prioritized to improve landscape integrity and connectivity, protect rare species and their habitats, and ensure long-term persistence of natural processes.

As a result of this process, 11 Core Habitat Areas and 4 existing or potentially viable linkages that include both protected and unprotected natural lands were identified (Figure C.5-1). To further refine the design of the Plan's Preserve System, individual parcels within unprotected natural lands, designated as "Opportunity Areas," were assessed relative to their (a) position on the interior or edge of the core area and (b) proximity to protected open space. The positional factor considered "edge effects," or habitat degradation that occurs at or near the urban-wildland interface (i.e., the habitat "edge"), while the proximity factor recognized the value of adding to existing conservation investments. Using this evaluation process, unprotected lands expected to contribute most to the integrity of the existing regional reserve system were identified for each core and linkage area. Establishing specific conservation objectives for each core and linkage area allowed identification of those parcels or groups of parcels for which acquisition would be a "no regrets" decision, based on their contribution to the existing regional reserve system. These no-regrets lands, or Priority Conservation Areas (PCAs), represent the final step in the reserve design filtering process and are the focus of initial conservation efforts for development of the Preserve System.

The Core Habitat Areas, landscape linkages, Opportunity Areas, and PCAs are discussed further below.



OCTA

Core Habitat Areas and Linkages

C.5-1

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Date: 4/13/2016

Core Habitat Areas

The conservation assessment identified Core Habitat Areas as a way to subdivide and describe the distribution of natural features, habitat, and overall conservation value. The primary purpose of these areas is to describe the specific areas in which conservation actions, including land acquisitions, will occur without identifying individual parcels. Designation of Core Habitat Areas was based on conservation values, with a focus on areas of high landscape integrity, high biodiversity, large patch size, and, to some degree, shape. Based on these criteria, 11 Core Habitat Areas were identified across the Plan Area (Figure C.5-1):

- Santa Ana Mountains
- Northern Foothills
- Southern Foothills
- San Joaquin Hills
- Chino Hills
- West Coyote Hills
- Upper Santa Ana River
- North Coast (Seal Beach, Bolsa Chica, Santa Ana River Mouth, and Upper Newport Bay)

A brief description of each Core Habitat Area is presented below.

Santa Ana Mountains Core Habitat Area

The Santa Ana Mountains constitute the largest block of high integrity habitat in the Plan Area. Based on size, location, and connectivity to other core areas both within and beyond the county, this core area functions as the "backbone" of the regional reserve system. Maintenance of intact habitat within this core area is critical to the continued persistence of wide-ranging species in the region such as mountain lion and mule deer (*Odocoileus hemionus*). In addition, this core area is large enough to support intact ecosystem processes and has the ability to function as both refugium and source area for key species in the event of large-scale disturbances or climate change. This core area is characterized by both medium- and high elevation vegetation communities and species, and supports the only coniferous forest in Orange County. An estimated 88% of habitat within this core area is currently protected, much of that in the Cleveland National Forest.

Key conservation objectives for the Santa Ana Mountains Core Habitat Area include conserving core populations of Covered Species, including bobcat and mountain lion.

Northern Foothills Core Habitat Area

The Northern Foothills Core Habitat Area is a medium-sized core area situated at the western base of the Santa Ana Mountains. Despite their contiguity with the Santa Ana Mountains Core Habitat Area, the Northern Foothills are delineated separately because they support primarily low elevation vegetation and sensitive species. The Northern Foothills are bordered by urban development to the west, and are fragmented by two major highways and rural residential development. Nonetheless, this Core Habitat Area supports relatively large blocks of intact habitat and high biodiversity. In combination with habitat to the east, the Northern Foothills also support wide-ranging species. The southern end of this core lies between the Santa Ana Mountains and Trabuco Creek/O'Neill Canyon, and is critical to maintaining wildlife movement between these two areas. An estimated 76% of this core area is currently protected, much of that on lands within the Central Subregion of the Central-Coastal NCCP/HCP planning area.

Key conservation objectives for the Northern Foothills Core Habitat Area include conserving core populations of Covered Species, including coastal cactus wren, coastal California gnatcatcher, bobcat, mountain lion, intermediate mariposa-lily, and many-stemmed dudleya.

Southern Foothills Core Habitat Area

The Southern Foothills constitute the second largest core area in the Plan Area. They are contiguous with the Santa Ana Mountains Core Habitat Area to the north and existing conservation investments in San Diego County to the south. The eastern and southern portions of this core area are largely undeveloped and intact, while the northern and western edges are adjacent to and fragmented by a number of residential developments (e.g., Rancho Santa Margarita, Ladera Ranch, Cote de Caza, Rancho Mission Viejo) and associated roads. San Juan Creek and the Ortega Highway bisect this core area.

The southern portion, in particular, has been identified as a "hotspot" of biological diversity (CBI 2001). It is a core area for several vegetation communities, and supports core populations of Covered Species, designated critical habitat, and wide-ranging species such as mountain lion and golden eagle. An estimated 79% of this core area is currently protected within the Southern Subregion HCP planning area and other public or private conservation investments.

Key conservation objectives for the Southern Foothills Core Habitat Area include conserving core populations of Covered Species, including coastal cactus wren, coastal California gnatcatcher, least Bell's vireo, bobcat, and mountain lion.

San Joaquin Hills Core Habitat Area

The San Joaquin Hills Core Habitat Area is a medium-sized block of habitat on the immediate coast. It supports high quality, relatively intact habitat, but is bisected by two major roads (SR-73 and SR-133), and is largely isolated from other sizeable Core Habitat Areas, which may have implications for the long-term viability of biological resources. For example, this area is no longer capable of supporting wide-ranging species such as mountain lion or mule deer. The bobcat population in the San Joaquin Hills appears to be genetically distinct from the population in the Santa Ana Mountains, although no evidence of inbreeding has been noted in either the coastal or inland population (Lyren et al. 2008b). The San Joaquin Hills support a number of sensitive vegetation communities and core populations of rare species, including the endemic Laguna Beach dudleya (*Dudleya stolonifera*), the only U.S. population of big-leaved crownbeard (*Verbesina dissita*), coastal cactus wren (*Campylorhynchus brunneicapillus*), and coastal California gnatcatcher, among others. An estimated 84% of this core area is currently protected, primarily within the Coastal Subarea of the Central-Coastal NCCP/HCP planning area.

Key conservation objectives for the San Joaquin Hills Core Habitat Area include conserving core populations of Covered Species, including coastal cactus wren, coastal California gnatcatcher, least Bell's vireo, bobcat, and many-stemmed dudleya.

Chino Hills Core Habitat Area

The Chino Hills are situated at the northern edge of the Santa Ana Mountains, along the Orange County–Los Angeles County line. The Chino Hills core area is delineated separately from the Santa Ana Mountains because it generally supports lower elevation vegetation communities and species. In addition, the two core areas are physically separated by the Santa Ana River. The Chino Hills Core Habitat Area is contiguous with the Puente Hills to the north in Los Angeles County, and is adjacent to the heavily urbanized Los Angeles Basin to the south and west. SR-57 transects the area, and encroaching development has resulted in habitat fragmentation along the southern edge and in the western portion. The eastern portion lies largely within Chino Hills State Park.

The Chino Hills Core Habitat Area is notable for its biodiversity, including the sensitive and regionally under-protected California walnut woodland, as well as core populations of Covered Species. Substantial stands of walnut woodland occur in Tonner Canyon, and coastal sage scrub in the Chino Hills is critical habitat for the coastal California gnatcatcher. Although this core area currently supports wide-ranging species such as mountain lion and mule deer, persistence of these species in the Chino Hills is contingent upon maintaining a connection with more extensive habitat to the southeast in the Santa Ana Mountains. An estimated 57% of this core area is currently protected, much of that in Chino Hills State Park.

Key conservation objectives for the Chino Hills Core Habitat Area include conserving core populations of Covered Species, including coastal cactus wren, coastal California gnatcatcher, bobcat, and mountain lion.

West Coyote Hills Core Habitat Area

The West Coyote Hills Core Habitat Area is a relatively small block of habitat in the northwest portion of the county. This core—the second smallest in the Plan Area—is isolated from other Core Habitat Areas and lies within a matrix of urban lands. These factors lower its resilience to short- and long-term disturbance events, as well as the potential for long-term persistence of biological resources. The effects of habitat loss and fragmentation are reflected in the relatively low biodiversity of this area compared to other core areas in Orange County.

Despite these shortcomings, West Coyote Hills currently supports several key species, including a large population of the coastal California gnatcatcher. Coastal sage scrub in this core area is designated critical habitat for the gnatcatcher. In addition, this core area may function as a temporary refugium for gnatcatchers to the north, in the Puente-Chino Hills. An estimated 18% of this core area is currently protected.

Upper Santa Ana River Core Habitat Area

The Upper Santa Ana River Core Habitat Area includes that portion of the Santa Ana River that flows through Santa Ana Canyon, just west of the Orange County–Riverside County line. This is the smallest core area in the Plan Area; however, it lies between the largest—the Santa Ana Mountains—and a medium-sized Core Habitat Area, the Chino Hills. The Upper Santa Ana River core area was designated primarily for its high quality riparian habitat, which is utilized by at least two riparian-obligate bird species: the least Bell's vireo and southwestern willow flycatcher. This core area is utilized by wide-ranging species that travel between the Santa Ana Mountains and Chino Hills.

The landscape integrity of this Core Habitat Area is relatively low due to river alterations and adjacent urban development and roads. Its resilience to disturbance events and climate change may be compromised by its size, shape, edge effects, and future road-widening projects. An estimated 56% of this core area is currently protected.

Key conservation objectives for the Upper Santa Ana River Core Habitat Area include conserving core populations of Covered Species, including least Bell's vireo and southwestern willow flycatcher.

North Coast Core Habitat Areas

The North Coast Core Habitat Areas consist of four distinct coastal wetland units, each of which is considered a distinct Core Habitat Area: Seal Beach, Bolsa Chica, Santa Ana River Mouth, and Upper Newport Bay. Although relatively small and isolated, each of these core areas supports valuable wetland habitat and among the largest concentrations of threatened and endangered species in Orange County. The significance of these wetlands extends far beyond their geographic boundaries. Situated along the Pacific Flyway in a section of California that has suffered extensive wetland habitat losses, they provide important wintering and migratory *stepping-stone* habitats for numerous shorebirds and waterfowl. In addition, a number of endemic invertebrate species occur in these systems. Where these wetlands abut upland habitat, sensitive upland species such as coastal California gnatcatcher and coastal cactus wren occur. Extensive grasslands surrounding these wetlands provide significant raptor foraging areas as well.

Because these wetlands are small, isolated, and situated largely within a matrix of urban lands, they lack the full range of ecosystem functions and are subject to edge effects. These factors may compromise their ability to respond to future climate change or disturbance events. Nonetheless, the high biodiversity of these core areas, which includes regionally under-protected and sensitive wetland habitats and a concentration of endangered and threatened species, warrants continued long-term conservation efforts.

The Seal Beach Core Habitat Area, which includes habitat at Anaheim Bay and the Seal Beach National Wildlife Refuge, supports some of the healthiest wetlands in southern California (SCWRP 2001). An estimated 99% of this core area is currently protected.

The Bolsa Chica Core Habitat Area includes some of the most important remnant wetlands in southern California. An estimated 76% of this core area is currently protected.

The Santa Ana River Mouth Core Habitat Area includes habitat along the Santa Ana River, as well as the Huntington Beach wetlands. Together, these areas represent the remnants of a formerly expansive wetland system that once covered 2,900 acres (SCWRP 2001). An estimated 76% of this core area is currently protected. Key conservation objectives for this Core Habitat Area include conserving core populations of Covered Species, including the coastal California gnatcatcher.

The Upper Newport Bay Core Habitat Area, which includes Upper Newport Bay and San Joaquin Marsh, supports some of the highest quality tidal marsh habitat in southern California (SCWRP 2001). An estimated 93% of this core area is currently protected. Key conservation objectives for this Core Habitat Area include conserving core populations of Covered Species, including the coastal California gnatcatcher.

Landscape Linkages

Landscape linkages are vital in the prioritization of acquisitions and restoration efforts and, ultimately, design of the Preserve System. For the purposes of this Plan, landscape linkages are defined as areas that allow for the movement of species from one area of suitable habitat to another. A linkage can vary from a narrow strip of habitat that only functions as a conduit for movement (i.e., a corridor) or a large area of intact habitat that is used for movement, dispersal, and other life functions such as foraging and breeding.

The NCCPA explicitly requires NCCPs to address landscape or habitat linkages, as shown below.

> Establishing one or more reserves or other measures that provide equivalent conservation of Covered Species within the plan area and linkages between them and adjacent habitat areas outside of the plan area (Section 2820[a][4][B])….
>
> Sustaining the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the habitat areas within the plan area (Section 2820[a][4][E]).

Some species require linkages for periodic migrations among different habitat types used for breeding, feeding, or roosting. Wildlife movement from one important habitat area to another may vary from daily to seasonal migration depending on the species. Linkages may also be needed for the permanent immigration or emigration of individuals among habitat patches, allowing for gene flow and recolonization after local extinction (Beier and Noss 1998, Hilty et al. 2006, Groom et al. 2006).

Linkage requirements differ greatly from species to species. Specific characteristics of linkages, such as dimensions, location, and quality of habitat, can influence species use. Wider linkages tend to be more effective than narrower linkages (Merenlender and Crawford 1998, Hilty et al. 2006). These linkages are described below and illustrated in Figure C.5-1.

Coal Canyon Linkage

The Santa Ana Mountains are separated from the Puente-Chino Hills by SR-91, a major freeway with heavy traffic and significant physical barriers to wildlife (Spencer 2005). The only viable linkage between these two areas is the Coal Canyon linkage, a wildlife underpass that was restored specifically to maintain this connectivity. This underpass is critical to maintaining movement of wide-ranging species between these two areas.

The Coal Canyon linkage is an existing, protected linkage; however, this connection is potentially threatened by road-widening projects and infrastructure improvements. Further, wildlife use of this linkage may be inhibited by a lack of vegetation, as well as high noise levels from the freeway. This linkage is currently protected and supports about 65% native vegetation.

Irvine Linkage

The San Joaquin Hills Core Habitat Area supports regionally important biological resources, but appears to be functionally isolated from other sizeable core areas in the region. Establishing or enhancing connectivity between this area and other core areas is critical to the long-term persistence of conservation values in the San Joaquin Hills. The City of Irvine has developed the *Irvine Wildlife Corridor Plan* to establish a linkage through the former Marine Corps Air Station (MCAS) El Toro property. This connection would extend from Limestone-Whiting Wilderness Park in the Northern Foothills through the Orange County Great Park to Laguna Coast Wilderness Park in the San Joaquin Hills (Cotton/Bridges Associates and EcoSystems Restoration Associates 2004).

The Irvine linkage, which includes the proposed Irvine Wildlife Corridor and additional lands to the east and west, is the shortest route between the San Joaquin Hills and Northern Foothills Core Habitat Areas. In addition, much of the linkage is already protected. This linkage would, however, require extensive habitat restoration and road enhancements or modifications to encourage wildlife use. The width of the proposed corridor is constrained by existing development in several areas, including portions of the Great Park and just west of the I-5/I-405 interchange (El Toro "Y"). Lyren et al. (2008a) identified the 26-lane I-5/I-405 interchange as the major constriction point of this proposed linkage and the biggest obstacle to functional connectivity. It is anticipated that use of the El Toro "Y" undercrossing by wildlife species would require extensive structural modifications. An estimated 88% of this linkage is protected, although only about 7% of the linkage currently supports native vegetation.

Trabuco Creek Linkage

While the Irvine linkage presents the shortest link between the San Joaquin Hills and Northern Foothills, there are potential constraints to its functionality. The Trabuco Creek linkage offers a second, potentially viable linkage between these core areas. This linkage extends from the southern end of the San Joaquin Hills through the Salt Creek corridor, crosses I-5 at Trabuco Creek, and continues along Trabuco Creek through O'Neill Canyon to the Northern Foothills Core Habitat Area.

This linkage is longer than the Irvine linkage, and key acquisitions would be required at the southern end of the San Joaquin Hills, in the vicinity of the I-5 undercrossing, and in O'Neill Canyon to complete and/or protect the corridor. However, both the landscape integrity and existing native vegetation cover are high in this linkage, and O'Neill Canyon, in particular, supports important biological resources. An estimated 60% of this linkage is currently protected, with a 74% cover of native vegetation.

San Juan Creek Linkage

The San Juan Creek linkage is a potentially viable connection from the San Joaquin Hills to the Southern Foothills through Trabuco Creek and then southward to San Juan Creek. This connection follows the same course as the Trabuco Creek linkage from the southern San Joaquin Hills across I-5 and into Trabuco Creek/O'Neill Canyon. However, about 0.6 mile north of I-5, this connection diverges to the southeast, with a possible route through undeveloped lands to San Juan Creek. This southeastward portion of the connection includes drainages, slopes, and ridgelines, and movement across portions of the linkage may be constrained by topography. In at least one location, wildlife would have to skirt or cross active agricultural fields. An estimated 53% of this linkage is currently protected, with a 72% cover of native vegetation.

Opportunity Areas and Positional Priorities

For the purposes of reserve design, Opportunity Areas were defined as unprotected natural lands within the Habitat Core Areas and landscape linkages described above. Figure C.5-2 displays where these Opportunity Areas occur within Core Habitat Areas and linkages. Individual parcels within Opportunities Areas have been prioritized based on their (a) position on the interior or edge of the core area and (b) proximity to protected open space. The positional factor considers "edge effects," or habitat degradation that occurs at or near the urban-wildland interface (i.e., the habitat "edge"), while the proximity factor recognizes the value of adding to existing conservation investments. Positional priority levels were established for individual parcels within each group of Core Habitat Areas and linkages (Table C.5-1). Positional priorities for parcels are graphically displayed in Figure C.5-3. From a biological perspective, the highest priority Opportunity Areas are those that fill regional conservation gaps and/or contribute to the integrity and long-term persistence of biological resources county-wide.

Table C.5-1. Positional Levels[1] of Parcels within Opportunity Areas

Unit	High[2]	Medium[2]	Low[2]	Total # Parcels
Santa Ana Mountains[3]	112	939	2,087	3,138
Northern Foothills[3]	1	744	4,123	4,868
Southern Foothills	11	1,236	7,023	8,270
San Joaquin Hills	0	1,533	8,240	9,773
Chino Hills	4	504	3,184	3,692
W. Coyote Hills	--	99	319	418
Upper Santa Ana River	--	56	175	231
North Coast	--	418	2,426	2,844
Linkages	--	910	3,103	4,013
Total # Parcels	128	6,439	30,680	37,247

[1] Numbers represent number of parcels within each Positional Priority Level.

[2] Unit 1 (Large/Medium-sized Core Habitat Areas): High Priority = Interior/Adjacent; Medium Priority = Interior/Not Adjacent *or* Edge/Adjacent; Low Priority = Edge/Adjacent

Unit 2 (Small Core Habitat Areas/Linkages): Medium Priority = Adjacent; Low Priority = Not Adjacent

[2] Parcels that straddle the Santa Ana Mountains/Northern Foothills Core Habitat Area boundaries are included in the counts for both areas.

The process CBI used for evaluating lands at the local scale included the following steps, further illustrated by the boxes below:

- Stratify or group core habitat areas and linkages into two units so that areas with similar conservation values are compared against each other;
- Conduct edge analysis (interior versus edge) for parcels in the first unit only, as parcels within the second unit are assumed to be edge-effected based on small size or relatively linear shape;
- Establish *Positional Priority Levels,* i.e., rank individual parcels within the first unit based on position relative to both edge and existing conserved lands, and within the second unit based on position relative to existing conserved lands;
- Develop *Positional Priority Level* map.

Large/Medium Core Areas (Unit 1)	**Small Core Areas/Linkages (Unit 2)** [1]
o Santa Ana Mountains	o West Coyote Hills
o Northern Foothills	o Upper Santa Ana River
o Southern Foothills	o North Coast (Seal Beach, Bolsa Chica, Santa Ana River Mouth, Upper Newport Bay)
o San Joaquin Hills	o Irvine/Trabuco Creek/San Juan Creek Linkages
o Chino Hills	

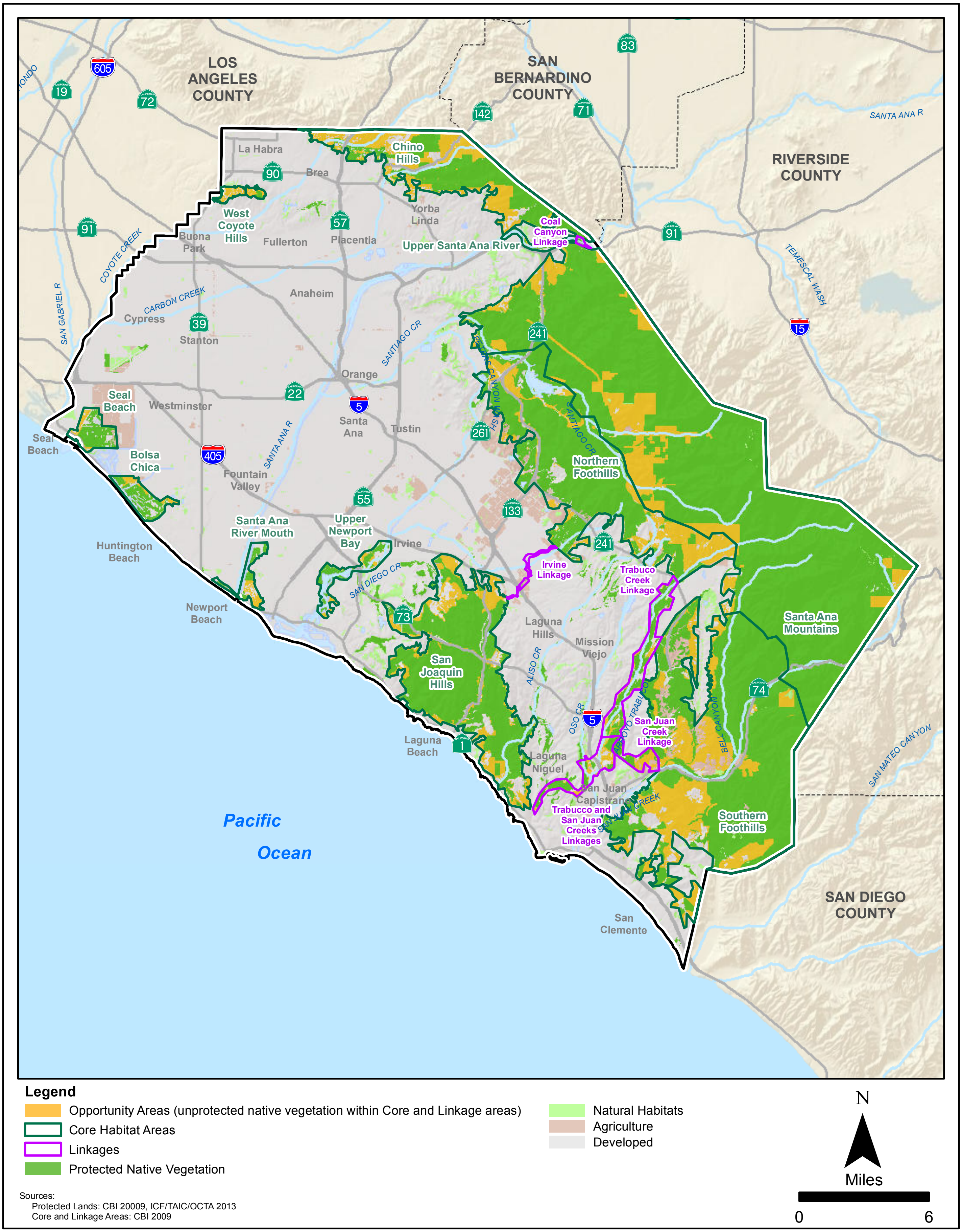
[1] The Coal Canyon Linkage was excluded from this analysis because it is already protected.

Positional Priority Level	Position/Proximity[1]
Large/Medium Core Habitat Areas (Unit 1)	
High Priority	Interior/Adjacent
Medium Priority	Interior/Not Adjacent *or* Edge/Adjacent
Low Priority	Edge/Not Adjacent
Small Core Habitat Areas/Linkages (Unit 2)	
Medium Priority	Adjacent
Low Priority	Not Adjacent

[1] Position refers to position relative to urban-wildland interface (e.g., interior versus edge) as determined through a modeling process; proximity refers to position relative to existing conservation investments.

Priority Conservation Areas

The final step in the reserve design process was to identify unprotected lands that contribute most to achieving conservation objectives. Based on the characterization of the landscape noted above, both at the regional and parcel levels, PCAs were delineated within Opportunity Areas (Figure C.5-4). PCAs are defined as those currently unprotected lands for which acquisition would be a “no regrets” decision, based on their contribution to the existing regional reserve system.



Sources:
Protected Lands: CBI 20009, ICF/TAIC/OCTA 2013
Core and Linkage Areas: CBI 2009

OCTA

Opportunity Areas within Core Habitat Areas and Linkages

C.5-2

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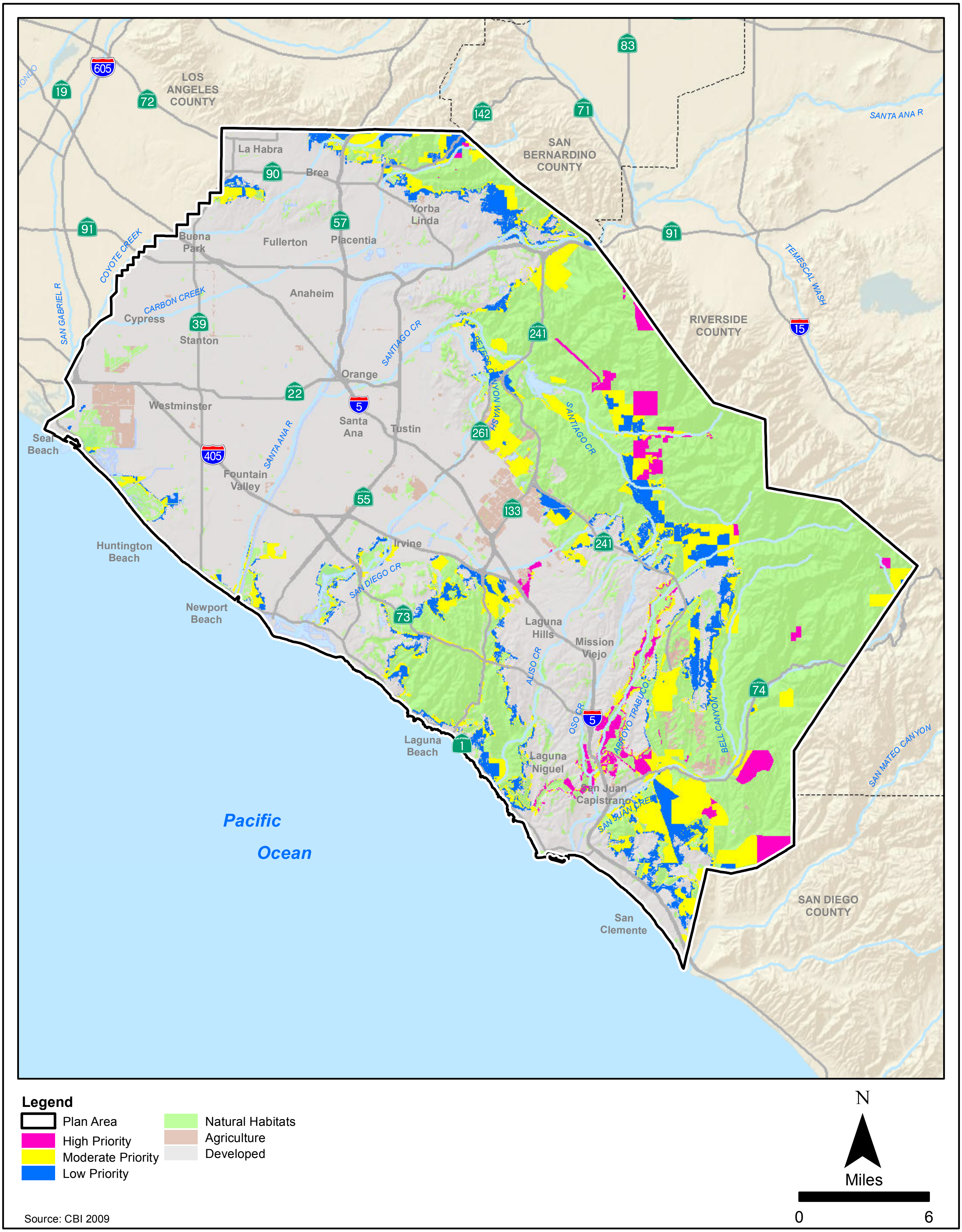

OCTA

Positional Priority Levels

Figure C.5-3

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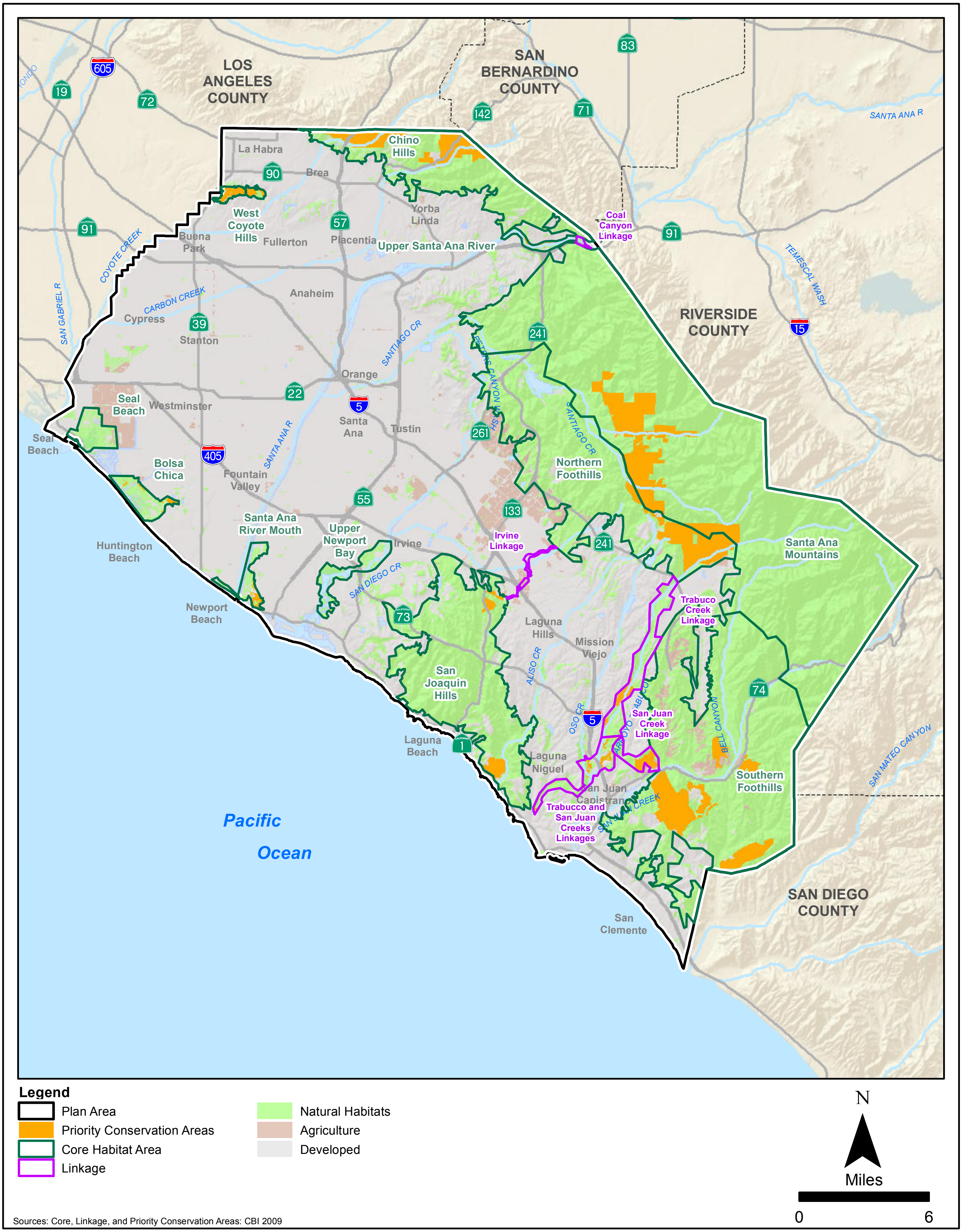

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Priority Conservation Areas within Core Habitat Areas and Linkages

Figure C.5-4

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Date: 4/13/2016

References

Beier, P. and R. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 12:1241-1252.

Conservation Biology Institute (CBI). 2001. On the global and regional ecological significance of southern Orange County: conservation priorities for a biodiversity hotspot. Prepared for Endangered Habitats League. October.

———. 2009. Conservation assessment of Orange County. Prepared for Orange County Transportation Authority. December

Cotton/Bridges Associates and EcoSystems Restoration Associates. 2004. Irvine wildlife corridor plan. Prepared for City of Irvine. 112 pp.

M. J. Groom, G. K. Meffe and C. R. Carroll. 2006. Principles of Conservation Biology, Third Edition. Sinauer Associates, Inc. Sunderland, Massachusetts.

Hilty J.A., Lidicker W.Z .and Merenlender A.M. 2006. Corridor Ecology: The science and practice of linking landscapes for biodiversity conservation (Island Press, Washington): 323.

Lyren, L. M., R. S. Alonso, K. R. Crooks, and E. E. Boydston. 2008a. Evaluation of functional connectivity for bobcats and coyotes across the former El Toro Marine Base, Orange County, California. Administrative report. 179 pp.

Lyren, L. M., R. S. Alonso, K. R. Crooks, and E. E. Boydston. 2008b. GPS telemetry, camera trap, and mortality surveys of bobcats in the San Joaquin Hills, Orange County, California. Administrative report. 134 pp.

Merenlender, A., and J. Crawford. 1998. Vineyards in an Oak Landscape. University of California, Division of Agriculture and Natural Resources.

Southern California Wetlands Recovery Project (SCWRP). 2001. Wetlands recovery project regional strategy. http://www.scwrp.org/regional_strategy.htm.

Spencer, W.D. 2005. Maintaining ecological connectivity across the “Missing Middle” of the Puente-Chino Hills Wildlife Corridor. Prepared for Resources Legacy Fund Foundation by the Conservation Biology Institute. July.

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Appendix C.6
Baseline Biological Survey Reports

Hayashi Property – Bonterra Consulting, December 2013

South County Properties, Bonterra Consulting, December 2013

MacPherson Property – Bonterra Psomas, September 2015

Aliso Canyon Property – Bonterra Psomas, October 2015

Baseline Biological Surveys Technical Report for the Hayashi Property

Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California

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December 2013

TABLE OF CONTENTS

Section **Page**

1.0 Introduction 1
Background 1
Project Location and Physical Environmental Setting 2
2.0 Survey Methodologies 6
Literature Review 6
Vegetation Mapping and General Surveys 6
Focused Biological Surveys 7
Regulatory Surveys 11
3.0 Existing Biological Resources 12
Vegetation Types and Other Areas 12
Wildlife Populations and Movement Patterns 16
Special Status Biological Resources 20
Covered Species Summary 44
4.0 References 49

TABLES

Table **Page**

1 Summary of Survey Data and Conditions for Gnatcatcher/cactus wren Surveys 9
2 Vegetation Types and Other Areas on the Property 13
3 “Waters of the U.S.” and “Waters of the State” on the Hayashi Property 25
4 Attribute Scores for Hayashi Assessment Areas 27
5 Special Status Plant Species Known to Occur in the Vicinity of the Property 28
6 Hubby’s Phacelia Populations Observed on the Hayashi Property 35
7 Special Status Wildlife Species Known to Occur in the Vicinity of the Property 36
8 Summary Of Covered Species 45

EXHIBITS

Exhibit		**Follows Page**
1	Regional Location	1
2	Local Vicinity	2
3	Soil Types	2
4	Regional Environmental Setting	2
5	Fire History	5
6	Vegetation Types	12
7	Jurisdictional Resources	25
8	Special Status Plant Locations	26

ATTACHMENTS

A M2 Acquisition/Restoration/Management Criteria Evaluation
B Plant and Wildlife Compendia

1.0 INTRODUCTION

This Biological Technical Report has been prepared to support California Environmental Quality Act (CEQA) documentation and resource management planning for the Measure M2 Freeway Environmental Mitigation Program (EMP) Acquisition Properties Evaluation Project. The EMP project includes five separate Orange County Transportation Authority (OCTA) acquisition properties (Hayashi, Ferber, Hafen, O'Neill Oaks, and Saddle Creek South), located in unincorporated Orange County, California (Exhibit 1). Due to the regional reparation between the Hayashi property (located in northeast Orange County) and the remaining four properties (located in southeast Orange County), this report only covers the Hayashi property (hereinafter also referred to as the Project).

This information has been reported in accordance with accepted scientific and technical standards that are consistent with the requirements of the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW[1]).

BACKGROUND

Project Description

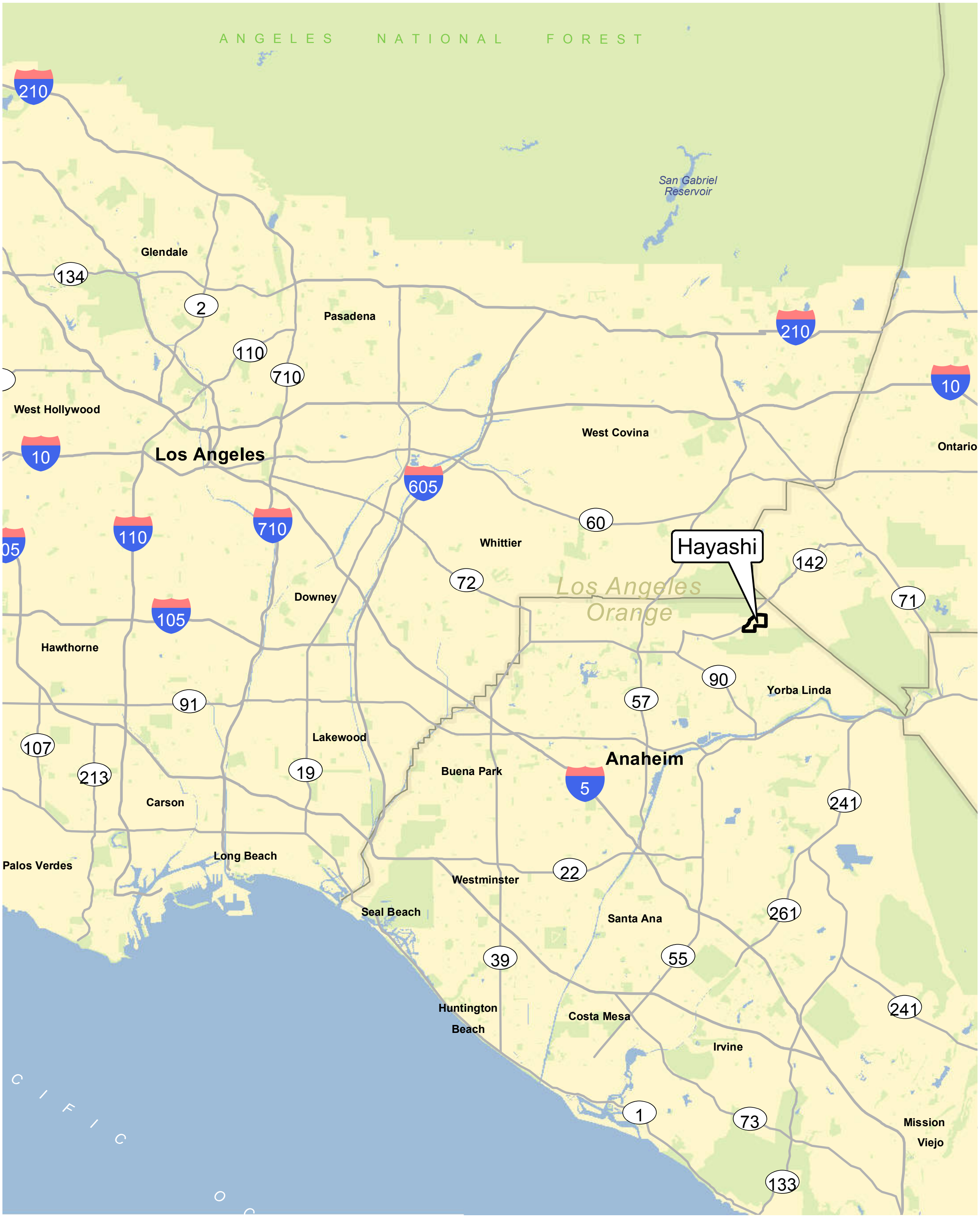
In 2006, Orange County voters approved the renewal of Measure M, effectively extending the half-cent sales tax in the County from April 2011 to March 2041. Renewed Measure M (or Measure M2) will continue to provide funding for transportation projects and programs in the County, including select freeway and roadway improvements, transit programs, and two environmental programs.

OCTA's M2 Freeway EMP provides comprehensive mitigation to offset the environmental impacts of the 13 Measure M2-funded freeway projects. The EMP is spearheaded by the Environmental Oversight Committee (EOC), which is made up of OCTA Board members and representatives from the California Department of Transportation (Caltrans), resource agencies, environmental groups, and the public.

Instead of mitigating the natural resource impacts of Measure M2 freeway projects on a project-by-project basis, the EMP presents a comprehensive mitigation approach that not only replaces habitat, but also provides the opportunity to improve the overall functions and value of sensitive biological resources throughout Orange County. Working collaboratively with the resource and regulatory agencies, it was ultimately decided by OCTA that creation of a Natural Community Conservation Plan (NCCP)/Habitat Conservation Plan (HCP) and programmatic wetland permitting would best serve as the main implementation tools for the EMP.

As one of the key components of the conservation strategy for the NCCP/HCP and wetlands permitting, OCTA has undertaken a systematic approach to identify and acquire habitat preserves to meet the goals and objectives of the NCCP/HCP and wetland mitigation programs. A formal conservation assessment was completed by Conservation Biology Institute (CBI) for Orange County that resulted in the identification of Priority Conservation Areas (PCA), which included candidate parcels and properties that could be considered for habitat and wildlife conservation purposes. OCTA solicited willing sellers and evaluated each property using standardized criteria and a prioritization process to rank properties for purchase. Properties for acquisition were selected based on: conservation values, policy considerations, mitigation credits, mitigation plan review, and adoption and real estate value/economics. The results of the

[1] The California Department of Fish and Game (CDFG) changed its name to the California Department of Fish and Wildlife (CDFW) effective January 1, 2013.



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Regional Location

Exhibit 1

Measure M2 Acquisition Properties Evaluation/Hayashi Property

N W E S

6 3 0 6 Miles

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M2 acquisition/restoration/ management criteria evaluation for the Hayashi property are included in Attachment A.

The Hayashi property was selected and acquired in 2011. Baseline biological surveys were completed in 2012 with the following goals:

- A general biological assessment of the preserve was completed to establish the baseline biological value of the property and identify any biological threats that had the potential to reduce the long-term biological value. In addition, information on the overall condition of the property will guide the development of a site-specific Resource Management Plan (RMP).

- Comprehensive surveys of vegetation types and jurisdictional resources were completed to provide detailed knowledge of the natural habitat and a quantification of habitat type credits within the Preserve.

- Focused surveys for OCTA M2 NCCP/HCP Covered Species and their habitats were completed to establish a baseline of the Preserve status and conditions. Results of future biological monitoring will be compared to the baseline results to evaluate habitat and Covered Species trends.

PROJECT LOCATION AND PHYSICAL ENVIRONMENTAL SETTING

The approximately 296-acre Hayashi property is located in the Chino Hills southeast of Carbon Canyon Road (State Route [SR] 142). Chino Hills State Park borders the southeastern boundary of the property. The property is located on the U.S. Geological Survey's (USGS') Yorba Linda 7.5-minute topographic quadrangle at Township 3 South, Range 9 West, Sections 2 and 11 (Exhibit 2). Land cover in the immediate vicinity consists primarily of undeveloped open space (e.g., protected land in Chino Hills State Park to the south and currently undeveloped, but unprotected private property to the north and east) with residential development along SR-142 to the southwest of the Project site. A blueline stream in Soquel Canyon crosses the eastern corner of the property. Topographically, a ridgeline runs across the center of the property in a northeast-southwesterly direction with steep slopes down to Soquel Canyon and Carbon Canyon. Elevations range from approximately 650 to 1,260 feet above mean sea level (msl). Soil types mapped on the property consist of Alo clay (15 to 30 percent slopes), Anaheim clay loam (15 to 30 percent slopes, 30 to 50 percent slopes, and 50 to 75 percent slopes), Balcom clay loam (15 to 30 percent slopes), Calleguas clay loam (50 to 75 percent slopes, eroded), Cropley clay (2 to 9 percent slopes), Mocho loam (2 to 9 percent slopes), San Emigdio fine sandy loam (2 to 9 percent slopes), and Soper loam (15 to 30 percent slopes) (Exhibit 3).

Regional Environmental Setting

The Project site is generally located within large blocks of undeveloped land in the 30,000-acre Puente-Chino Hills regional wildlife corridor that provides a 31-mile swath of continuous wildlife habitat between the Cleveland National Forest and the west end of the Puente Hills, above Whittier Narrows (Exhibit 4). This represents the "last major natural open space resource connecting Los Angeles, Orange, San Bernardino, and Riverside Counties" (Los Angeles County et al. 2003). Specifically, the Project site lies along Carbon Canyon between the remainder of the Chino Hills to the southeast and the Puente Hills to the northwest. These hills form the northern end of the Peninsular Ranges in Southern California. The rolling hills, mountains, and canyons interrupt the generally flat Los Angeles Basin on the southern and eastern sides. The hills are a result of uplift and folding along the Whittier and Chino faults (California State Parks 2011).

Open space within the Puente-Chino Hills regional wildlife corridor consists of a mix of protected land (e.g., Chino Hills State Park), and private property that is undeveloped at this time. The Project site is immediately adjacent to the westernmost portion of the 14,102-acre Chino Hills State Park. To the southeast, open space in the Chino Hills State Park connects to larger areas of open space in the Irvine Ranch Land Reserve and the Cleveland National Forest via the Coal Canyon corridor designed to facilitate wildlife movement under SR-91. On both sides of SR-91, Chino Hills State Park provides a large expanse of canyons, grasslands, and large areas of walnut woodlands. West of the park, Tonner Canyon provides a movement corridor beneath the SR-57. To the northwest of the Project site, open space extends to a Los Angeles County Significant Ecological Area, Powder Canyon, Schabarum Regional Park, Arroyo Pescadero Park, Hellman Wilderness Park, and the Whittier Narrows Recreation Area.

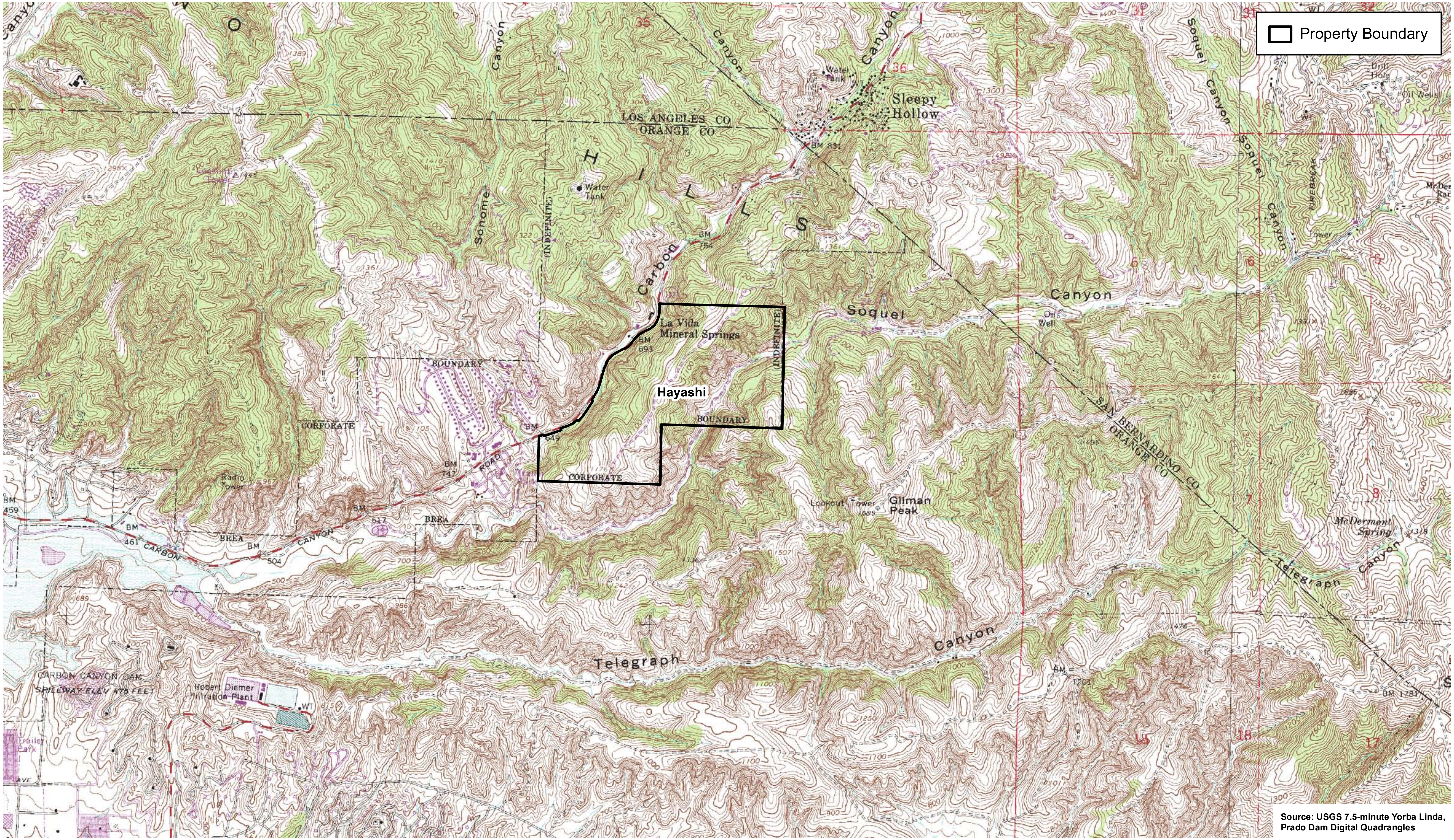
Fire History

There are various hypotheses regarding the fire history of Southern California, what constitutes a "natural" fire regime, and the role of fire for chaparral plant species. Traditionally, the fire season in Southern California is from May through September (OCFA 2008). In the past, fires were started by lightning and typically moved down slopes due to falling brands and coals. According to one school of thought, fires only occasionally formed the hot runs on steep slopes that are typical of today's fires and large, intense fires were uncommon (Howard 1992). This fire regime resulted in a mosaic of numerous small burns. New fires were limited by recently burned regions with very little fuel; dead wood and other fuels could not accumulate for long. However, an opposing hypothesis is that large, high-intensity chaparral fires were regular occurrences in the 19th century, often driven by severe weather that involved high temperatures, low humidity, and high winds (Keeley and Zedler 2009).

Mediterranean shrub communities, including those types found on the Project site, are resilient to infrequent wildfires and historically burned at a frequency of every 30 to 150 years (Halsey 2005). Many plant species associated with chaparral and scrub communities exhibit characteristics that constitute adaptations to fires. A new fire will then typically burn hot and high into the canopy, killing much of the aboveground biomass. These canopy fires facilitate seed establishment by removing shrub cover and eliminating competitors. In the first few years after a fire, herbs and herbaceous shrubs—such as deerweed (*Acmispon glaber* [*Lotus scoparius*]), lupines (*Lupinus* spp.), paintbrushes (*Castilleja* spp.), and phacelias (*Phacelia* spp.)—are abundant. Because chaparral fires burn nitrogenous compounds in plant tissues and detritus, there is a large loss of nitrogen from the ecosystem. This allows species equipped with nitrogen-fixing bacteria to grow quickly after a fire. While herbaceous species are establishing, the previously dominant chaparral species are also returning. Many chaparral species rely on fire to release and germinate seeds. Others resprout from roots or buds at the base of the stem. As the shrub canopy closes, whether due to resprouting of individuals burned by the fire or growth of seedlings, these herbaceous species decrease in abundance.

Due to an understory of herbaceous annuals, walnut woodlands are subject to periodic fire. Fire often kills off the crown of the tree, but trees typically recover well. A large woody platform at the soil surface shields meristematic tissue of walnuts from fire (Esser 1993). After a fire, the tree will resprout from this area, often forming a multi-trunk tree.

Fire is also a natural element of oak ecosystems and a decreasing fire frequency tends to favor development of oak woodland over scrub or chaparral. Coast live oak is especially fire resistant; trees can survive and resprout even after severe burning due to food reserves stored in the extensive root system (Steinberg 2002). Adaptations to fire include evergreen leaves, thick bark, and the ability to resprout (Steinberg 2002). Trees resprout from the main trunk and upper crown, but also from the root crown; resprouting may result in a multi-trunk tree. While acorns on the soil are killed, animal-buried acorns usually survive moderately severe fire which allows



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Local Vicinity

Exhibit 2

Measure M2 Acquisition Properties Evaluation/Hayashi Property

N W E S

2,000 1,000 0 2,000 Feet

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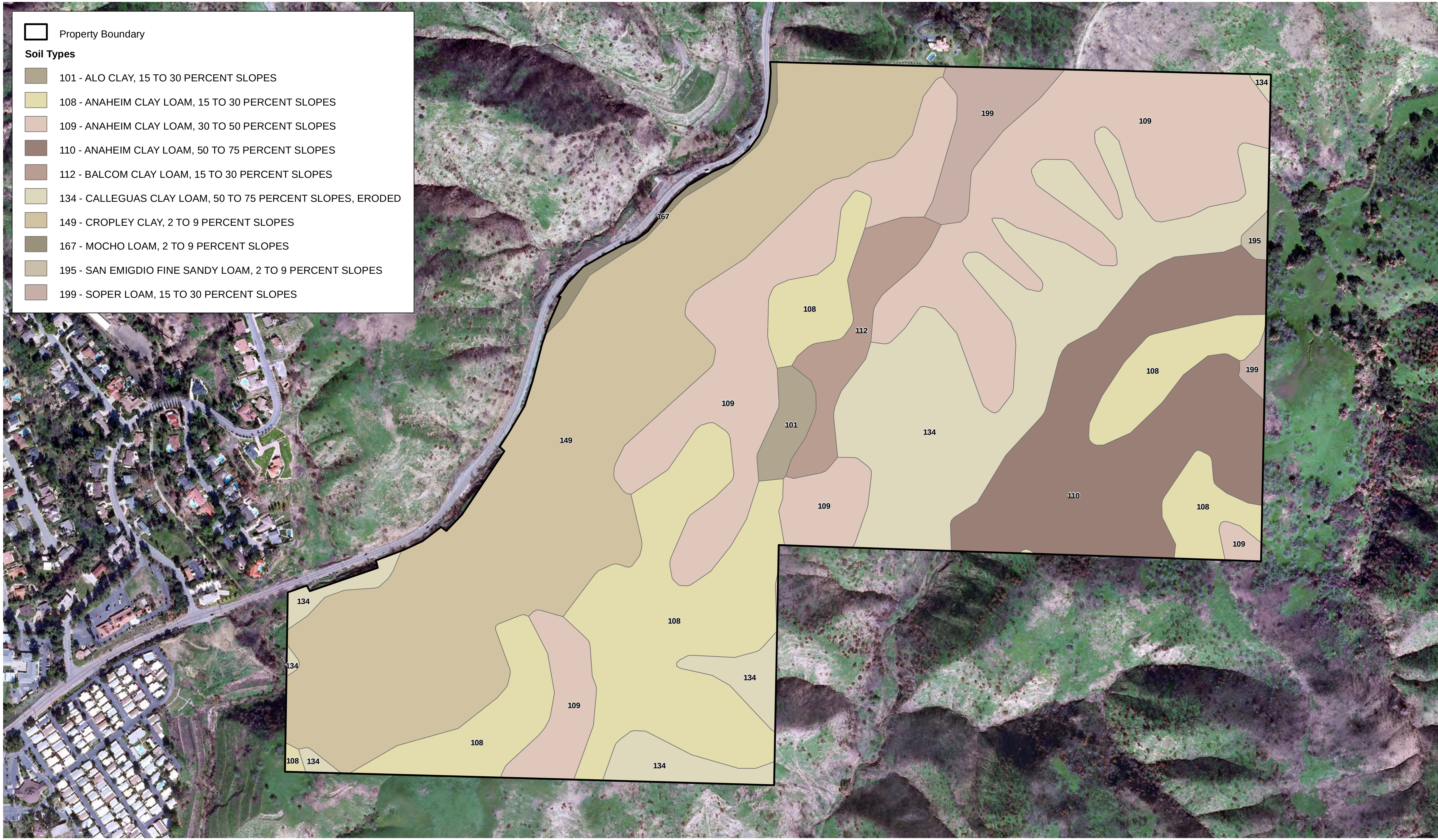

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Soil Types

Exhibit 3

Measure M2 Acquisition Properties Evaluation/Hayashi Property

N W E S

500 250 0 500
Feet

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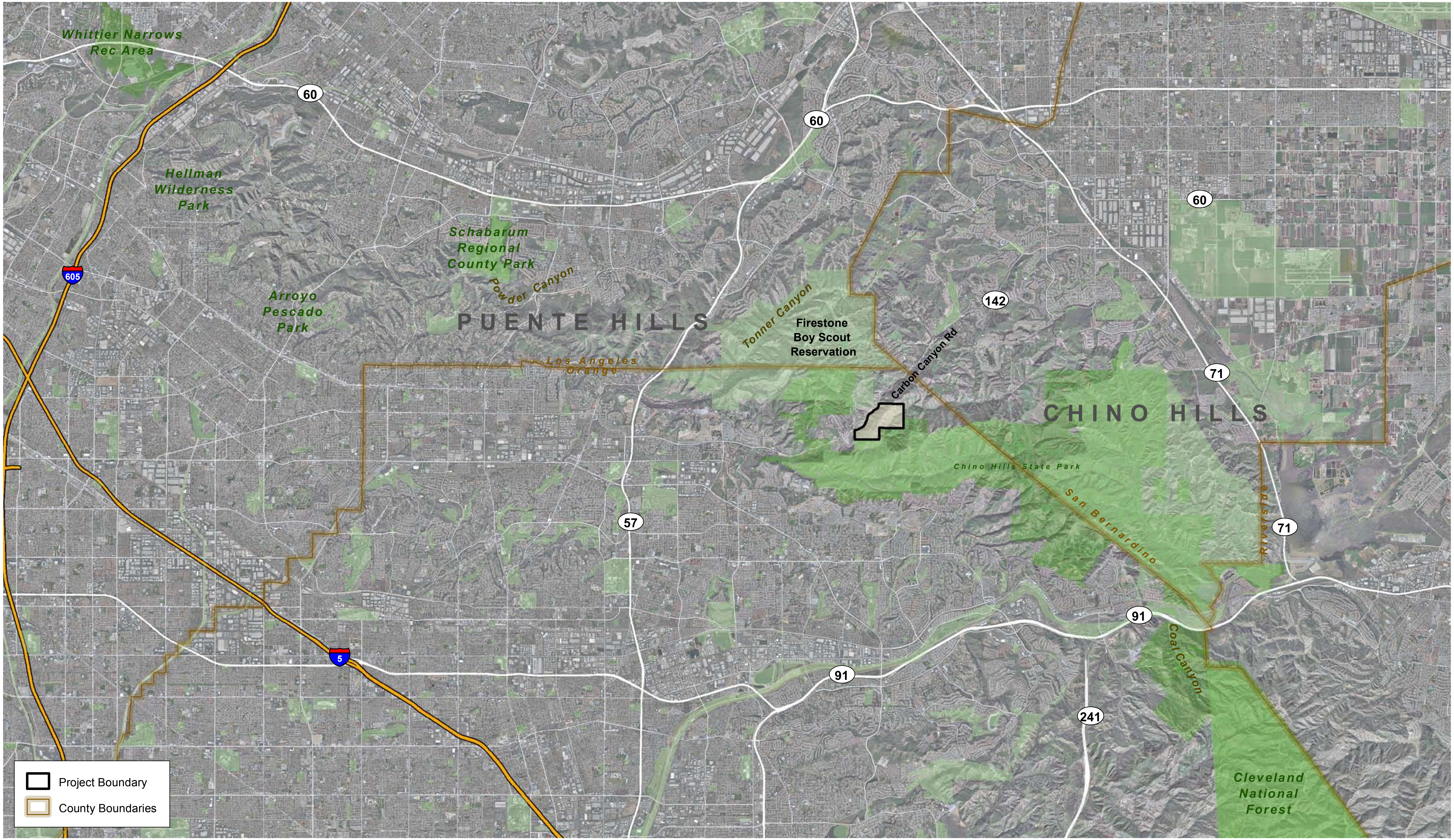

Regional Environmental Setting

Exhibit 4

Measure M2 Acquisition Properties Evaluation/Hayashi Property

10,000 5,000 0 10,000 Feet

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for high rates of post-fire establishment. Post-fire establishment may also be facilitated by western scrub-jays (*Aphelocoma californica*), which prefer burned areas for caching sites (Steinberg 2002). The frequent, low-intensity burning by Native Americans likely resulted in cohorts of large oak trees growing in open, savannah-like stands (McCreary 2004).

Although fires are a natural part of chaparral, scrub, and oak communities, both unnatural increases and decreases in fire frequency can have a negative impact. Now nearly all wildfires are started by humans, either through arson or accidents (Schoenherr 1992). Of the 70 fires with a known point of origin in the vicinity of Chino Hills State Park, 2 were caused by lightning; 47 were caused by arson, power lines, automobiles, fireworks, plane crashes, machinery, or a fire agency reigniting a prescribed burn; and 29 had an “unknown” cause (Hills for Everyone 2012). While the fire season traditionally occurs from May through September, in the past 15 years, Orange County has experienced its most devastating wildfires from October through April (OCFA 2008), with the three largest fires in the Chino Hills State Park area occurring in October and November (Hills for Everyone 2012). Drought conditions contribute to an increase in dead fuels; dryer and more explosive fuels; and more intense fire behavior. In addition, sustained Santa Ana Winds increase the speed of fire and magnify the effects on the available fuel bed. Santa Ana Winds are strong, warm, and dry winds that flow down into the valleys when stable; during these conditions, high pressure air is forced across and then down the lee-side slopes of a mountain range. The descending air is warmed and dried, which produces critical fire weather conditions.

Anthropogenic increases in fire frequency can change the natural resilience of native communities. With a high frequency of fires, plants may not store enough energy between fires to resprout from roots or buds. In general, when an area burns too often for the community to mature, native plants may not be able to maintain dominance, often resulting in a habitat type conversion. Ruderal species, including annual grasses and invasive forbs, often thrive in post-fire conditions. As a result, fires often promote the spread of non-native species into native habitats. In turn, this high degree of non-native grass and forb cover can lead to more frequent fire return intervals (e.g., intervals of less than eight years have been reported) (Minnich and Dezzani 1998).

A decrease in fire frequency may also hinder reproduction of fire-adapted species. In the past, government agencies tried to prevent and stop the spread of wildfires through a policy of fire suppression. These efforts were found to be unsuccessful; they occasionally resulted in larger and more catastrophic fires. While they are less frequent, unnaturally large fires may burn so hot and intense that the canopy, roots, and even the seeds of fire-adapted plants are destroyed. Habitat type conversion may occur in scrub and chaparral communities where fire suppression allows oaks to increase in density (McCreary 2004). When fire isn’t allowed to regenerate the understory of oak savannahs, the shrub component increases and more severe, crown-consuming fires may result.

Over the past 60 years, Orange County has experienced a number of major (i.e., burned greater than 2,000 acres, burned for an extended period or time, and/or resulted in extraordinary property loss) wildland fires, including 20 that burned over 2,000 acres (OCFA 2008). The topography and east-west alignment of Santa Ana Canyon, south of the Hayashi property, increases wind speed in the area and magnifies the effects of fire. Between 1914 and 2011, 103 fires were documented in the vicinity of Chino Hills State Park, burning a total of over 252,678 acres; the 1944 Gaines Fire (124.6 acres burned on site), the 1980 Carbon Canyon Fire (0.96 acre burned on site), and the 1990 Carbon Canyon Fire (3.58 acres burned on site) extended to the Hayashi property (Hills for Everyone 2012). The California Department of Forestry and Fire Protection (CAL FIRE) has also tracked significant fire events on the Hayashi property including the 1959 La Vida Fire (175.9 acres burned on site), the 1978 Soquel Fire

(291.8 acres burned on site), the 1985 Shell Fire (267.5 acres burned on site), the 1985 Telegraph Fire (89.5 acres burned on site), and the 1990 Yorba Fire (34.9 acres burned on site). Exhibit 5 shows the fire history of the property. In 2008, the Freeway Complex Fire burned over 30,305 acres including all of the Hayashi property, and is the largest wildland fire in the past 40 years (OCFA 2008). This fire initially started at 9:01 AM on the north side of SR-91 east of Green River Drive. At 10:43, a second fire started near the Olinda Alpha Landfill near Carbon Canyon. These separate fires were subsequently merged into a complex. This fire consumed the property and adjacent areas and extended throughout the Chino Hills from the SR-57 to SR-91. Vegetation on the property is currently recovering from the Freeway Complex Fire.

Climate

Southern California experiences a Mediterranean climate characterized by mild, rainy winters and hot, dry summers. There can also be dramatic differences in rainfall from year to year. Consequently, the vegetation types in the Southern California area consist of drought-tolerant, woody shrubs and trees and annual, fall/winter-sprouting grasses.

The temperature in Southern California is moderated by the coastal influence of the Pacific Ocean, which creates mild conditions throughout most of the year. The stable atmosphere creates cloudless conditions, producing dry summers and a subtropical climate with many days of sunshine (Ritter 2006). The most distinguishing characteristic of a Mediterranean climate is its seasonal precipitation. In Southern California, precipitation is characterized by brief, intense storms generally between November and March. It is not unusual for a majority of the annual precipitation to fall during a few storms over a close span of time. Rainfall patterns are subject to extreme variations from year to year and longer-term wet and dry cycles.

In the City of Brea, the average daily temperature in the summer, as measured in July from 1961 to 1990, is 72.6 degrees Fahrenheit (°F), and the average daily temperature in the winter, as measured in January from 1961 to 1990, is 57.4°F (U.S. Bureau of Labor Statistics et al. 2009). The City receives an average annual precipitation of 12.27 inches (as measured from 1961 to 1990).

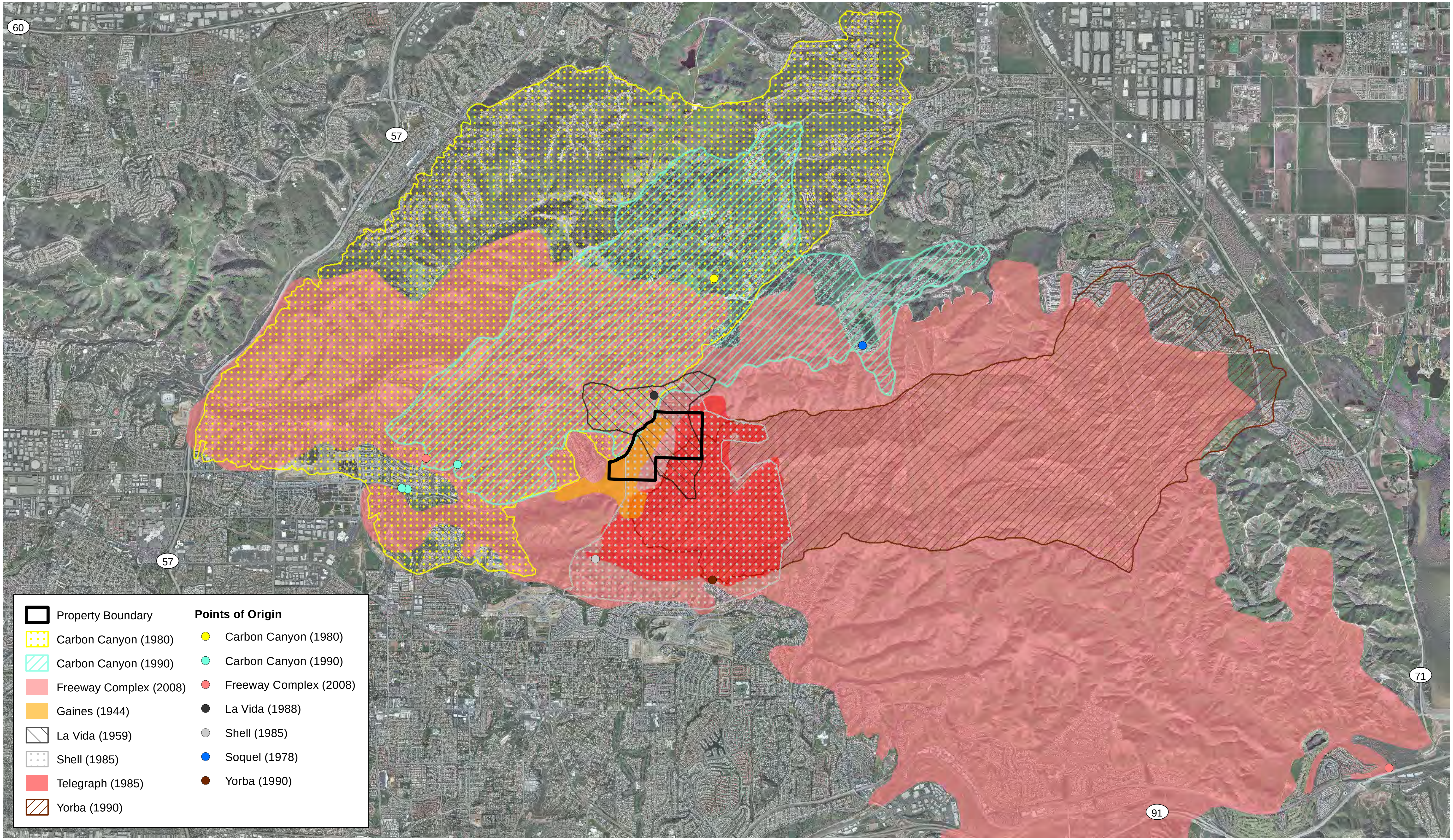
Anthropogenic Uses of the Property

Grazing

Grazing of cattle in the Chino Hills (including the Hayashi property) has occurred since 1771, after the Spanish founded Mission San Gabriel. The Chino Hills were used extensively for grazing by mission cattle. During the Mexican Republic era, the hills were used as spillover grazing from such surrounding Mexican ranchos as Santa Ana del Chino and La Sierra Yorba. After Mexico ceded California to the United States in 1848, the lands within the Chino Hills were still used primarily for grazing.

A review of the earliest historic aerial photographs of the property showed evidence of grazing in 1938. Between 1938 and 1946, Carbon Ridge Road was extended from the area northeast of the property, on to the property, along Carbon Canyon Ridge. From 1946 through 1952, the width of Carbon Ridge Road onsite was increased, and additional smaller trails radiating from this ridge road were established. This unpaved road still exists on the property.

While not formally used for grazing at this time, cattle are known to cross the property boundary and graze on site. Existing, off-site fencing in Soquel Canyon is partially broken down and has not been adequate at preventing cattle encroachment. During the 2012 general and focused biological surveys, cattle were directly observed throughout the property, including on the ridgeline, slopes, and bottom of Soquel Canyon. Cattle paths cross the slopes throughout the



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Fire History

Exhibit 5

Measure M2 Acquisition Properties Evaluation/Hayashi Property

N W E S

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property. The most severe evidence of erosion due to cattle is present in the southwest portion of the property on the slopes between Carbon Canyon Road and the ridgeline. Here, the soil is exposed and unstable.

Structures

The historic aerial research did not identify any buildings or otherwise significant structures on the site since 1938. However, along the northern boundary of the property, an offsite residence has established some structures and landscaping on the Hayashi property. Between 1952 and 1965, aerial photograph review suggests that trail widening and other disturbed areas where becoming established along the northern edge of the property. In 1972, an apparent cleared pad has been established immediately off site for the future residence. In 1980, cleared areas extending from the residential development onto the Hayashi property are evident, although no structures and/or landscape plantings have occurred in the area at this time. By 1994, the cleared areas extending onto the Hayashi property have become improved by approximately 13,000 square feet of ornamental landscaping, bare ground, and landscape structures (arbor and fencing). In addition, a radio antenna is located on the ridgeline near the northern portion of the property.

2.0 SURVEY METHODOLOGIES

This section describes the methodology used to conduct the literature review; perform general biological surveys and vegetation mapping, focused biological surveys, a jurisdictional delineation, and California Rapid Assessment Method (CRAM) analysis; and assess the property's potential to support special status species. A cumulative list of all plant and wildlife species observed on the property is included as Appendices A-1 and A-2, respectively.

LITERATURE REVIEW

BonTerra Consulting conducted a literature search to identify special status plants, wildlife, and habitats known to occur in the vicinity of the Hayashi property. This search included a review of the USGS' San Dimas, Ontario, Yorba Linda, and Prado Dam quadrangles in the California Native Plant Society's (CNPS') Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2012) and the California Natural Diversity Database (CNDDB) (CDFG 2012). In addition, a species list was obtained from the USFWS' Information, Planning, and Conservation System (IPaC) for the property.

VEGETATION MAPPING AND GENERAL SURVEYS

BonTerra Consulting Biologists David Hughes and Allison Rudalevige conducted general surveys to describe and map the vegetation types on the Hayashi property on May 22 and 23, 2012. Nomenclature for vegetation types generally follows *A Manual of California Vegetation* (Sawyer et al. 2009). Vegetation was mapped in the field on an aerial photograph at a scale of 1 inch equals 200 feet (1″=200′). Where vegetation overlaps another type of mapping unit (e.g., a tree canopy over water or roads), the area was mapped according to the uppermost layer of vegetation.

The general surveys included an evaluation of the Project site to support special status plant and wildlife species, with special focus on Covered Species. Covered Species include intermediate mariposa lily (*Calochortus weedii* var. *intermedius*), southern tarplant (*Centromadia parryi* ssp. *australis* [*Hemizonia p.* ssp. *a.*]), many-stemmed dudleya (*Dudleya multicaulis*), arroyo chub (*Gila orcutti*), coast horned lizard (*Phrynosoma blainvillii*), Beldings orange-throated whiptail (*Aspidoscelis hyperythra* [*Cnemidophorus h.*]), Pacific [western] pond turtle (*Actinemys* *marmorata* [*Emys m.*]), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bells vireo (*Vireo bellii pusillus*),coastal cactus wren (*Campylorhynchus brunneicapillus sandiegensis*), coastal California gnatcatcher (*Polioptila californica californica*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor* [*Felis c.*]). Suitable habitat and/or observed individuals were documented in field notes and with global positioning system (GPS) units and a CNDDB form was filled out for each occurrence.

During field surveys, natural or physical resources and opportunities were identified (mapped and included in field notes) that "preserve, restore and enhance aquatic, riparian and terrestrial natural communities and ecosystems that support Covered Species" (OCTA 2010). Resources that provide valuable enhancement, restoration, or preservation opportunities (e.g., significant stands of non-native species requiring eradication; presence of rock outcroppings that provide niche areas for unusual plants, bats, ringtails [*Bassariscus astutus*], or other species; nesting cavities; large mammal burrows; avian rookeries/roosts; and dens) were mapped and documented in field notes. This may include significant stands of invasive plant species based on the California Invasive Plant Council (Cal-IPC) Inventory. Anthropogenic influences/structures on the property (i.e., paved and unpaved roads, trails, radio antennae, water towers, abandoned vehicles and/or "dumped" trash or debris) were also documented. GPS devices were utilized for recording all point locations.

Plant species were identified in the field or collected for subsequent identification using keys in Baldwin et al. (2012), Munz (1974), Abrams (1923, 1944 1951), and Abrams and Ferris (1960). Taxonomy follows Baldwin et al. (2012) and current scientific data (e.g., scientific journals) for scientific and common names. Active searches for reptiles and amphibians included lifting, overturning, and carefully replacing rocks and debris. Birds were identified by visual and auditory recognition. Surveys for mammals were conducted during the day and included searching for and identifying diagnostic sign, including scat, footprints, burrows, and trails. Taxonomy and nomenclature for wildlife generally follows Crother (2008) for amphibians and reptiles, American Ornithologists' Union (AOU 2011) for birds, and Baker et al. (2003) for mammals. All species observed were recorded in field notes and are included in Attachment B.

FOCUSED BIOLOGICAL SURVEYS

Focused biological surveys were conducted in 2012 for special status plant species, coastal California gnatcatcher, coastal cactus wren, and bats[2].

Special Status Plant Species

Special status plant surveys were floristic in nature and conducted following the Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFG 2009) and the CNPS' Botanical Survey Guidelines (CNPS 2001). Target species included the following Covered Species: intermediate mariposa lily, southern tarplant, and many-stemmed dudleya.

For special status plant surveys, rainfall received in the winter and spring determines the germination of many annual and perennial herb species. Rainfall data was retrieved from the California Data Exchange Center (CDEC) of the California Department of Water Resources (CDWR 2012). The Tonner Canyon sensor (CDEC Station TNR), located approximately 2.25 miles from the property, provides data for 2005 to 2012. The average precipitation for October to July is 15.02 inches. The precipitation between October 2011 and July 2012 was measured at 9.1 inches, which is 61 percent of average.

2 Surveys for bats were conducted because five bat species were originally proposed for coverage during the baseline surveys; these species have since been removed from the Covered Species list.

In years of low or unusual rainfall patterns, monitoring of reference populations is important in order to interpret survey results. Prior to conducting the field surveys, reference populations of target species were monitored to ensure that the scheduled surveys were comprehensive and conducted during the appropriate blooming period for these species. Intermediate mariposa lily was observed flowering in Trabuco Canyon on May 29, 2012. Southern tarplant was observed flowering in San Juan Capistrano on May 21, 2012. Many-stemmed dudleya was observed flowering in San Juan Capistrano on April 18, 2012. Although reference populations and regional rainfall amounts were monitored to ensure the scientific adequacy of these focused surveys, there is always a minimal potential for false negative survey results as species could possibly be present on a site but may not be detectable at the time of the surveys.

The Hayashi property was surveyed for special status plant species on June 5, 2012 by BonTerra Consulting Biologists Allison Rudalevige and Carl Demetropoulos; on June 6 by Ms. Rudalevige, BonTerra Consulting Biologists Jennifer Pareti and Jason Aguayo, and Consulting Biologist Fred Roberts; and on July 26, 2012 by Ms. Rudalevige, BonTerra Consulting Biologists Lindsay Messett and Jason Mintzer, and Consulting Biologist David Bramlet. A systematic walking survey was conducted in all areas of suitable special status plant habitat; inaccessible areas were viewed through binoculars. The habitat preferences of target species (see Table 5, below) were compared to the resources on site (e.g., community associations, soil, slope, shade) to determine which portions of the property represented suitable habitat. All plant species observed were recorded in field notes. Plant species were identified in the field or collected for later identification. Plants were identified to the taxonomic level necessary to determine whether or not they are a special status species. Plants were identified using taxonomic keys, descriptions, and illustrations in Baldwin et al. (2012). Any voucher specimens collected will be deposited with the herbarium at Rancho Santa Ana Botanic Gardens in Claremont, California. Taxonomy and nomenclature follows the Baldwin et al. (2012), Hickman (1993), and current scientific journals for scientific and common names.

Coastal California Gnatcatcher and Coastal Cactus Wren

Surveys for the coastal California gnatcatcher were conducted in accordance with the guidelines issued by the USFWS for areas participating in a NCCP (USFWS 1997). These guidelines stipulate that three surveys must be conducted in suitable habitats with at least one week between site visits; the surveys can be conducted year-round. All visits must take place during the morning hours, and no more than 100 acres of suitable habitat may be surveyed per visit. Because of the habitat similarities, gnatcatcher and cactus wren surveys were conducted simultaneously.

Biologist Michael Couffer (USFWS Permit No. TE-782703-8) conducted the surveys on May 29 and 30; and June 7 and 15, 2012. The surveys covered all potentially suitable habitats for the coastal California gnatcatcher and coastal cactus wren. A summary of the focused gnatcatcher/cactus wren survey conditions on the Hayashi property is shown in Table 1 below.

TABLE 1
SUMMARY OF SURVEY DATA AND CONDITIONS FOR GNATCATCHER/CACTUS WREN SURVEYS

Date	Time	Surveyors	Weather Conditions		
			Temperature (°F) (Start/End)	Wind (mph) (Start/End)	Cloud Cover (%) (Start/End)
May 29, 2012	0730/1218	Couffer	73/81	0-1/2-8	Clear/Clear
May 30, 2012	0700/1016	Couffer	60/74	0-1/0-3	90/Clear
June 7, 2012	0615/0930	Couffer	60/74	0-1/0-2	50/Clear
June 15, 2012	0615/0740	Couffer	60/60	0-1/0-1	100/100

Weather conditions met the USFWS survey protocol requirements for optimal gnatcatcher detection. Weather conditions that were too cold (below 55°F), too hot (above 95°F), or too windy (wind speed greater than 15 miles per hour) were avoided. Surveys were conducted by slowly walking through all appropriate habitats while listening and watching for gnatcatcher/cactus wren activity. A combination of recordings of gnatcatcher/cactus wren vocalizations and "pishing" sounds were used in an attempt to elicit responses from any gnatcatchers/cactus wren that might be present. The frequency of vocalization playback and "pishing" varied depending on conditions, such as habitat patch size and topography in each area. All bird species detected during the survey were recorded, including notable observations of special status wildlife species.

Bats

Both visual and acoustic surveys for bat species (both common and special status) were conducted on the Hayashi property. During the day, visual surveys were conducted to locate potential roost sites and foraging areas. At dusk and after dark, bat activity was monitored both visually (with spotlights after dark) and acoustically with ultrasonic bat detectors.

Site Reconnaissance

Dr. Ed West and BonTerra Consulting Biologist Ann Johnston assessed the ecological status and condition of the property on June 8, 2012. All passable roads were driven and the lower portion of Soquel Canyon Road (trail) was hiked. The general condition and use history of the site was documented and potential areas for bat roosts and foraging activity were identified.

Bat Monitoring

Acoustic monitoring was conducted on the property on June 14 through 17, 2012. Mobile surveys were conducted along Carbon Canyon Road (5 surveys), Carbon Canyon Access Road (5), Carbon Ridge Road (3), and North Spur Road leading to Soquel Canyon (2). On-foot hiking surveys were conducted along the road/trail in Soquel Canyon (3). During the mobile surveys, two vertically mounted ultrasonic detector microphones were secured to the roof of a 4x4 Jeep Wrangler. The detectors were connected individually with cabling to an EM3 EchoMeter full spectrum bat detector (SMX-US microphone, Wildlife Acoustics, Inc.) and an Anabat SD2 CF bat detector (Standard Anabat microphone, Titley Scientific, Inc.) mounted on a platform in the vehicle. The EM3 detector was programed for Wav file format recording with a 256K sample rate. A GPS unit was connected to the EM3 unit to provide GPS locations of all recordings. All ultrasonic detections were digitally stamped with the date, time and location of the recordings. The SD2 detector was programmed for active monitoring. During the first hiking survey of Soquel Canyon (lower 1/3 section), the same microphones were vertically mounted on the top bar of a Kelty metal frame backpack and connected to the EM3/SD2 detectors which were handheld during the surveys. During the survey of the upper 2/3 section of the canyon, the EM3 detector was handheld without the external microphone thus activating the internal SMX-UT microphone. The SD2 detector was also handheld with the microphone directly connected to the unit. Both units were held at above head height with the microphones pointed vertically during the on-foot surveys.

During the mobile surveys, the roads were driven slowly and all bat detections were visually and aurally monitored by watching the EM3 real-time spectrogram and listening to the speaker output on both the EM3 and the SD2. When repeated detections occurred, the vehicle was often stopped and the site was monitored for 10 to 20 minutes. These sites were also often stopped at during subsequent surveys along the same route. Similar point monitoring procedures were implemented during the hiking surveys in Soquel Canyon. Additionally, flying bats were visually searched for at dusk during each survey in areas with standing water and within areas of riparian vegetation in Soquel Canyon.

Bat Call Acoustic Analysis

Following each survey the digital recordings of all the bat calls were downloaded to a computer and analyzed to identify which species were present. The EM3 recordings were analyzed using SonoBat 3.1 (June 2012 release, SonoBat™). All recordings obtained using the SMX-US microphone were acoustically adjusted to SonoBat standards using the SMX-UT conversion tool in the SM2 Batch Attributer program. This option was turned off for analysis of all recordings obtained using the internal SMX-UT microphone in the EM3 unit. Following batch scrubbing of extraneous ultrasonic recordings (i.e., removal of all recordings of leaf rustling noise, wind, etc.) the bat calls were automatically identified using the SonoBat SonoBatch feature. Call files (wav. format) were tagged with species codes whenever the call quality met the identification threshold standards of the SonoBat program. Call files of lower quality were either tagged with a list of probable species or a general category identifying the general frequency range of the calls (e.g. High vs. Low). Calls with lower quality were not identified to species but were tagged as being bat calls.

All calls were then individually reviewed using SonoBat 3 to verify (or not) the SonoBat species identifications. All calls without species ID code tags were visually examined to determine if the calls were embedded in noise that reduced their quality but were recognizable and could be digitally extracted and re-evaluated. These call files were then processed using Raven™ (Cornell Lab of Ornithology) to remove the extraneous noise. The cleaned-up files were then re-run through SonoBat 3.1 to obtain species identifications wherever possible.

All SonoBat and GPS files for calls for which species/species group identifications could be obtained were then converted to Google Earth™ KML files and mapped using Myotisoft™ Transect 1.0.5b.

All bat calls recorded on the Anabat SD2 units were downloaded to the computer using CFRead™ (Titley Scientific) and sonograms were produced using AnalookW™ (Titley Scientific). Each sonogram was then visually compared to sonograms of known species in a digital library to determine species/species group identities. Unique calls were identified and matched to the date-time sequencing of the SonoBat calls and wav. file tags were generated for the Myotisoft KML file creation and Google Earth mapping.

REGULATORY SURVEYS

Jurisdictional Delineation

A jurisdictional delineation was conducted by BonTerra Consulting Ecologist/Regulatory Technician David Hughes with assistance from Forrest Maxon July 9 and 11, 2012, to describe and map the extent of resources under the jurisdiction of the U.S. Army Corps of Engineers (USACE), the Regional Water Quality Control Board (RWQCB), and the CDFW. The delineation followed guidelines presented in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008). This regional supplement is designed for use with the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Both the 1987 Wetlands Manual and the Arid West Supplement to the manual provide technical methods and guidelines for determining the presence of "Waters of the U.S." and wetland resources. A three-parameter approach—which requires evidence of wetland hydrology, hydrophytic vegetation, and hydric soils—was used to identify wetlands on the Project site and adjacent off-site areas. In order to be considered a wetland, an area must exhibit at least minimal hydric characteristics within the three parameters. However, problem areas may periodically or permanently lack certain indicators due to seasonal or annual variability of the nature of the soils or plant species on a project site. Atypical wetlands lack certain indicators due to recent human activities or natural events. Guidance for determining the presence of wetlands in these situations is presented in the regional supplement. Non-wetland "Waters of the U.S." are delineated based on the limits of the Ordinary High Water Mark (OHWM), which can be determined by a number of factors including erosion, the deposition of vegetation or debris, and changes in vegetation.

It should be noted that the RWQCB shares the USACE jurisdiction unless isolated conditions are present. If isolated waters conditions are present, the RWQCB takes jurisdiction using the USACE's definition of the OHWM and/or the three-parameter wetlands methodology pursuant to the 1987 Wetlands Manual. The CDFW's jurisdiction is defined as the top of the bank of the stream, channel, or basin or the outer limit of riparian vegetation located within or immediately adjacent to the river, stream, creek, pond, or lake.

California Rapid Assessment Method Analysis

A CRAM analysis was conducted by Mr. Hughes on July 9 and 11, 2012 (concurrent with the jurisdictional delineation), with an additional survey on October 24, 2012. Surveys were conducted in accordance with the CRAM for Wetlands *User's Manual* (Collins et al. 2008). The CRAM analysis for Riverine Wetlands[3] was used to establish and score 100-meter-long Assessment Areas (AAs) in the principal streambed features on the property. The AA is the fundamental unit of evaluation for CRAM analysis. The AA width was defined as the outer canopy of vegetation that overhung the streambed.

Information recorded for the AA includes (1) the percentage of the AA that was surrounded by a buffer and the width of the buffer; (2) the water source for the AA; (3) the cross-sectional measurements to determine hydrologic connectivity to adjacent areas; (4) the number of plant layers within the AA; and (5) the number of co-dominant species and invasive species. Qualitative factors that were assessed include (1) the condition of the buffer surrounding the AA;

[3] CRAM uses the definition of a wetland provided by the National Wetland Inventory (NWI) of the USFWS: "Wetlands are lands transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is not a soil and is saturated with water or covered by shallow water at some time during the growing season of each year" (Cowardin et al. 1979).

(2) the channel stability; (3) the complexity of the channel's bank with regards to the number of surfaces or features that provide habitat for species and topography; and (4) the horizontal and vertical structure of the plant community. Individual scores are obtained by "choosing the best-fit set of narrative descriptions of observable conditions ranging from the worst commonly observed (D) to the best achievable for the wetland (A)" (Collins et al. 2008). Each description has a fixed numerical value. This information was used to assess four primary attributes (i.e., Buffer and Landscape Context, Hydrology, Physical Structure, and Biotic Structure). The attribute score is calculated by first adding the values of the chosen narrative descriptions for the attribute's component metrics, and then converting the sum into a percentage of the maximum possible score for the attribute. The overall AA score is the average of the final attribute scores.

AA scores range from 25 to 100. The maximum AA score possible represents how a wetland is doing relative to the best achievable conditions for that wetland type in the state. It is assumed that the same scores for different wetlands of the same type represent the same overall condition and functional capacity. Therefore, these scores may be used to track the progress of restoration efforts over time; to compare impacted sites to their in-kind mitigation sites; or to compare an individual wetland to the status and trends in ambient condition of its wetland type.

3.0 EXISTING BIOLOGICAL RESOURCES

This section describes the biological resources that occur or potentially occur on the property. Vegetation types, wildlife populations and movement patterns, and special status biological resources are discussed below.

VEGETATION TYPES AND OTHER AREAS

Eleven vegetation types and other areas occur on the Hayashi property: blue elderberry stand, bush mallow scrub, California walnut groves, California walnut groves/laurel sumac scrub association, coast live oak woodland, disturbed (bare ground), giant wild rye grassland, laurel sumac scrub, mulefat thicket, needle grass grassland, semi-natural herbaceous stands, and willow thickets (Table 2, Exhibit 6). These vegetation types were cross-walked to the general vegetation types used in the NCCP/HCP Plan.

TABLE 2
VEGETATION TYPES AND OTHER AREAS ON THE PROPERTY

General Vegetation Types	Detailed Vegetation Types or Other Areas	Project Site (Acres)
Chaparral		
	Blue Elderberry Stand	0.76
	Bush Mallow Scrub	1.18
	Laurel Sumac Scrub	55.48
	Chaparral Subtotal:	**57.42**
Grassland		
	Giant Wild Rye Grassland	1.34
	Needle Grass Grassland	0.43
	Semi-Natural Herbaceous Stands	42.00
	Grassland Subtotal:	**43.77**
Riparian		
	Mulefat Thicket	2.13
	Willow Thickets	1.79
	Riparian Subtotal:	**3.92**
Woodland		
	California Walnut Groves	132.04
	California Walnut Groves/Laurel Sumac Scrub Association	42.55
	Coast Live Oak Woodland	11.55
	Woodland Subtotal:	**186.14**
Developed/Non-native	Disturbed (Bare Ground)	2.45
	Total Acreage	***293.70***

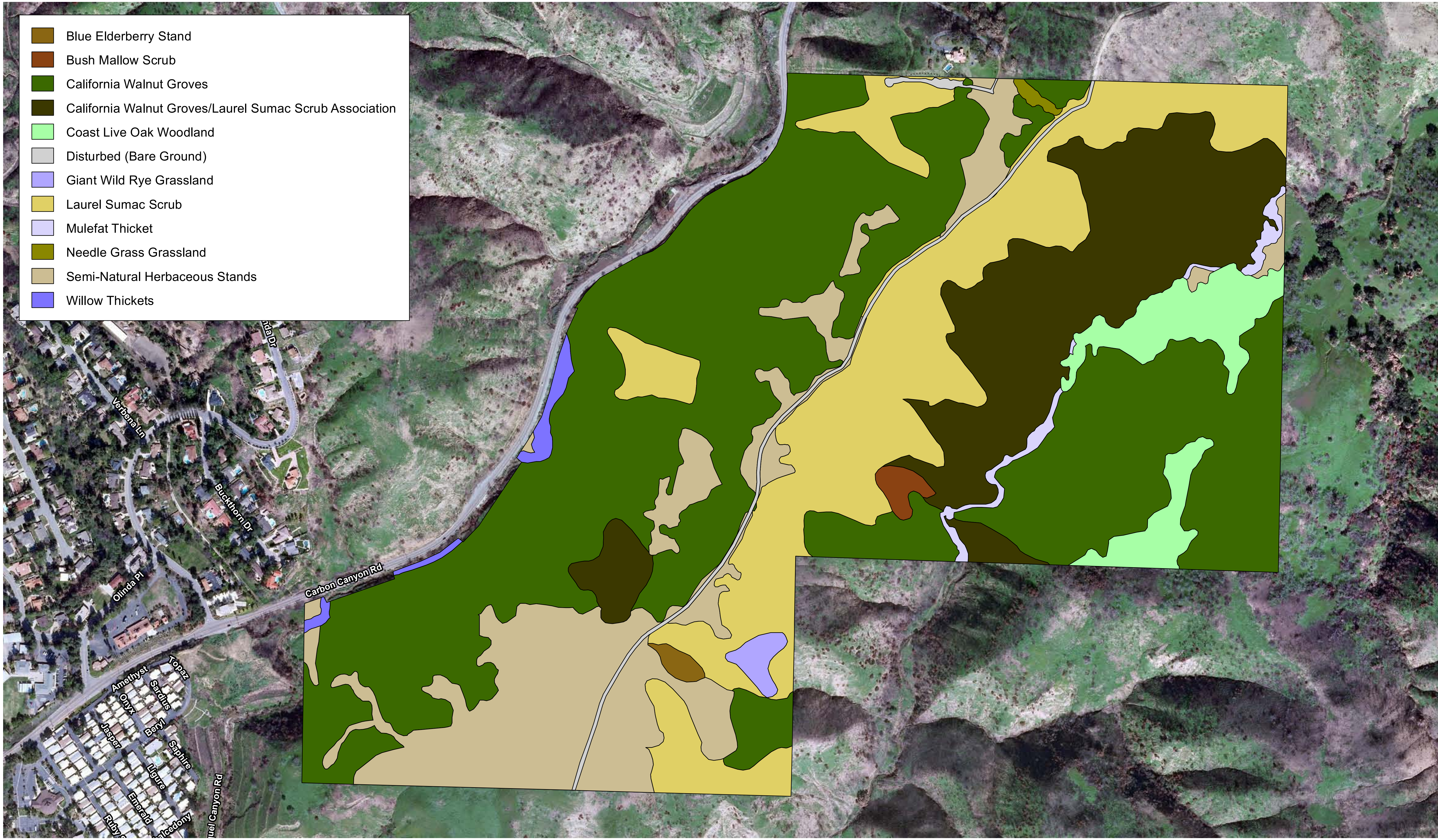
Chaparral

Blue Elderberry Stand

A total of 0.76 acre of blue elderberry stands occurs on the Hayashi property. This vegetation type is located on a southwestern-facing slope near the southern edge of the site. It is dominated by scattered blue elderberry (*Sambucus nigra* ssp. *caerulea*) with California brittlebush (*Encelia californica*). The understory consists of non-native grasses such as slender wild oat (*Avena barbata*).

Bush Mallow Scrub

A total of 1.18 acres of bush mallow scrub occurs on the Hayashi property. This vegetation type is located on a ridge near the center of the site. It is dominated by dense chaparral mallow (*Malacothamnus fasciculatus*). This species sprouts and grows vigorously after a light to moderate fire; individual shrubs are suppressed by the shade of longer-lived shrub species within a decade of fire (Sawyer et al. 2009). Lesser amounts of bush monkeyflower (*Mimulus aurantiacus*) and California everlasting (*Pseudognaphalium californicum* [*Gnaphalium c*.]) are also scattered throughout this vegetation type.



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Vegetation Types

Exhibit 6

Measure M2 Acquisition Properties Evaluation/Hayashi Property

N W E S

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Feet

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Laurel Sumac Scrub

A total of 55.48 acres of laurel sumac scrub occurs on the Hayashi property. This vegetation type is primarily located on the upper, southeast-facing slopes east of the main ridgeline. It is dominated by dense laurel sumac (*Malosma laurina*) and chaparral mallow; as a fire-follower, chaparral mallow is expected to be suppressed by longer-lived species as the site recovers from the 2008 Freeway Complex Fire. Areas along the ridgeline have California sagebrush *(Artemisia californica)*, black sage *(Salvia mellifera)*, and purple sage (*Salvia leucophylla*) as sub-dominant species. Blue elderberry is sub-dominant in other areas.

Grassland

Giant Wild Rye Grassland

A total of 1.34 acres of giant wild rye grassland occurs on the Hayashi property. This vegetation type is located on a plateau near the southern edge of the site. It is dominated by giant wild rye *(Elymus condensatus* [*Leymus c.*]). Non-native grasses, such as ripgut grass (*Bromus diandrus*) are also present in this vegetation type.

Needle Grass Grassland

A total of 0.43 acre of needle grass grassland occurs on the Hayashi property. This vegetation type is located in an opening between California walnut groves at the northern edge of the site. It is characterized by having at least 10 percent relative cover of purple needlegrass (*Stipa pulchra* [*Nassella p.*]) and foothill needlegrass (*Stipa lepida* [*Nassella l.*]). This vegetation type has been heavily disturbed by grazing and has a high proportion of non-native species such as ripgut grass and slender wild oat.

Semi-Natural Herbaceous Stands

A total of 42.00 acres of semi-natural herbaceous stands occurs on the Hayashi property. This vegetation type is located along the ridgeline running across the site; down the adjacent slopes; and interspersed with woodland on the site. Ripgut grass and slender wild oat are dominant in some areas, with species such as common horehound (*Marrubium vulgare*) and tocalote (*Centaurea melitensis*) also occurring. Other areas, especially the southwest portion of the site, are dominated by milk thistle (*Silybum marianum*). Scattered purple needlegrass, foothill needlegrass, and giant wild rye are present in this vegetation type; however, the coverage of these species is too low to be mapped as native perennial grassland. This vegetation type has been heavily disturbed by grazing.

This vegetation type would be an appropriate candidate for habitat restoration to native grassland, scrub, or woodland communities, depending on the slope, aspect, and soils present. Given that milk thistle is prevalent in the southwest portion of the site, this area should be prioritized for weed treatment.

Riparian

Mulefat Thicket

A total of 2.13 acres of mulefat thicket occurs on the Hayashi property. This vegetation type is located within the drainage of Soquel Canyon. It is dominated by mule fat (*Baccharis salicifolia* ssp. *salicifolia* [*B. salicifolia*]) with dense patches of California rose (*Rosa californica*) and western poison oak (*Toxicodendron diversilobum*). Herbaceous vegetation in the understory also includes salt grass (*Distichlis spicata*) and giant wild rye. Scattered coast live oaks

(*Quercus agrifolia*), southern California black walnut (*Juglans californica*), and blue elderberry are also present in and adjacent to the drainage. Water is present intermittently in the drainage.

Willow Thickets

A total of 1.79 acres of willow thickets occurs on the Hayashi property. This vegetation type is located along Carbon Canyon Creek on the northwestern edge of the site. It is dominated by a mix of willow species (e.g., Goodding's black willow [*Salix gooddingii*] and arroyo willow [*Salix lasiolepis]*). Southern California black walnut, blue elderberry, and poison hemlock (*Conium maculatum*) are also present along the creek.

Woodland

California Walnut Groves

A total of 132.04 acres of California walnut groves occurs on the Hayashi property. This vegetation type is located on northwest-facing slopes throughout the site. It is dominated by an open canopy of southern California black walnuts. In some areas, sub-dominant species densely occurring in this woodland include toyon (*Heteromeles arbutifolia*), laurel sumac, and blue elderberry. In other areas, the understory is relatively open and composed of non-native grasses.

California Walnut Groves/Laurel Sumac Scrub Association

A total of 42.55 acres of California walnut groves/laurel sumac scrub association occurs on the Hayashi property. This vegetation type is located on the lower, southeast-facing slopes of the site. It is similar to the California walnut groves described above, but co-dominated by southern California black walnuts and laurel sumac. The tree density is also sparser in this vegetation type. Blue elderberry and chaparral mallow are sub-dominant species in some areas.

Coast Live Oak Woodland

A total of 11.55 acres of coast live oak woodland occurs on the Hayashi property. This vegetation type is located on northwest-facing slopes east of and at the bottom of Soquel Canyon. It is dominated by a canopy of coast live oak. The understory contains non-native grasses and western poison oak.

Developed/Non-native

Disturbed (Bare Ground)

A total of 2.45 acre of disturbed (bare ground) occurs on the Hayashi property. This consists of the dirt access road running along the ridgeline and areas cleared around the residential property north of the site. Disturbed areas contain little to no vegetation.

WILDLIFE POPULATIONS AND MOVEMENT PATTERNS

Vegetation on and adjacent to the property provides potential habitat for a number of wildlife species. Common wildlife species observed or expected to occur on the property and/or in adjacent off-site areas are discussed below.

Fish

Most creeks and waterways in Southern California are subject to periods of high water flow in winter and spring and little to no flow during the late summer and fall. Most drainages occurring on the Project site are expected to convey water only following storm events. However, Carbon Canyon Creek contains perennial flows. Water was observed flowing at the time of the surveys.

No fish species were observed on the property. Fish species expected to occur in Carbon Canyon Creek include green sunfish (*Lepomis cyanellus*) and western mosquitofish (*Gambusia affinis*).

Amphibians

Amphibians require moisture for at least a portion of their life cycle and many require standing or flowing water for reproduction. Terrestrial species may or may not require standing water for reproduction; they survive in dry areas by aestivating (i.e., remaining beneath the soil in burrows or under logs and leaf litter, and emerging only when temperatures are low and humidity is high). Many of these species' habitats are associated with water and they emerge to breed once the rainy season begins. Soil moisture conditions can remain high throughout the year in some habitat types depending on factors such as amount of vegetation cover, elevation, and slope/aspect.

Amphibian species are expected to occur primarily along the stream in Soquel Canyon. No amphibian species were observed on the property. Common amphibian species that may occur on the property include garden slender salamander (*Batrachoseps major*), western toad (*Anaxyrus boreas*), Pacific treefrog (*Pseudacris* [*Hyla*] *regilla*), and Baja California treefrog (*Pseudacris hypochondriaca*).

Reptiles

Reptiles are well-adapted to life in arid habitats. They have several physiological adaptations that allow them to conserve water. Reptiles can also become dormant during weather extremes, allowing them to survive prolonged droughts and paucity of food (Ruben and Hillenius 2005). Reptilian diversity and abundance typically varies with vegetation type and character. Many species prefer only one or two vegetation types; however, most species will forage in a variety of habitats. Most reptile species that occur in open areas will excavate a burrow or use rodent burrows for cover, protection from predators, and refuge during extreme weather conditions.

Lizard species observed on the property include western fence lizard (*Sceloperus occidentalis*) and side-blotched lizard (*Uta stansburiana*). Snakes observed on the Project site include gopher snake (*Pituophis catenifer*) and common kingsnake (*Lampropeltis getula*).

Birds

A variety of bird species are expected to be residents on the property, using the habitats throughout the year. Other species are present only during certain seasons. For example, the white-crowned sparrow (*Zonotrichia leucophrys*) is expected to occur on the property during the winter season, but would not occur in the summer season because it migrates north to its breeding range.

Resident bird species observed on the Project site include California quail (*Callipepla californica*), acorn woodpecker (*Melanerpes formicivorus*), Nuttall's woodpecker *(Picoides nuttallii),* western scrub-jay, common raven (*Corvus corax*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), house wren (*Troglodytes aedon*), wrentit (*Chamaea fasciata*), California thrasher (*Toxostoma redivivum*), common yellowthroat (*Geothlypis trichas*), yellow warbler (*Setophaga petechia* [*Dendroica petechia*]), spotted towhee (*Pipilo maculatus*), California towhee (*Pipilo crissalis*), rufous-crowned sparrow (*Aimophila ruficeps*), and song sparrow (*Melospiza melodia*). Urban-tolerant species that occur in disturbed areas and in natural vegetation types that were also observed on the property include mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), black phoebe (*Sayornis nigricans*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), house finch (*Carpodacus mexicanus*), and lesser goldfinch (*Spinus* [*Carduelis*] *psaltria*).

Wintering birds are those species that generally breed outside the region but migrate to the area for the winter season. Wintering species observed on the property include fox sparrow (*Passerella iliaca*). Summer residents are species that migrate into the region to breed, but generally winter south of the region. Summer breeders observed during the surveys include black-chinned hummingbird (*Archilochus alexandri*), Pacific-slope flycatcher (*Empidonax difficilis*), cliff swallow (*Petrochelidon pyrrhonota*), black-headed grosbeak (*Pheucticus melanocephalus*), blue grosbeak (*Passerina caerulea*), lazuli bunting (*Passerina amoena*), hooded oriole (*Icterus cucullatus*), and Bullock's oriole (*Icterus bullockii*). During spring and fall migration, the Project site also provides foraging habitat for a variety of migratory species.

Birds of prey (raptors) observed on the property include barn owl (*Tyto alba*), western screech-owl (*Megascops kennicottii*), turkey vulture (*Cathartes aura*) (a scavenger), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*). The western screech-owl (i.e., adults with two or three fledglings) was observed at a nest in an abandoned refrigerated trailer just off site.

Mammals

Active burrows are present throughout the property and could provide cover for a number of small mammal species. Small ground-dwelling mammals or their sign observed on the site include California ground squirrel (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*). Additional common small mammals expected on site include deer mouse (*Peromyscus maniculatus*), California pocket mouse (*Chaetodipus californicus*), western harvest mouse (*Reithrodontomys megalotis*), and woodrats (*Neotoma* spp.).

Open grassland communities and the leafy understory of scrub and woodland communities provide excellent foraging habitat for herbivorous mammals. Common herbivores observed during field surveys include mule deer (*Odocoileus hemionus*) and desert cottontail (*Sylvilagus audubonii*).

Medium to larger mammalian predators (both carnivorous and omnivorous species) that were observed or are expected on the property in a variety of habitats include common striped skunk (*Mephitis mephitis*), northern raccoon (*Procyon lotor*), gray fox (Urocyon cinereoargenteus), coyote (*Canis latrans*), and bobcat. The mountain lion is also among the larger mammals associated with variety of vegetation communities on site. Mountain lions are known to occur within the Chino Hills, and are expeced to occur on site.

Four bat species were identified from the acoustic analysis: Brazilian free-tailed bat (*Tadarida brasiliensis*), Yuma myotis (*Myotis yumanensis*), hoary bat (*Lasiurus cinereus*), and a potential western red bat (*Lasiurus blossevillii*). The species determination for the western red bat is tentative, being based on a single call sequence recording. Most of the bat activity documented on the property occurred in the lower elevation canyons and ravines where the bats are most likely to find more abundant insect food. No active bat roosts were located during the surveys. However, small numbers of foliage-roosting bats, such as the hoary bat, are likely to occur in the nearby riparian and urban areas which support large-leaved deciduous trees such as the western sycamore (*Platanus racemosa*) and/or the Freemont cottonwood (*Populus fremontii*).

Wildlife Movement

Wildlife corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization creates isolated "islands" of wildlife habitat. In the absence of habitat linkages that allow movement to adjoining open space areas, various studies have concluded that some wildlife species, especially the larger and more mobile mammals, will not likely persist over time in fragmented or isolated habitat areas because they prohibit the infusion of new individuals and genetic information (MacArthur and Wilson 1967; Soule 1987; Harris and Gallagher 1989; Bennett 1990). Corridors mitigate the effects of this fragmentation by (1) allowing animals to move between remaining habitats, thereby permitting depleted populations to be replenished and promoting genetic exchange; (2) providing escape routes from fire, predators and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or local species extinction; and (3) serving as travel routes for individual animals as they move in their home ranges in search of food, water, mates, and other necessary resources (Noss 1983; Fahrig and Merriam 1985; Simberloff and Cox 1987; Harris and Gallagher 1989).

Wildlife movement activities usually fall into one of three movement categories: (1) dispersal (e.g., juvenile animals from natal areas or individuals extending range distributions); (2) seasonal migration; and (3) movements related to home range activities (e.g., foraging for food or water, defending territories or searching for mates, breeding areas, or cover). A number of terms such as "wildlife corridor", "travel route", "habitat linkage", and "wildlife crossing" have been used in various wildlife movement studies to refer to areas in which wildlife move from one area to another. To clarify the meaning of these terms and to facilitate the discussion on wildlife movement in this analysis, these terms are defined as follows:

- ***Travel route –*** a landscape feature (such as a ridgeline, drainage, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and to provide access to necessary resources (e.g., water, food, cover, den sites). The travel route is generally preferred because it provides the least amount of topographic resistance in moving from one area to another. It contains adequate food, water, and/or cover while moving between habitat areas and it provides a relatively direct link between target habitat areas.

- ***Wildlife corridor –*** a piece of habitat, usually linear in nature, that connects two or more habitat patches that would otherwise be fragmented or isolated from one another. Wildlife corridors are usually bound by urban land areas or other areas unsuitable for wildlife. The corridor generally contains suitable cover, food, and/or water to support species and to facilitate movement while in the corridor. Larger, landscape-level corridors (often referred to as "habitat linkages" or "landscape linkages") can provide both transitory and resident habitat for a variety of species.

- ***Wildlife crossing*** **–** a small, narrow area, relatively short in length and generally constricted in nature that allows wildlife to pass under or through an obstacle or barrier that otherwise hinders or prevents movement. Crossings typically are man-made and include culverts, underpasses, drainage pipes, and tunnels to provide access across or under roads, highways, pipelines, or other physical obstacles. These often represent "choke points" along a movement corridor, which may impede wildlife movement and increase the risk of predation.

It is important to note that in a large open space area where there are few or no man-made or naturally occurring physical constraints to wildlife movement, wildlife corridors (as defined above) may not yet exist. Given an open space area that is both large enough to maintain viable populations of species and to provide a variety of travel routes (e.g., canyons, ridgelines, trails, riverbeds, and others), wildlife will use these "local" routes while searching for food, water, shelter, and mates and will not need to cross into other large open space areas. Based on their size, location, vegetative composition and availability of food, some of these movement areas (e.g., large drainages and canyons) are used for longer lengths of time and serve as source areas for food, water and cover, particularly for small- and medium-sized animals. This is especially true if the travel route is within a larger open space area. However, once open space areas become constrained and/or fragmented as a result of urban development or construction of physical obstacles (such as roads and highways), the remaining landscape features or travel routes that connect the larger open space areas become corridors as long as they provide adequate space, cover, food and water, and do not contain obstacles or distractions (e.g., man-made noise, lighting) that would generally hinder wildlife movement.

In general, animals discussed within the context of movement corridors typically include larger, more mobile species (such as mule deer, black bear [*Ursus americanus*], mountain lion, fox [*Urocyon* sp.], and coyote) and even some of the mid-sized mammals (such as raccoon, striped skunk, American badger [*Taxidea taxus*], and Virginia opossum [*Didelphis virginiana*]). Most of these species have relatively large home ranges through which they move to find adequate food, water, and breeding and wintering habitat. It is assumed that corridors that serve larger, more vagile species also serve as corridors for many smaller, less mobile species, such as reptiles, amphibians, and rodents (generally discussed within the context of local movement). Regional movement for these species facilitates gene flow and requires at least some local "stepping stone" movement of individuals between populations.

The availability of open space corridors is generally considered less important for bird species. Most bird species are believed to fly in more or less direct paths to desired locations; however, some habitat-specific species may not move great distances from their preferred habitat types, and are believed to be less inclined to travel across unsuitable areas.

Ideally, an open space corridor should encompass a heterogeneous mix of vegetation types to accommodate the ecological requirements of a wide variety of resident species in any particular region. Most species typically prefer adequate vegetation cover during movement, which can serve as both a food source and as protection from weather and predators. Drainages, riparian areas, and forested canyon bottoms typically serve as natural movement corridors because these features provide cover, food, and often water for a variety of species. Very few species will move across large expanses of open, uncovered habitat unless it is the only option available to them. For some species, landscape linkages must be able to support animals for sustained periods, not just for travel. Smaller or less mobile animals (such as rodents and reptiles) require long periods to traverse a corridor, so the corridor must contain adequate food and cover for survival.

Regional Movement

Open space on the property provides a connection between Chino Hills State Park property south of SR-142 and Chino Hill State Park and other open space north of SR-142. Wildlife moving northwest or southeast is constrained to an approximate 3.65-mile-wide wildlife corridor by development southwest of Telegraph Canyon Road and northeast of Canyon Hills Road. This large area is currently broken up into approximate 0.29-mile-wide, 1.00-mile-wide, 1.40-mile-wide areas of habitat by Olinda Village and Sleepy Hollow, as measured at the narrowest point. These remaining corridors currently consist of undeveloped open space, though residential development is proposed across SR-142 northeast of Olinda Village. SR-142 acts as a barrier to wildlife movement along this corridor.

A wildlife corridor analysis was conducted in the region in October 2000 (URS 2001). Mountain lion, coyote, bobcat, and mule deer were documented along the ridgeline and along Soquel Canyon within the property. Soquel and Telegraph Canyons and associated ridgelines converge at SR-142 southwest of the property and there are several moderately sized drainages and ridgelines on the north side of the road that wildlife can use to move toward Sonome and Tonner Canyons to the north.

Local Movement

The property consists of a northeast-southwest oriented ridgeline and relatively steep northwest-southeast oriented canyons draining to Soquel Canyon to the east and Carbon Canyon to the west. These areas provide a variety of travel routes for local wildlife movement. Movement is expected to occur on the property, as well as between the property and contiguous off-site habitat. Wildlife that require relatively large home ranges, such as coyote and mule deer, were observed on the property.

SPECIAL STATUS BIOLOGICAL RESOURCES

The following section addresses special status biological resources that were observed, reported, or have the potential to occur on the property or in adjacent off-site areas. These resources include plant and wildlife species that have been afforded special status and/or recognition by federal and State resource agencies, as well as private conservation organizations. In general, the principal reason an individual taxon (i.e., species, subspecies, or variety) is given such recognition is the documented or perceived decline or limitations of its population size, geographic range, and/or distribution resulting in most cases from habitat loss. Tables 5 and 6 provide a summary of special status plant and wildlife species known to occur in the Project vicinity (i.e., the USGS' San Dimas, Ontario, Yorba Linda, and Prado Dam 7.5-minute quadrangles) and include information on the status; habitat; potential for occurrence; results of focused survey efforts; and definitions for the various status designations. Generally, this list includes species reported by the CNDDB and CNPS, supplemented with species from the author's experience that either occur nearby or could occur based on the presence of suitable habitat. In addition to species, special status biological resources include vegetation types and habitats that are either unique; of relatively limited distribution in the region; or of particularly high wildlife value. These resources have been defined by federal, State, and local government conservation programs. Sources used to determine the status of biological resources are listed below.

- ***Plants –*** Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2012); the CNDDB (CDFG 2012); various USFWS *Federal Register* notices regarding listing status of plant species; and the *List of Special Vascular Plants, Bryophytes, and Lichens* (CDFG 2013).

- ***Wildlife –*** California Wildlife Habitat Relationships Database System (CDFG BDB 2012); the CNDDB (CDFG 2012); various USFWS *Federal Register* notices regarding listing status of wildlife species; and *List of Special Animals* (CDFG 2011).

- ***Habitats –*** CNDDB (CDFG 2012) and *List of California Natural Communities* (CDFG 2010).

Definitions of Special Status Biological Resources

A **federally Endangered species** is one facing extinction throughout all or a significant portion of its geographic range. A **federally Threatened species** is one likely to become Endangered within the foreseeable future throughout all or a significant portion of its range. The presence of any federally Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in "take" of the species or its habitat. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct. Harm, in this sense, can include any disturbance of habitats used by the species during any portion of its life history.

Proposed species or **Candidate species** are those officially proposed by the USFWS for addition to the federal Threatened and Endangered species list. Because proposed species may soon be listed as Threatened or Endangered, these species could become listed prior to or during implementation of a proposed project. The presence of a Proposed or Candidate species within a project impact area may impose constraints on development if they are listed prior to issuance of project permits, particularly if a project would result in "take" of the species or its habitat.

The State of California considers an **Endangered species** as one whose prospects of survival and reproduction are in immediate jeopardy; a **Threatened species** as one present in such small numbers throughout its range that it is likely to become an Endangered species in the near future in the absence of special protection or management; and a **Rare species** as one present in such small numbers throughout its range that it may become Endangered if its present environment worsens. Rare species applies only to California native plants. State-listed Threatened and Endangered species are protected against take unless an Incidental Take Permit is obtained from the resource agencies. The presence of any State-listed Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in "take" of the species or its habitat.

California Species of Special Concern is an informal designation used by the CDFW for some declining wildlife species that are not State Candidates. This designation does not provide legal protection, but signifies that these species are recognized as special status by the CDFW. Recently, the CDFW downgraded some of these species from Species of Special Concern to the **Watch List**.

Species that are **California Fully Protected** and **Protected** include those protected by special legislation for various reasons, such as the mountain lion and white-tailed kite (*Elanus leucurus*). Fully Protected species may not be taken or possessed at any time. California Protected species include those species that may not be taken or possessed at any time except under special permit from the CDFW issued pursuant to the *California Code of Regulations* (Title 14, §§650, 670.7) or Section 2081 of the *California Fish and Game Code.*

Species of **Local Concern** are those that have no official status with the resource agencies, but are being watched because there is either a unique population in the region or the species is declining in the region.

Special Animal is a general term that refers to species that the CNDDB is interested in tracking, regardless of legal or protective status. This term includes species designated as any of the above terms, but also includes species that may be considered biologically rare; restricted in distribution; declining throughout their range; have a critical, vulnerable stage in their life cycle that warrants monitoring; are on the periphery of their range and are threatened with extirpation in California; are associated with special status habitats; or are considered by other State or federal agencies or private organizations to be sensitive or declining.

The California Rare Plant Rank (CRPR), formerly known as CNPS List, is a ranking system by the Rare Plant Status Review group[4] and managed by the CNPS and the CDFW. A CRPR summarizes information on the distribution, rarity, and endangerment of California's vascular plants. Plants with a CRPR of **1A** are presumed extinct in California because they have not been seen in the wild for many years. Plants with a CRPR of **1B** are Rare, Threatened, or Endangered throughout their range. Plants with a CRPR of **2A** are presumed extirpated from California, but are more common elsewhere. Plants with a CRPR of **2B** are considered Rare, Threatened, or Endangered in California, but are more common elsewhere. Plants with a CRPR of **3** require more information before they can be assigned to another rank or rejected; this is a "review" list. Plants with a CRPR of **4** are of limited distribution or infrequent throughout a broader area in California; this is a "watch" list. The CRPR Threat Rank is an extension added onto the CRPR to designate the level of endangerment by a 1 to 3 ranking (CNPS 2012). An extension of **.1** is assigned to plants that are considered to be "seriously threatened" in California (i.e., over 80 percent of the occurrences threatened or having a high degree and immediacy of threat). Extension **.2** indicates the plant is "fairly threatened" in California (i.e., between 20 and 80 percent of the occurrences threatened or having a moderate degree and immediacy of threat). Extension **.3** is assigned to plants that are considered "not very threatened" in California (i.e., less than 20 percent of occurrences threatened or having a low degree and immediacy of threat or no current threats known). The absence of a threat code extension indicates plants lacking any threat information.

<u>Vegetation Types</u>

In addition to providing an inventory of special status plant and wildlife species, the CNDDB also provides an inventory of vegetation types that are considered special status by the State and federal resource agencies, academic institutions, and various conservation groups (such as the CNPS). Determination of the level of imperilment (i.e., exposure to injury, loss, or destruction) is based on the NatureServe Heritage Program Status Ranks that rank both species and vegetation types on a global (G) and statewide (S) basis according to their rarity, trend in population size or area, and recognized threats (e.g., proposed developments, habitat degradation, and non-native species invasion) (Faber-Langendoen et al. 2009). The ranks are scaled from 1–5. NatureServe considers **G or S 1** communities to be critically imperiled and at a very high risk of extinction or elimination due to extreme rarity, very steep declines, or other factors; **G or S 2** communities to be imperiled and at high risk of extinction or elimination due to very restricted range, very few populations or occurrences, steep declines, or other factors; **G or S 3** communities to be vulnerable and at moderate risk of extinction or elimination due to a restricted range, relatively few populations or occurrences, recent and widespread declines, or other factors; **G or S 4** communities to be apparently secure and uncommon but not rare with some cause for long-term concern due to declines or other factors; and **G or S 5** communities to be secure. A question mark (?) denotes an inexact numeric rank, but existing information points

[4] A group of over 300 botanical experts from the government, academia, non-governmental organizations, and the private sector.

to this rank (Faber-Langendoen et al. 2009).For vegetation alliances[5] that have State ranks of S1–S3, all associations within the alliance are considered to be highly imperiled.

Special status vegetation types observed on the Project site are described further below.

Chaparral Communities

A total of 1.18 acres of bush mallow scrub and 56.42 acres of laurel sumac scrub are present on the property. These vegetation types are ranked according to their degree of imperilment by the CDFW; both the *Malacothamnus fasciculatus* (Bush mallow scrub) Alliance and the *Malosma laurina* (laurel sumac scrub) Alliance are ranked as G4 S4. The Global/State rankings of bush mallow scrub and laurel sumac scrub indicate that they are apparently secure.

As a transitional vegetation type, areas mapped as bush mallow scrub may develop into a more complex chaparral or coastal sage scrub community. Chaparral is a “drought tolerant plant community dominated by sclerophyllous, woody shrubs shaped by a Mediterranean-type climate and naturally recurring wildfires” (Halsey 2007). It is the most extensive vegetation community in California and is not presently considered to have special status, though its status in the future may be uncertain given continuing drought conditions, increased fire frequencies, and limited understanding of the system. Coastal sage scrub has, as a whole, declined approximately 70 to 90 percent in its historic range in California by the mid-1990s (Noss and Peters 1995). Sage scrub has largely been lost to land use changes in Southern California basins and foothills. The ecological function of Southern California’s remaining sage scrub is threatened by habitat fragmentation and degradation, which is largely the result of invasive non-native species, livestock grazing, off-highway vehicles, altered fire regime, and air pollution (O’Leary 1995; Allen et al. 2000).

Giant Wild Rye Grassland

A total of 1.34 acres of giant wild rye grassland is ranked according to its degree of imperilment by the CDFW; the *Leymus condensatus* (giant wild rye grassland) Alliance is ranked G3 S3. Vegetation types ranked as S3 are considered of special concern. Giant wild rye grassland is described under the Herbaceous Alliances and Stands and this association tends to be short lived because they are stimulated by fire and are fairly quickly taken over by native shrubs of the coastal sage scrub zone following fire (Sawyer et al. 2009). Giant wild rye was one of the species whose abundance was maintained by Native American burning (Sawyer et al 2009). Giant wild rye does occur after fires; however, it may persist independently of fire in areas of human disturbance and urban runoff or in areas of coastal sage scrub where natural slumping and seepage occur (Sawyer et al 2009).

Blue Elderberry Stand

A total of 0.76 acre of blue elderberry stand is present on the property. This vegetation type is ranked as G3 S3. While this ranking indicates that this vegetation type is vulnerable, the blue elderberry stand on the property contains sparse elderberry individuals and an understory of non-native grasses.

[5] A vegetation alliance is “a classification unit of vegetation, containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover” (Sawyer et al. 2009).

Willow Thicket

A total of 2.13 acres of mulefat thickets and 1.79 acres of willow thickets are present on the property. Willow riparian woodland is ranked according to its degree of imperilment by the CDFW; black willow thickets are ranked G4 S3, arroyo willow thickets are ranked G4 S4 and mulefat thickets are ranked G5 S4. Typically, riparian vegetation provides important biological functions for an ecosystem such as (1) for cover and water sources for wildlife; (2) for filtration of runoff water and groundwater to be recharged; and (3) for flood control and sediment stabilization purposes. Riparian habitats are biologically productive as well as diverse, and are the exclusive habitat of several special status species. As a result, the resource agencies often consider riparian vegetation types to be important resources. It is estimated that as much as 95 to 97 percent of historic riparian habitats in Southern California had been lost by the late 1980s due to agriculture, urban development, flood control, and other human-caused impacts (Faber et al. 1989; Bell 1997). Additionally, since the 1970s, giant reed has become the greatest threat to the remaining riparian resources in coastal Southern California (Bell 1997). This invasive species competes with native species such as willows (Salix spp.), mule fat, and cottonwoods (Populus spp.); is difficult to control; and apparently does not provide food or nesting habitat for native species (Bell 1997).

Woodland Communities

A total of 11.55 acres of coast live oak woodland occurs on the property. Coast live oak woodland is ranked according to its degree of imperilment by the CDFW; the *Quercus agrifolia* (coast live oak woodland) Alliance is ranked G5 S4. In addition, some oak woodlands on the Project site are associated with jurisdictional resources and discussed separately below. Oak woodlands are declining throughout California due to residential, commercial, and industrial development. They are an important resource in California that provides aesthetic, cultural, economic, and environmental value, in addition to wildlife habitat.

A total of 131.78 acres of California walnut groves occurs on the property. In addition, a total of 42.55 acres is an association of California walnut groves and laurel sumac scrub. California walnut woodland is ranked according to its degree of imperilment by the CDFW; the *Juglans californica* (California walnut groves) Alliance is ranked G3 S3 (any associations with this alliance, such as with laurel sumac, would also be considered highly imperiled). Vegetation types ranked as S3 are considered of special concern.

Needle grass Grassland

A total of 0.43 acre of needle grass grassland occurs on the property. Needle grass grassland is ranked according to its degree of imperilment by the CDFW; the *Nassella pulchra* (purple needle grass grassland) Provisional Alliance is ranked as G4 S3?[6] and the *Nassella lepida* (foothill needle grass grassland) Provisional Alliance is ranked as G3? S3?. Vegetation types ranked as S3 are considered of special concern. Native grasslands are believed to have covered nearly $^1/_5$ of the state and have declined by approximately 99 percent in their historic range in California (Barry 1972; Noss and Peters 1995). In the mid-nineteenth century, heavy grazing by cattle and sheep caused native perennials to be replaced by fast-growing annual grasses, which are able to take advantage of spring rains and produce seeds before the dry heat of summer. The native perennial grasses, which are more palatable to livestock than annuals, were damaged by grazing and trampling. Native grasslands have also been lost to development and conversion to agriculture. Needlegrass grassland on the property has been

6 A question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank.

disturbed by grazing as well as the presence of non-native grasses and would, therefore, not be considered as biologically valuable as undisturbed types.

Jurisdictional Areas

The Hayashi property is within the Los Angeles-San Gabriel River Hydrologic Unit. There are two principal drainage features on the property, Carbon Canyon Creek and Soquel Canyon Creek. These drainage features eventually connect with the Pacific Ocean, a Traditional Navigable Water (TNW), as designated by the USACE. These streambeds satisfy the USACE criteria for Relatively Permanent Waters (RPW). As a result, Carbon Canyon Creek and Soquel Canyon Creek fall within the USACE's jurisdiction, as described in the Supreme Court's *Rapanos* decision, as do tributaries to these streambeds. A total of 2.02 acres of "Waters of the U.S.", including wetlands, occur on the property (Exhibit 7; Table 3). Isolated waters, having an Ordinary High Water Mark but no "significant nexus" to a TNW, were mapped on the property. As a result, the RWQCB would take jurisdiction over 2.09 acres on the property. A total of 6.35 acres under the jurisdiction of the CDFW occur on the property (Exhibit 7, Table 3).

TABLE 3
"WATERS OF THE U.S." AND "WATERS OF THE STATE"
ON THE HAYASHI PROPERTY

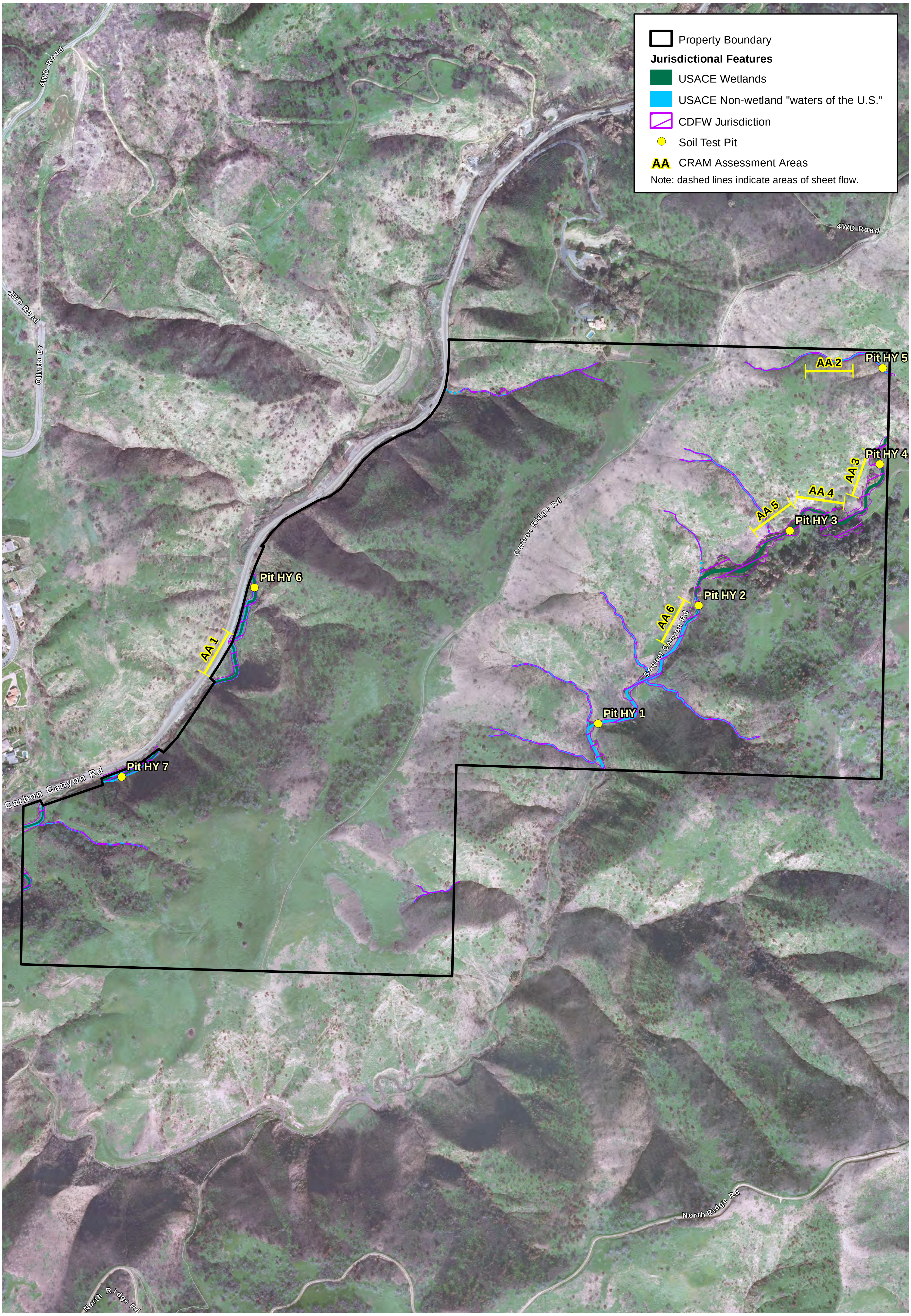
Jurisdiction	Existing on Property (Acres)
Wetlands	0.99
Non-wetland "Waters of the U.S."	1.03
Total "Waters of the U.S." [a]	**2.02**
Isolated Feature[b]	**0.07**
Total "Waters of the State" [c]	**6.35**

[a] "Waters of the U.S." are under the jurisdiction of both the USACE and the RWQCB.
[b] The isolated feature is a drainage that does not connect to Carbon Canyon Creek and is therefore not considered "waters of the U.S.".
[c] CDFW limits include 0.16 acre of isolated streambed that does not connect to Carbon Canyon Creek.

Should jurisdictional resources be impacted by management activities on the property, permits/agreements from the regulatory agencies would be required. This would consist of a USACE Section 404 Permit and Letters of Permission, a RWQCB Section 401 Water Quality Certification; and a CDFW Section 1602 Streambed Alteration Agreement.

CRAM is a tool for assessing the overall condition[7] of a wetland that was developed by a consortium of federal, State, and local scientists and managers. The results of a condition assessment can be used to infer the ability to provide various functions or services to which a wetland is most suited. This analysis can be used for a variety of applications, such as in project evaluation to inform regulatory decisions (e.g., Section 401 and 404 permitting) or restoration or mitigation site evaluation.

[7] "Condition" is defined as the state of a wetland AA's physical and biological structure, the hydrology, and its buffer and landscape context relative to the best achievable states for the same type of wetland (CWMW 2009).



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Jurisdictional Resources

Exhibit 7

Measure M2 Acquisition Properties Evaluation/Hayashi Property

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AA scores range from 25 to 100. The maximum AA score possible represents how a wetland is doing relative to the best achievable conditions for that wetland type in the state. It is assumed that the same scores for different wetlands of the same type represent the same overall condition and functional capacity. Therefore, these scores may be used to track the progress of restoration efforts over time; to compare impacted sites to their in-kind mitigation sites; or to compare an individual wetland to the status and trends in ambient condition of its wetland type.

Six, 100-meter-long AAs were scored for a CRAM analysis (Exhibit 8). The overall AA score ranges from 58.0 to 72.9 (Table 4). These scores reflect the generally natural condition of the property. The Buffer and Landscape Context attribute scores range from 52.8 to 100.0; the Hydrology attribute scores range from 75.1 to 91.7; the Physical Structure attribute scores range from 37.5 to 50.0; and the Biotic Structure attribute scores range from 36.1 to 66.7. The scores are generally high for buffer condition and hydrology. This reflects the large amount of open space surrounding the drainages and lack of disturbance to the water sources resulting in little or no channel degradation. The landscape connectivity score for AA1 is low compared to the other AAs since it runs along and crosses under Carbon Canyon Road. The generally low scores for Physical Structure are a reflection of the type of riparian system (i.e., generally ephemeral and uniform) as opposed to the result of anthropogenic disturbance. Because most of the jurisdictional resources are dominated by coast live oak riparian habitat or walnut woodland, the natural density of these woodlands has limited the establishment of understory species and inhibited the scores for Biotic Structure.

There are several areas along Soquel Canyon Creek where cattle grazing is present. Overgrazing may negatively impact the quality of drainages and surrounding buffer (e.g., through soil compaction, erosion, and facilitating the spread and persistence of non-native species) (Schoenherr 1992). Enhancement opportunities (e.g., elimination of grazing and restoration of native species) exist within both Carbon Canyon Creek and Soquel Canyon Creek. This has the potential to increase the CRAM scores for the number of co-dominant species and the vertical biotic structure metrics. Control of invasive species such as tree tobacco (*Nicotiana glauca*) and giant reed (*Arundo donax*) may increase the score for the percent of invasive co-dominant species metric. However, this enhancement may not be fully illustrated in the CRAM score for buffer condition because the coverage of non-native species is not high for all the AAs impacted by cattle. CRAM may not capture the results of an enhancement program eliminating grazing on the property; other qualitative methods should be utilized to capture the potential improvement in condition of the buffer following elimination of grazing from the property.

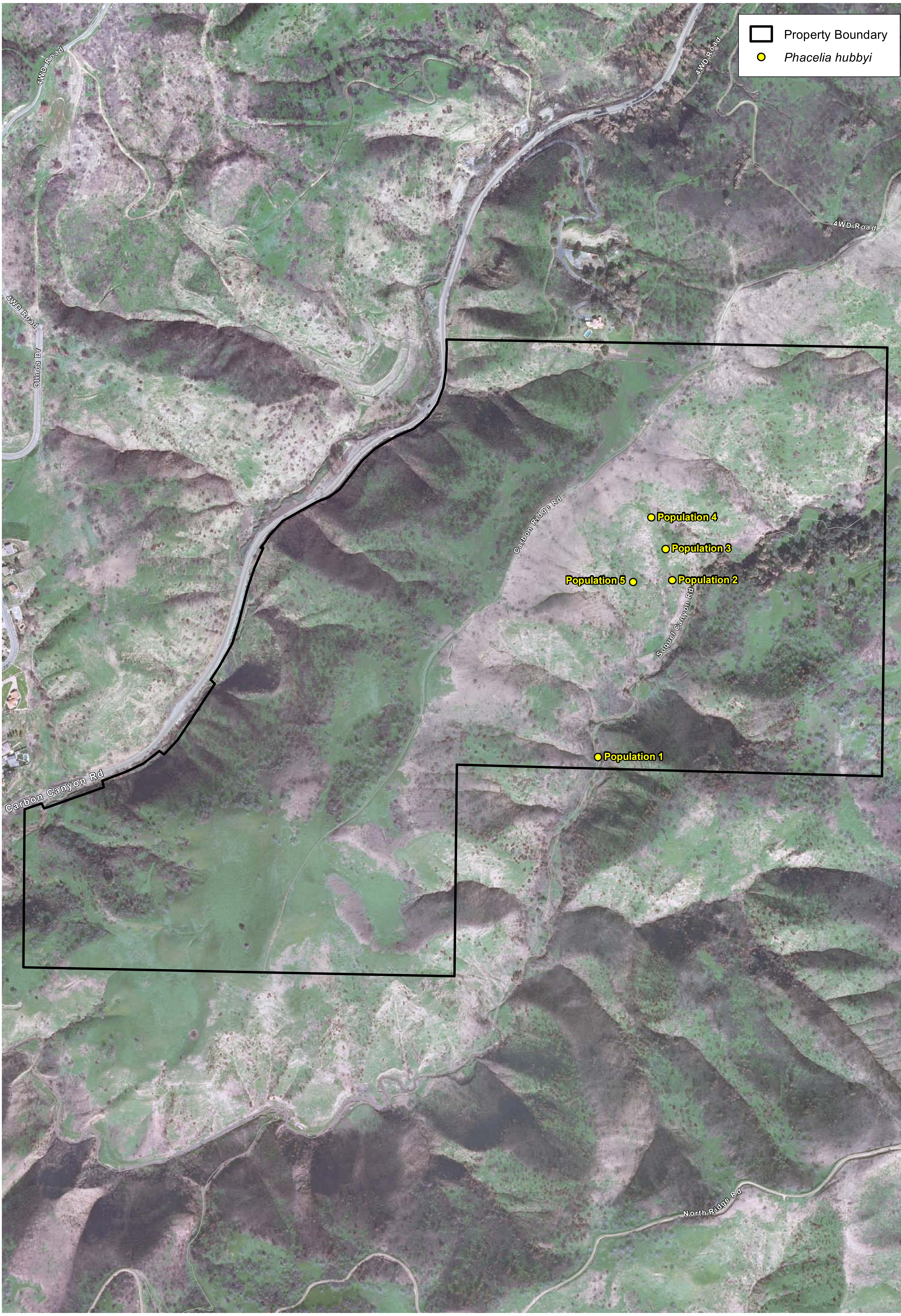
TABLE 4
ATTRIBUTE SCORES FOR HAYASHI ASSESSMENT AREAS

Attribute	Metric	CRAM Scores[a]					
		AA1	AA2	AA3	AA4	AA5	AA6
Buffer and Landscape Context	Landscape Connectivity	D (3)	A (12)	A (12)	A (12)	A (12)	A (12)
	Buffer Condition (submetrics below)						
	Percentage of Assessment Area with Buffer	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)
	Average Buffer Width	B (9)	A (12)	A (12)	A (12)	A (12)	A (12)
	Buffer Condition	B (9)	B (9)	C (6)	C (6)	B (9)	A (12)
	Attribute Score	*52.8*	*93.3*	*85.4*	*85.4*	*93.3*	*100.0*
Hydrology	Water Source	B (9)	A (12)	A (12)	A (12)	A (12)	A (12)
	Hydroperiod/Channel Stability	B (9)	B (9)	B (9)	A (12)	A (12)	A (12)
	Hydrologic Connectivity	B (9)	A (12)	B (9)	B (9)	C (6)	C (6)
	Attribute Score	*75.0*	*91.7*	*83.3*	*91.7*	*83.3*	*83.3*
Physical Structure	Structural Patch Richness	D (3)	D (3)	D (3)	D (3)	D (3)	C (6)
	Topographic Complexity	C (6)	C (6)	C (6)	C (6)	C (6)	C (6)
	Attribute Score	*37.5*	*37.5*	*37.5*	*37.5*	*37.5*	*50.0*
Biotic Structure	Plant Community (submetrics below)						
	Number of Plant Layers	A (12)	B (9)	A (2)	A (12)	B (9)	B (9)
	Number of Co-dominant Species	B (9)	B (9)	C (6)	D (3)	C (6)	C (6)
	Percent of Invasive Co-dominant Species	C (6)	D (3)	A (12)	B (9)	B (9)	A (2)
	Horizontal Interspersion/Plant Zonation	C (6)	D (3)	D (3)	D (3)	D (3)	C (6)
	Vertical Biotic Structure	B (9)	D (3)	B (9)	C (6)	C (6)	C (6)
	Attribute Score	*66.7*	*36.1*	*61.1*	*47.2*	*47.2*	*58.3*
	Overall Assessment Area Score[b]	***58.0***	***64.6***	***66.8***	***65.4***	***65.3***	***72.9***

CRAM: California Rapid Assessment Method; AA: Assessment Area.
[a] CRAM scores are indicated by the letter score (A through D) that is assigned to each metric and the corresponding numeric value of that score is in parentheses.
[b] The overall CRAM score is calculated by averaging the four attribute scores.

Special Status Plants

Based on the results of the literature review, 30 special status plant species are known to occur in the vicinity of the property. These species and their potential for occurrence (which is based on the presence of suitable habitat) are summarized in Table 5. Note that these species are listed alphabetically according to their scientific name. Two special status plant species were observed on the Hayashi property. These species are discussed below.



Special Status Plant Locations

Exhibit 8

Measure M2 Acquisition Properties Evaluation/Hayashi Property

N W E S

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Feet

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TABLE 5
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR
IN THE VICINITY OF THE PROPERTY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	CRPR				
Abronia villosa var. *aurita* chaparral sand-verbena	—	—	1B.1	Between January and September.	Sandy places, primarily in coastal sage scrub and chaparral habitats and alluvial washes and river benches.	Central and southern South Coast and western Sonoran (Colorado) Desert; between sea level and 5,250 feet above msl.	No suitable habitat. Not expected to occur.
Arenaria paludicola marsh sandwort	FE	SE	1B.1	Between May and August.	Wet meadows and marshes.	Southern Central Coast (i.e., Nipomo Mesa), South Coast (i.e., Santa Ana River), and Mexico; sea level to 985 feet above msl.	No suitable habitat. Not expected to occur.
Atriplex coulteri Coulter's saltbush	—	—	1B.2	Between March and October.	Alkaline soils or clay barrens in open areas of perennial grasslands, coastal sage scrub, and coastal bluff scrub.	South Coast and Channel Islands to Baja California, Mexico; sea level to 1,640 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Atriplex serenana var. *davidsonii* Davidson's saltscale	—	—	1B.2	Between April and October.	Bluffs.	Southern South Coast; sea level to 655 feet above msl.	No suitable habitat. Not expected to occur.
Berberis nevinii Nevin's barberry	FE	SE	1B.1	Between March and June.	Sandy to gravelly soils, washes, and chaparral.	Southwestern California; sea level to 2,130 feet above msl.	Outside known range. Not expected to occur.
Brodiaea filifolia thread-leaved brodiaea	FT	SE	1B.1	Between March and June.	Grasslands and vernal pools.	South Coast, San Bernardino Mountains, and western Peninsular Ranges; 80 to 2,820 feet above msl.	Suitable habitat present. Surveys not conducted during blooming period.

TABLE 9 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE PROPERTY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	CRPR				
Brodiaea orcutti Orcutt's brodiaea	—	—	1B.1	Between May and July.	Grasslands near streams and vernal pools.	Peninsular Ranges of southern Riverside and San Diego counties; sea level to 5,250 feet above msl.	Outside known range. Not expected to occur.
California macrophylla round-leaved filaree	—	—	1B.1	Between March and May	Open sites in grassland and scrubland.	Northern California to northern Mexico and Santa Cruz and Santa Catalina Islands; sea level to 3,940 feet above msl.	Suitable habitat present. Surveys not conducted during blooming period.
Calochortus catalinae Catalina mariposa lily	—	—	4.2	Between March and June, uncommonly as early as February.	Heavy soils in open grasslands, coastal sage scrub, and chaparral.	Southern Central Coast, western South Coast, and Channel Islands; sea level to 2,300 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Calochortus plummerae Plummer's mariposa lily	—	—	4.2	Between May and July.	Coastal sage scrub; dry, rocky chaparral; and yellow-pine forest.	South Coast and Peninsular Ranges; sea level to 5,580 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Calochortus weedii var. *intermedius* intermediate mariposa lily *	—	—	1B.2	Between May and July.	Coastal sage scrub and chaparral on dry, rocky, open slopes.	South Coast and northern Peninsular Ranges; sea level to 2,230 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Centromadia parryi ssp. *australis* southern tarplant *	—	—	1B.1	Between May and November.	Seasonally moist, silty, alkaline soils in salt marshes, alkali meadows, mesic grasslands, vernal pools, ditches, and coastal scrub.	South Coast to northwestern Baja California, Mexico; sea level to 655 feet above msl.	Suitable habitat present. Not observed during focused surveys.

TABLE 9 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE PROPERTY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	CRPR				
Centromadia pungens ssp. *laevis* smooth tarplant	—	—	1B.1	Between April and September.	Disturbed sites; grasslands; and open, poorly drained flats, depressions, and waterway beds and banks.	South Coast and Peninsular Ranges to northwestern Baja California, Mexico; 295 to 1,640 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Chorizanthe parryi var. *parryi* Parry's spineflower	—	—	1B.1	Between April and June.	Open, sandy sites; often on gravelly slopes.	East-central South Coast, eastern Transverse Ranges, and northwestern edge of Sonoran Desert; 295 to 2,625 feet above msl.	No suitable habitat. Not expected to occur.
Cladium californicum California saw-grass	—	—	2B.2	Between June and September.	Alkaline marshes and swamps.	Central Coast, outer South Coast Ranges, South Coast, Western Transverse Ranges, and desert to Utah, Arizona, Texas, and northern Mexico; sea level to 7,055 feet above msl.	Outside known range; no suitable habitat. Not expected to occur.
Dodecahema leptoceras slender-horned spineflower	FE	SE	1B.1	Between April and June.	Sandy or gravelly areas.	East-central South Coast, adjacent foothills of the Transverse Ranges, and Peninsular Ranges; 655 to 2,295 feet above msl.	Outside known range. Not expected to occur.

TABLE 9 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE PROPERTY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	CRPR				
Dudleya multicaulis many-stemmed dudleya *	—	—	1B.2	Between April and July.	Heavy (often clayey) soils in coastal sage scrub and native grassland on coastal plains and sandstone outcrops.	South Coast; sea level to 1,970 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Eriastrum densifolium ssp. *sanctorum* Santa Ana River woollystar	FE	SE	1B.1	Between May and September.	Washes, floodplains, and dry river beds.	Eastern South Coast (i.e., the Santa Ana River drainage and southwestern San Bernardino County); sea level to 1,640 feet above msl.	No suitable habitat and considered extirpated from Orange County.
Horkelia cuneata ssp. *puberula* mesa horkelia	—	—	1B.1	Between February and July.	Dry, sandy coastal chaparral and openings in oak woodlands.	Outer South Coast Ranges, Peninsular Ranges, and South Coast; 230 to 2,855 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Juglans californica **Southern California black walnut**	**—**	**—**	**4.2**		**Hillsides and canyons.**	**Outer South Coast Ranges; 100 to 2,950 feet above msl.**	**Observed on the property.**
Lepidium virginicum var. *robinsonii* Robinson's pepper-grass	—	—	4.3	Between January and July.	Dry sandy or thin soils in coastal sage scrub and chaparral.	Southwestern California and Baja California, Mexico; sea level and 1,640 feet above msl.	Suitable habitat present. Not observed during focused surveys.

TABLE 9 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE PROPERTY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	CRPR				
Muhlenbergia californica California muhly	—	—	4.3	Between June and September.	Streambanks and canyons.	South Coast and San Gabriel, San Bernardino, and San Jacinto Mountains; 330 and 6,560 feet above msl.	Outside known range. Not expected to occur.
Navarretia prostrata prostrate vernal pool navarretia	—	—	1B.1	Between April and July.	Alkaline floodplains and vernal pools.	Western San Joaquin Valley, Central Coast, San Francisco Bay area, South Coast Ranges, central South Coast, and Peninsular Ranges; sea level to 2,300 feet above msl.	No suitable habitat. Not expected to occur.
Nolina cismontana peninsular nolina	—	—	1B.2	Between May and July.	Dry chaparral or coastal mountains.	South Coast, Western Transverse Ranges, and Peninsular Ranges; 655 to 4,265 feet above msl.	Suitable habitat present. Not observed during focused surveys.
Phacelia hubbyi **Hubby's phacelia**	**—**	**—**	**4.2**	**Between April and July.**	**Gravelly or rocky slopes of chaparral and grassland.**	**Northern South Coast, Western Transverse Ranges, and Santa Cruz Island; sea level to 3,281 feet above msl.**	**Observed on the property.**

TABLE 9 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE PROPERTY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	CRPR				
Pseudognaphalium leucocephalum white rabbit-tobacco	—	—	2B.2	Between August and November, uncommonly as early as July or as late as December.	Sandy or gravelly benches, dry stream bottoms, and canyon bottoms.	South Coast, San Bernardino Mountains, and Peninsular Ranges to Arizona, New Mexico, and Mexico; sea level to 1,640 feet above msl.	No suitable habitat. Not expected to occur.
Ribes divaricatum ssp. *parishii* Parish's gooseberry	—	—	1A	Between February and April.	Moist woodlands.	South Coast and San Gabriel Mountains; 195 to 1,020 feet above msl.	No suitable habitat; considered extirpated. Not expected to occur.
Senecio aphanactis chaparral ragwort	—	—	2B.2	Between January and April.	Alkaline flats and dry, open rocky areas of coastal bluff scrub and coastal sage scrub.	Central Western California and South Coast to Baja California, Mexico; 30 and 1,805 feet above msl.	Suitable habitat present. Surveys not conducted during blooming period.
Sidalcea neomexicana salt spring checkerbloom	—	—	2B.2	Between March and June.	Alkaline seeps, springs, and marshes.	South Coast, San Gabriel Mountains, San Bernardino Mountains, Peninsular Ranges, and southwestern Mojave Desert to New Mexico and northern Mexico; possibly extirpated from the Western Transverse Ranges; sea level to 4,920 feet above msl.	Suitable habitat present. Not observed during focused surveys.

TABLE 9 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE PROPERTY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	CRPR				
Symphyotrichum defoliatum San Bernardino aster	—	—	1B.2	Between July and November.	Grasslands, seasonal or perennial wetlands, and disturbed places.	San Gabriel Mountains, San Bernardino Mountains, and Peninsular Ranges; sea level to 6,725 feet above msl.	No suitable habitat. Not expected to occur.

LEGEND

Federal (USFWS)
FE Endangered
FT Threatened

State (CDFW)
SE Endangered

California Rare Plant Rank (CRPR)
1A Plants Presumed Extinct in California
1B Plants Rare, Threatened, or Endangered in California and Elsewhere
2B Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
4 Plants of Limited Distribution – A Watch List

CRPR Threat Code Extensions
.1 Seriously Threatened in California (over 80% of occurrences threatened; high degree and immediacy of threat)
.2 Fairly Threatened in California (20–80% of occurrences threatened; moderate degree and immediacy of threat)
.3 Not Very Threatened in California (<20% of occurrences threatened; low degree and immediacy of threat or no current threats known)

* Proposed covered species in the NCCP/HCP

Southern California Black Walnut

Southern California black walnut was observed throughout the Hayashi property. These trees were observed in California walnut groves and intermixed with chaparral and coastal sage scrub vegetation. A tree survey would allow the number, size, and health of individual trees on the property to be quantified.

Hubby's Phacelia

Hubby's phacelia (*Phacelia hubbyi*) was observed on the Hayashi property. One population was observed at the bottom of Soquel Canyon near the southern boundary of the property. Four other populations were observed in annual grassland on the slope above Soquel Canyon in the central portion of the property. The population occurrances are summarized in Table 6 and illustrated on Exhibit 8. These locations represent the first record of this species from the Chino Hills.

TABLE 6
HUBBY'S PHACELIA POPULATIONS OBSERVED
ON THE HAYASHI PROPERTY

Population	Number of Individuals	Phenology		
		Percent Vegetative	Percent Flowering	Percent Fruiting
1	1	0	0	100%
2	55	0	20%	80%
3	80	0	60%	40%
4	15	0	20%	80%
5	10	0	0	100%

Special Status Wildlife

Based on the results of the literature review and the list of proposed covered wildlife species for the NCCP/HCP, 59 special status wildlife species are known to occur in vicinity of the property. Two of the 59 special status wildlife species were observed on site or immediately off site and are discussed below. All 59 species and their potential for occurrence (i.e., based on the presence of suitable habitat) are summarized in Table 7. Note that these species are listed taxonomically.

Cooper's Hawk

Cooper's hawk was observed flying over the Hayashi property on multiple survey visits. It is expected to occur for nesting as well as foraging on the property.

Yellow-breasted Chat

Yellow-breasted chat was observed singing in riparian habitat in lower Soquel Canyon downstream of the property. It may also occur upstream on the property.

TABLE 7
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE PROPERTY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Invertebrates					
Branchinecta sandiegonensis San Diego fairy shrimp	FE	–	Vernal pools.	Coastal Orange County and San Diego County.	No suitable habitat. Not expected to occur.
Streptocephalus wootoni Riverside fairy shrimp	FE	–	Vernal pools and ephemeral ponds.	Coastal Ventura County south to Baja California, Mexico.	No suitable habitat. Not expected to occur.
Euphydryas editha quino Quino checkerspot butterfly	FE	–	Low-growing vegetation interspersed with barren spots, frequently on hilltops. Requires suitable host plants for egg laying.	Currently known from western Riverside County, southern San Diego County, and northern Baja California, Mexico.	Outside current known range. Not expected to occur.
Fish					
Catostomus santaanae Santa Ana sucker	FT	SSC	Small to medium-sized perennial streams, preferably with coarse gravel, rubble, or boulder substrate.	Los Angeles, San Gabriel, and Santa Ana River drainages.	Limited potential habitat in Carbon Canyon Creek; however; isolated from known populations. Not expected to occur.
Gila orcuttii arroyo chub[a]	–	SSC	Coastal freshwater streams and rivers with steady current and emergent vegetation.	Currently found at three native locations: Santa Margarita and De Luz Creeks in San Diego Couty, Trabuco and San Juan Creeks in Orange County; and Malibu Creek in Los Angeles County; introduced elsewhere.	Limited potential habitat in Carbon Canyon Creek; however; isolated from known populations. Not expected to occur.
Amphibians					
Spea hammondii western spadefoot	–	SSC	Quiet streams, vernal pools, and temporary ponds.	Great Valley and bordering foothills, and Coast Ranges from Monterey Bay south to Baja California, Mexico.	Marginally suitable habitat. Limited potential to occur.
Anaxyrus californicus [*Bufo microscaphus californicus*] arroyo toad	FE	SSC	Semi-arid regions near washes or intermittent streams; requires suitable breeding pools.	Southern California and northwestern Baja California, Mexico.	No suitable habitat. Not expected to occur.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Lithobates pipiens [*Rana p.*] northern leopard frog (native populations)	–	SSC	Variety of habitats such as grasslands, brushlands, woodlands, and forests; requires aquatic habitat for overwintering and breeding.	Broadly distributed; native in California only from Modoc and Lassen counties.	Outside native range of species; not expected to occur as a native population.
Rana draytonii California red-legged frog	FT	SSC	Streams with deep pools, slow-moving water, and emergent vegetation.	California and Baja California, Mexico; extant populations in Los Aneles, Verntura, and San Diego counties.	No suitable habitat. Not expected to occur.
Reptiles					
Actinemys marmorata [*Emys m.*] Pacific [western] pond turtle[a]	–	SSC	In ponds, lakes, marshes, rivers, streams, and irrigation ditches with rocky or muddy bottom and aquatic vegetation.	Pacific slope drainages in Washington to northern Baja California, Mexico.	Suitable habitat. Expected to occur.
Phrynosoma blainvillii coast horned lizard[a]	–	SSC	Scrubland, grassland, coniferous forests, and broadleaf woodland with friable soil for burrowing.	Northern California south to northern Baja California, Mexico.	Suitable habitat. Expected to occur.
Aspidoscelis hyperytha [*Cnemidophorus hyperythus beldingi*] orangethroat whiptail[a]	–	SSC	Washes and open areas of sage scrub and chaparral in friable, gravelly soil.	Western Peninsular Ranges from Orange and San Bernardino counties south to Baja California, Mexico.	Suitable habitat. Expected to occur.
Anniella pulchra pulchra silvery legless lizard	–	SSC	In loose sandy soil of chaparral, pine-oak woodland, beach, and riparian areas.	Coast, Transverse, and Peninsular Ranges from Contra Costa County south to Baja California, Mexico.	Suitable habitat. May occur.
Salvadora hexalepis virgultea coast patch-nosed snake	–	SSC	Sandy or rocky grasslands, chaparral, sagebrush plains, piñon-juniper woodlands, and desert scrub.	Coast of California from San Luis Obispo County south to Baja California, Mexico.	Suitable habitat. May occur.
Thamnophis hammondii two-striped garter snake	–	SSC	Perennial or intermittent freshwater streams with rocky beds bordered by willows or other dense vegetation.	From Monterey County south to El Rosario in Baja California, Mexico.	Suitable habitat. May occur.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Thamnophis sirtalis ssp. south coast garter snake	–	SSC[b]	Associated with permanent or semi-permanent bodies of water in habitats such as grassland, woodland, scrubland, chaparral, and forest.	Coastal plain from Ventura County to San Diego County.	Suitable habitat. May occur.
Crotalus ruber red-diamond rattlesnake	–	SSC	Open scrub, chaparral, woodland, and grassland.	Orange County and San Bernardino County south to Baja California, Mexico.	Suitable habitat. May occur.
Birds					
***Accipiter cooperii* Cooper's hawk (nesting)**	**–**	**WL**	**Prefers to nest in oak woodlands and riparian woodlands. Forages primarily in forest habitats.**	**Breeds from southern Canada into northwestern and north-central Mexico. Wintering range extends south.**	**Observed on the property. Expected to occur for foraging and nesting; suitable foraging and nesting habitat.**
Accipiter striatus sharp-shinned hawk (nesting)	–	WL	Nests and forages in forest habitats.	Breeds in Alaska and Canada, portions of the U.S., in the West Indies, and south through Mexico, Central America, and South America. Migrant and winter visitor in Orange County.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Aquila chrysaetos golden eagle (nesting and non-breeding/ wintering)	–	FP, WL	Nests in open and semi-open habitats, such as tundra, shrublands, grasslands, woodland-brushlands, coniferous forests, farmland, and riparian habitats. Forages in broad expanses of open country.	Resident throughout Southern California, except in the Colorado Desert and Colorado River, where it is a casual winter visitor.	May occur for foraging; suitable foraging habitat. Limited potential to occur for nesting; marginal nesting habitat.
Buteo regalis ferruginous hawk (non-breeding/wintering)	–	WL	Open, dry habitats such as grasslands, shrublands, rangelands, and plowed agricultural fields.	Winter resident in California; visitor along the coast of southern California.	Not expected to occur for foraging or nesting; no suitable foraging habitat and outside the breeding range of the species.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Circus cyaneus northern harrier (nesting)	–	SSC	Breeds on the ground within dense vegetation. Forages in open habitats such as marshes and fields.	Winter migrant throughout Southern California, but a scarce local breeder.	Suitable foraging habitat; expected to occur for foraging. Suitable nesting habitat; may occur for nesting.
Elanus leucurus white-tailed kite (nesting)	–	FP	Low elevation grassland, agricultural areas, wetlands, oak woodlands, savannahs, and riparian habitat adjacent to open areas.	Resident in coastal Southern California and a visitor and local breeder on the western edge of the deserts.	Suitable foraging and nesting habitat; may occur for foraging and nesting.
Falco columbarius merlin (non-breeding/wintering)	–	WL	Breeds in forests and prairies. Occures along the coast in open grasslands, savannahs; in inland and montane valleys; and in the desert.	Breeds in northern North America, Europe, and Asia. Fall transient and rare winter visitor in California.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Falco mexicanus prairie falcon (nesting)	–	WL	Nests on cliffs. Forages in grassland and scrub vegetation.	Year-round resident of interior Southern California. Winter resident and rare summer resident along the Southern California coast.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Coccyzus americanus occidentalis western yellow-billed cuckoo (nesting)	FC	SE	Broad areas of old-growth riparian habitats dominated by willows with dense understory.	Breeds primarily along the Sacramento River and south fork of the Kern River; from the Santa Ana River in the region.	No suitable habitat. Not expected to occur.
Asio otus long-eared owl (nesting)	–	SSC	Nests in dense trees such as oaks and willows. Forages over grasslands and other open habitats.	Breeds in Canada south to northern Baja California, Mexico. Winters throughout breeding range to the interior of Mexico.	Potentially suitable foraging and nesting habitat; may occur for foraging and nesting.
Athene cunicularia burrowing owl (burrow sites; wintering in northern counties)	–	SSC	Sparse vegetation in arid and semi-arid habitats such as grasslands, steppes, deserts, prairies, and agricultural areas. Nests in mammal burrows or man-made cavities.	In California from the Central Valley and southern California.	No suitable habitat. Not expected to occur.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Contopus cooperi olive-sided flycatcher (nesting)	–	SSC	Nests in late-successional conifer forests with open canopies. Occur at edges, openings, and clearings of dense or semi-open forests.	Breeds from western and central Alaska across central and southern Canada south to Baja California, Mexico and North Carolina.	Suitable habitat. May occur.
Empidonax traillii extimus southwestern willow flycatcher[a] (nesting)	FE	SE	Riparian habitats with dense growths of willows; often with a scattered overstory of cottonwood.	Breeds in coastal Southern California.	No suitable habitat. Not expected to occur.
Lanius ludovicianus loggerhead shrike (nesting)	–	SSC	Grasslands and other dry, open habitats.	Throughout North America; a year-round resident in Southern California.	Suitable foraging and nesting habitat; may occur for foraging and nesting.
Vireo bellii pusillus least Bell's vireo[a] (nesting)	FE	SE	Riparian habitat dominated by willows with dense understory vegetation.	Breeds throughout the Central Valley and other low-elevation river systems in California and Baja California, Mexico.	No suitable habitat. Not expected to occur.
Eremophila alpestris actia California horned lark	–	WL	Open habitats with bare ground or short vegetation, such as shortgrass prairie, deserts, brushy flats, alpine, shrubsteppe, and agricultural areas.	From Alaska and Canadian arctic south to Mexico. Common migrant and winter resident that remains to breed along the Southern California coast.	No suitable habitat. Not expected to occur.
Progne subis purple martin (nesting)	–	SSC	Breeds in cavities of conifer or western sycamore. Forages over riparian areas, forests, and woodlands.	Throughout much of eastern North American and locally in the Rocky Mountains, Sonoran Desert, Central Mexico, and Pacific coast states. Summer resident and migrant in California.	No suitable habitat. Not expected to occur.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren[a] (San Diego and Orange Counties)	–	SSC	Coastal sage scrub and alluvial sage scrub with prickly pear cactus and/or cholla.	Southern Orange County and San Diego County to northwestern Baja California, Mexico.	No suitable habitat. Not expected to occur.
Polioptila californica californica coastal California gnatcatcher[a]	FT	SSC	Coastal sage scrub vegetation.	Los Angeles, Orange, Riverside, and San Diego Counties south to Baja California, Mexico.	Limited suitable habitat. Not observed during focused surveys.
Dendroica petechia brewsteri yellow warbler (nesting)	–	SSC	Riparian vegetation, often with willows and cottonwoods.	Breeds in Southern California.	Suitable habitat. May occur.
Icteria virens **yellow-breasted chat (nesting)**	**–**	**SSC**	**The border of streams, creeks, sloughs, and rivers in dense thickets and tangles of blackberry, wild grape, and willow.**	**Summer resident in Southern California along the coast and in the deserts.**	**Suitable habitat. May occur. Observed in Soquel Canyon downstream of property.**
Aimophila ruficeps canescens Southern California rufous-crowned sparrow	–	WL	Steep, dry, rocky, south- or west-facing slopes in scrub vegetation interspersed with grasses and forbs or rock outcrops.	Year-round in Southern California.	Suitable habitat. May occur.
Ammodramus savannarum grasshopper sparrow (nesting)	–	SSC	Dense, dry or well-drained grassland.	Across North American from southern Canada south to Ecuador. Summer resident along the coastal slope of Southern California.	No suitable habitat. Not expected to occur.
Amphispiza belli belli Bell's sage sparrow	–	WL	Low, dense chamise chaparral and dry scrub vegetation, often with stands of cactus.	Resident in interior foothills or coastal Southern California.	Suitable habitat. May occur.
Pooecetes gramineus affinis Oregon vesper sparrow (non-breeding/wintering)	–	SSC	Winters on open ground in grasslands.	Winters in the Central Valley and Southern California (generally west of the coastal mountain ranges) to northwestern Baja California, Mexico.	No suitable habitat. Not expected to occur.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Agelaius tricolor tricolored blackbird (nesting colony)	–	SSC	Colonially nests in marsh vegetation of bulrushes and cattails. In winter, forages in grasslands, agricultural fields, dairies, and feedlots.	Primarily in California with local nesting colonies in Oregon, Washington, Nevada, and coastal Baja California, Mexico.	No suitable habitat. Not expected to occur.
Mammals					
Antrozous pallidus pallid bat[a]	–	SSC	Low elevation grasslands, shrublands, woodlands, and forests. Roosts in vaves, crevices, mines, bridges, and occasionally in hollow trees.	Throughout California excepting the high Sierra Nevada from Shasta County to Kern County and in the northwestern portion of the State.	Suitable foraging and roosting habitat; may occur for foraging and roosting.
Corynorhinus townsendii Townsend's big-eared bat	–	SSC	Wide variety of habitats excepting subalpine and alpine. Roosts in caves, mines, tunnels, buildings, or other human-made structures.	Throughout most of California.	Suitable foraging habitat; may occur for foraging. No suitable roosting habitat; not expected to occur for roosting.
Euderma maculatum spotted bat	–	SSC	Foothills, mountains, arid deserts, grasslands, and mixed conifer forests. Roosts in rock crevices, occasionally in caves and buildings.	Western North American from southern British Columbia to Mexico.	No suitable habitat. Not expected to occur.
Lasiurus xanthinus western yellow bat	–	SSC	Valley foothill riparian, desert riparian, desert wash, and palm oasis. Roosts in trees.	Mexican Plateau, coastal western Mexico, and deserts of the southwestern U.S.	Suitable foraging and roosting habitat. May occur for foraging and roosting.
Eumops perotis californicus western mastiff bat	–	SSC	Open, semi-arid to arid habitats including conifer and deciduous woodland, coastal scrub, grasslands, palm oases, chaparral, desert scrub, and urban. Roosts in crevices in cliffs, high buildings, trees, and tunnels.	Southeastern San Joaquin Valley and Coastal Ranges from Monterey County south through Southern California, and from the coast eastward to the Colorado Desert.	Suitable foraging and roosting habitat. May occur for foraging and roosting.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Nyctinomops femorosaccus pocketed free-tailed bat	–	SSC	Pinyon-juniper woodland, desert scrub, desert succulent scrub, desert riparian, desert. Roosts in crevices in cliffs, caverns, or buildings.	Southwestern U.S. to south-central Mexico.	No suitable habitat. Not expected to occur.
Nyctinomops macrotis big free-tailed bat[a]	–	SSC	Forages over water in rugged, rocky terrain. Roosts in crevices in high cliffs or rocky outcrops.	Western U.S. to northern South American and the Caribbean Islands.	Suitable foraging habitat; may occur for foraging. Marginal suitable roosting habitat; limited potential to occur for roosting.
Lepus californicus bennettii San Diego black-tailed jackrabbit	–	SSC	Herbaceous and desert-shrub areas and open, early stages of forest and chaparral.	Pacific slope from Santa Barbara County south to northwestern Baja California, Mexico.	No suitable habitat. Not expected to occur.
Chaetodipus fallax fallax northwestern San Diego pocket mouse	–	SSC	Chaparral, coastal sage scrub, and grassland.	Southwest San Bernardino County south to northern Baja California, Mexico.	Suitable habitat. May occur.
Perognathus longimembris brevinasus Los Angeles pocket mouse	–	SSC	Lower elevation grasslands and coastal sage scrub with open ground and fine sandy soils.	The Los Angeles Basin, from approximately Burbank and San Fernando in the northwest, San Bernardino in the northeast, and Cabazon, Hemet, and Aguanga in the east and southeast.	Suitable habitat. May occur.
Neotoma lepida intermedia San Diego desert woodrat	–	SSC	Joshua tree woodland, pinyon-juniper, mixed and chamise-redshank chaparral, sagebrush, and desert habitats.	Pacific slope from San Luis Obispo south to northwestern Baja California, Mexico.	Suitable habitat. May occur.
Onychomys torridus ramona southern grasshopper mouse	–	SSC	Desert areas, especially in scrub habitats with friable soil. Also in coastal scrub, mixed chaparral, sagebrush, low sage, and bitterbrush habitats.	Along the coast of Southern California from Los Angeles County south through San Diego County.	Suitable habitat. May occur.

TABLE 7 (Continued)
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW			
Bassariscus astutus ringtail[a]	–	–	Woodlands, riparian areas, and arid scrubland.	The southwestern third of the U.S. into Baja California and other portions of Mexico.	Suitable habitat. May occur.
Taxidea taxus American badger	–	SSC	Drier, open stages of shrub, forest, and herbaceous habitats with friable soil.	Throughout California excepting the extreme northwest.	Suitable habitat. May occur.
Puma concolor [*Felis c.*] mountain lion[a]	–	–	Broad variety of habitats in range excepting shrubless deserts and agricultural areas.	Latitudinal range of 110 degrees in North and South America.	Suitable habitat. May occur.
Lynx rufus bobcat[a]	–	–	Broad variety of habitats.	Throughout contiguous U.S., Mexico south to Rio Mescale, and Canada.	Suitable habitat. May occur.

LEGEND

Federal (USFWS)
FE Endangered
FT Threatened
FC Candidate Species

State (CDFW)
SE Endangered
SSC Species of Special Concern
WL Watch List
FP Fully Protected

a Proposed Covered Species in the OCTA M2 NCCP/HCP.
b Individuals on the coastal plain from Ventura County to San Diego County, from sea level to approximately 2,790 feet above msl, are protected.

Critical Habitat

Critical habitat has been proposed or designated by the USFWS for a variety of federally listed plant and wildlife species. The Hayashi property is not located in any area proposed or designated as critical habitat.

COVERED SPECIES SUMMARY

The baseline surveys described in this document were focused towards establishing baseline knowledge of the set of species covered by the OCTA M2 NCCP/HCP. The OCTA M2 NCCP/HCP includes requirements to understand and document the status of Covered Species and their habitats within the Preserves. Table 8 provides of summary of the OCTA M2 NCCP/HCP Covered Species; whether they were observed during the baseline surveys; other information documenting the potential for the Covered Species to occur on site, and a description of the threats and opportunities for management of the Preserve to benefit Covered Species.

TABLE 8
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Opportunities, Threats, and Management
Plants			
Calochortus weedii var. *intermedius* intermediate mariposa lily	Not observed on site.	Suitable habitat; may establish on site.	Potential threats include off-road vehicles and grazing. Opportunities occur to establish the species on the Project site in areas with suitable conditions (e.g., soils). A resource management plan may incorporate restricting unauthorized vehicles on site and transplantation and/or seeding of this variety in suitable areas on site.
Centromadia parryi ssp. *australis* southern tarplant	Not observed on site.	Suitable habitat; may establish on site.	Potential threats include off-road vehicles and grazing. Opportunities occur to establish the species on the Project site in areas with suitable conditions (e.g., soils). A resource management plan may incorporate restricting unauthorized vehicles on site and transplantation and/or seeding of this subspecies in suitable areas on site.
Dudleya multicaulis many-stemmed dudleya	Not observed on site.	Suitable habitat; may establish on site.	Potential threats include off-road vehicles and grazing. Opportunities occur to establish the species on the Project site in areas with suitable conditions (e.g., soils). A resource management plan may incorporate restricting unauthorized vehicles on site and transplantation and/or seeding of species in suitable areas on site.
Fish			
Gila orcutti arroyo chub	Not observed on site.	Limited potential habitat but isolated from known populations; not expected to occur.	N/A

TABLE 8 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Opportunities, Threats, and Management
Reptiles			
Phrynosoma blainvillii coast horned lizard	Not observed on site.	Suitable habitat; expected to occur.	Potential threats include mortality and habitat destruction due to off-road vehicles and spread of non-native ant species. Habitat restoration opportunities for coastal sage scrub and other suitable habitat occurs on site. A resource management plan may incorporate restricting unauthorized vehicles on site and ensuring any plant/soil material brought on site is free of non-native any species.
Aspidoscelis hyperytha [*Cnemidophorus hyperythus beldingi*] orangethroat whiptail	Not observed on site.	Suitable habitat; expected to occur.	The major threat to this subspecies is loss of habitat by development. The preservation of suitable habitats on site is the best conservation opportunity for this subspecies. A resource management plan may incorporate restoration opportunities for coastal sage scrub and other native habitats utilized by this subspecies.
Actinemys marmorata [*Emys m.*] Pacific [western] pond turtle	Not observed on site.	Suitable habitat; expected to occur.	Potential threats include water quality in Carbon Canyon Creek and illegal collection. Pond turtles are known to occur along Carbon Canyon Creek, adjacent to the property. It is anticipated that an expanding population of turtles within Carbon Canyon Creek could immigrate to suitable habitat within Soquel Canyon, which traverses the southwestern portion of the property. A resource management plan may incorporate restoration and enhancement opportunities for the pond turtle on site.

TABLE 8 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Opportunities, Threats, and Management
Birds			
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren	Not observed on site.	No suitable habitat; not expected to occur.	Habitat loss, degradation, fragmentation, and intense fire events are the most critical threats facing this subspecies. Protection of coastal sage scrub habitat that contains cactus is crucial for the preservation of this subspecies. Habitat restoration opportunities for coastal sage scrub with cactus species occur on site.
Polioptila californica californica coastal California gnatcatcher	Not observed on site.	Limited suitable habitat; limited potential to occur.	Habitat loss, degradation, and fragmentation are the most critical threats facing this subspecies. Protection of coastal sage scrub habitat is crucial for the preservation of this subspecies. There are limited opportunities to provide habitat for this subspecies on site because coastal sage scrub is a component of the chaparral vegetation. Coastal sage scrub may be established in suitable semi-natural herbaceous stands on site.
Empidonax traillii extimus southwestern willow flycatcher	Not observed on site.	No suitable habitat; not expected to occur.	The loss and degradation of riparian habitats and brood parasitism by the brown-headed cowbird (*Molothrus ater*) are this subspecies' greatest threats. The southwestern willow flycatcher population has not shown the same recovery that the least Bell's vireo has shown in response to riparian habitat restoration and cowbird control, as described below. Therefore, no additional opportunities or management activities has been identified.

TABLE 8 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Opportunities, Threats, and Management
Vireo bellii pusillus least Bell's vireo	Not observed on site.	No suitable habitat; not expected to occur.	The loss and degradation of riparian habitats and brood parasitism by the brown-headed cowbird are this subspecies' greatest threats. Opportunities are available for riparian habitat restoration and enhancement on site. A resource management plan may include a cowbird control program and an exotic plant removal effort to support riparian restoration efforts on site.
Mammals			
Lynx rufus bobcat	Not observed on site.	Suitable habitat present.	Potential threats include illegal hunting and habitat loss. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintainence of movement opportunities through Soquel Canyon.
Puma concolor mountain lion	Not observed on site.	Suitable habitat present.	Potential threats include illegal hunting and habitat loss. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintainence of movement opportunities through Soquel Canyon.

4.0 REFERENCES

Abrams, L. 1951. *Illustrated Flora of the Pacific States.* Vol. III: Geraniums to Figworts (*Geraniaceae* to *Scrophulariaceae*). Stanford, CA: Stanford University Press.

Abrams, L. 1944. *Illustrated Flora of the Pacific States.* Vol. II: Buckwheats to Kramerias (*Polygonaceae* to *Krameriaceae*). Stanford, CA: Stanford University Press.

Abrams, L. 1923. *Illustrated Flora of the Pacific States.* Vol. I: Ferns to Birthworts (*Ophioglossaceae* to *Aristolochiaceae*). Stanford, CA: Stanford University Press.

Abrams, L. and R. Ferris. 1960. *Illustrated Flora of the Pacific States.* Vol. IV: Bignonias to Sunflowers (*Bignoniaceae* to *Compositae*). Stanford, CA: Stanford University Press.

Allen, E.B, S.A. Eliason, V.J. Marquez, G.P. Schultz, N.K. Storms, C.D. Stylinski, T.A. Zink, and M.F. Allen. 2000. What are the Limits to Restoration of Coastal Sage Scrub in Southern California (pp. 253–262). *2nd Interface Between Ecology and Land Development in California* (J.E. Keeley, M. Baer-Keeley, and C.J. Fotheringham, Eds.). Sacramento, CA: U.S. Geological Survey.

American Ornithologists' Union (AOU). 2011 (August). *Check-list of North American Birds* (7th ed., as revised through 52nd Supplement). Washington, D.C.: AOU. http://www.aou.org/checklist/north/index.php.

Baker, R.J., L.C. Bradley, R.D. Bradley, J.W. Dragoo, M.D. Engstrom, R.S. Hoffmann, C.A. Jones, F. Reid, D.W. Rice, and C. Jones. 2003 (December). Revised Checklist of North American Mammals North of Mexico, 2003. *Occasional Papers (No. 229).* Waco, TX: Museum of Texas Tech University.

Baldwin, B.G., D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken (Eds.). 2012. *The Jepson Manual: Vascular Plants of California* (Second ed.). Berkeley, CA: University of California Press.

Barry, W.J. 1972. *California Prairie Ecosystems*. *Vol. 1: The Central Valley Prairie.* Sacramento, CA: State of California Resources Agency, Department of Parks and Recreation.

Bell, G. 1997. Ecology and Management of *Arundo donax* and Approaches to Riparian Habitat Restoration in Southern California (pp. 103–113). *Plant Invasions: Studies from North America and Europe* (J.H. Brock, M. Wade, P. Pysek, and D. Green, Eds.). Leiden, The Netherlands: Blackhuys Publishers.

Bennett, A.F. 1990. Habitat Corridors and the Conservation of Small Mammals in the Fragmented Forest Environment. *Landscape Ecology* 4(2–3):109–122. New York, NY: International Association for Landscape Ecology.

California Department of Fish and Wildlife (CDFW). 2013 (January). *Special Vascular Plants, Bryophytes, and Lichens List.* Sacramento, CA: CDFG, Natural Heritage Division.

California Department of Fish and Game (CDFG). 2012. California Natural Diversity Database. Records of Occurrence for the USGS San Dimas, Ontario, Yorba Linda, and Prado Dam 7.5-minute quadrangles. Sacramento, CA: CDFG, Natural Heritage Division.

———. 2011 (January). *Special Animals.* Sacramento, CA: CDFG, Natural Heritage Division.

———. 2010 (September). *The Vegetation Classification and Mapping Program: List of California Natural Communities.* Sacramento, CA: CDFG, Natural Heritage Division.

———. 2009 (November 24). *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. Sacramento, CA: CDFG.

California Department of Fish and Game, Biogeographic Data Branch (CDFG BDB). 2012. Wildlife Habitats — California Wildlife Habitat Relationships System. Data for Grasshopper Sparrow and American Badger. Sacramento, CA: CDFG BDB. http://www.dfg.ca.gov/bdb/html/wildlife_habitats.html.

California Department of Water Resources (CDWR). 2012. California Data Exchange Center. Tonner Canyon incremental precipitation sensor (CDEC Station TNR). http://cdec.water.ca.gov/cgi-progs/selectQuery?station_id=TNR&sensor_num=2&dur_code=H&start_date= 01/01/2000

California Native Plant Society (CNPS). 2012. Electronic Inventory of Rare and Endangered Vascular Plants of California. Records of Occurrence for the USGS San Dimas, Ontario, Yorba Linda, and Prado Dam 7.5-minute quadrangles. Sacramento, CA: CNPS. http://www.cnps.org/inventory.

———. 2001. *Inventory of Rare and Endangered Vascular Plants of California* (6th ed.) (D.P. Tibor, Ed.). Sacramento, CA: CNPS, Rare Plant Scientific Advisory Committee.

California State Parks. 2011. Chino Hills State Park: Geography. Sacramento, CA: Department of Parks and Recreation. http://www.parks.ca.gov/?page_id=21971.

Collins, J.N, E. Stein, M. Sutula, R. Clark, A.E. Fetscher, L. Grenier, C. Grosso, and A. Wiskind. 2008 (September). *California Rapid Assessment Method (CRAM) for Wetlands* (Version 5.0.2).

Crother, B.I. (Ed.). 2008 (May 2011, last update). Scientific and Standard English Names of Amphibians and Reptiles of North American North of Mexico, with Comments Regarding Confidence in our Understanding (Edition 6.1). Shoreview, MN: Society for the Study of Amphibians and Reptiles. http://www.ssarherps.org/pages/comm_names/Index.php.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual* (Technical Report Y-87-1). Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Esser, L. 1993. Juglans californica. In: Fire Effects Information System, [Online]. Golden, CO: U.S., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

Faber, P., E. Keller, A. Sands, B. Massey. 1989. *The Ecology of Riparian Habitats of the Southern California Coastal Region: A Community Profile* (Biological Report 85 [7.27]). Washington, D.C: U.S. Fish and Wildlife Service, Research and Development, National Wetlands Research Center.

Faber-Langendoen, D., L. Master, J. Nichols, K. Snow, A. Tomaino, R. Bittman, G. Hammerson, B. Heidel, L. Ramsay, and B. Young. 2009. *NatureServe Conservation Status Assessments: Methodology for Assigning Ranks.* Arlington, VA: NatureServe. http://www.natureserve.org/publications/ConsStatusAssess_RankMethodology.pdf.

Fahrig, L. and G. Merriam. 1985. Habitat Patch Connectivity and Population Survival. *Ecology* 66(6): 1762–1768. Tempe, AZ: Ecological Society of America.

Halsey, R.W. 2007. Chaparral: Pure California. *Fremontia* 35(4):2–7. Sacramento, CA: California Native Plant Society.

———. 2005. *Fire, Chaparral, and Survival in Southern California*. San Diego, CA: Sunbelt Publications, Inc.

Harris, L.D. and P.B. Gallagher. 1989. New Initiatives for Wildlife Conservation: The Need for Movement Corridors (pp. 11–34). *Preserving Communities and Corridors* (G. Mackintosh, Ed.). Washington, D.C.: Defenders of Wildlife.

Hickman, J.C., Ed. 1993. *The Jepson Manual of Higher Plants of California*. Berkeley, CA: University of California Press.

Hills for Everyone. 2012 (August). *A 100 Year History of Wildlifes Near Chino Hills State Park*. (Unpublished report). http://www.hillsforeveryone.org/news-publications/fire-study.html.

Howard, J.L. 1992. Malomsa laurina. In: Fire Effects Information System, [Online]. Golden, CO: U.S., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

Keeley, J.E. 1986. Resilience of Mediterranean Shrub Communities to Fires (pp. 95–112). *Resilience in Mediterranean-type Ecosystems* (B. Dell, A.J.M. Hopkins, and B.B. Lamont, Eds.). Dordrecht, Netherlands: Dr. W. Junk Publishers.

Los Angeles, County of, Santa Monica Mountains Conservancy, City of Brea, City of La Habra Heights, City of Whittier, and City of Diamond Bar (Los Angeles County et al.). 2003 (October 14, adopted). Wildlife Corridor Conservation Authority Joint Exercise of Powers Agreement (an agreement “to provide for the proper planning, conservation, environmental protection, and maintenance of the habitat and wildlife corridor between the Whittier-Puente Hills and the Cleveland National Forest in the Santa Monica Mountains.”).

MacArthur, R.H. and E.O. Wilson. 1967. *The Theory of Island Biogeography*. Princeton, NJ: Princeton University Press.

McCreary, D.D. 2004. *Fire in California’s Oak Woodlands*. University of California Integrated Hardwood Range Management Program. Davis, CA: University of California, Agricultural Issues Center, Integrated Hardwood Range Management Program. http://ucanr.org/faqs/filegroups/faqs14-sep-09-1109/16808.pdf.

Minnich, R.A. and R.J. Dezzani. 1998. Historic Decline of Coastal Sage Scrub in the Riverside – Perris Plain, California. *Western Birds.* 29(4): 366–391. San Diego, CA: Western Field Ornithologists.

Munz, P.A. 1974. *A Flora of Southern California*. Berkeley, CA: University of California Press.

Noss, R.F. 1983. A Regional Landscape Approach to Maintain Diversity. *BioScience.* 33(11): 700–706. Washington, D.C.: American Institute of Biological Sciences.

Noss, R.F. and R.L. Peters. 1995. *Endangered Ecosystems: a Status Report on America’s Vanishing Habitat and Wildlife.* Washington, D.C.: Defenders of Wildlife.

O'Leary, J. 1995. Coastal Sage Scrub: Threats and Current Status. *Fremontia.* 23(4): 27–31. Sacramento, CA: California Native Plant Society.

Orange County Fire Authority (OCFA). 2008 (November 15). *After Action Report: Freeway Complex Fire*. Irvine, CA: OCFA.

Orange County Transportation Authority (OCTA). 2010 (December 3). Notice of Preparation to Prepare an Environmental Impact Report. Orange, CA: OCTA.

Ritter, M.E. 2006. The Physical Environment: Mediterranean or Dry Summer Subtropical Climate. Stevens Point, WI: University of Wisconsin. http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/climate_systems/mediterranean.html.

Ruben, J.A. and W.J. Hillenius. 2005 (May). Cold Blooded. *Natural History*. New York, NY: American Museum of Natural History.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation* (2nd ed.). Sacramento, CA: CNPS.

Schoenherr, A.A. 1992. *A Natural History of California.* Berkeley, CA: University of California Press.

Soule, M.E. 1987. *Viable Populations for Conservation*. New York, NY: Cambridge University Press.

Steinberg, P.D. 2002. Quercus agrifolia. In: Fire Effects Information System, [Online]. Golden, CO: USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

URS. 2001 (May 1). *Canyon Crest Development Project Wildlife Corridor Assessment* (prepared for MRF – Carbon Canyon, LP). San Diego, CA: URS.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).* (J.S. Wakeley, R.W. Lichvar, and C.V. Noble, Eds.). Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Bureau of Labor Statistics, Federal Bureau of Investigation, National Oceanic and Atmospheric Administration, U.S. Census Bureau, U.S. Department of Housing and Urban Development. 2009 (July 10, last revised). Mapstats: Brea (city), California. Washington, D.C.: U.S. Bureau of Labor Statistics et al. http://www.fedstats.gov/qf/states/06000.html.

U.S. Fish and Wildlife Service (USFWS). 1997 (February 28). *Coastal California Gnatcatcher (Polioptila californica californica). Presence/Absence Survey Guidelines.* Washington, D.C.: USFWS.

Attachment A

M2 ACQUISITION/RESTORATION/MANAGEMENT CRITERIA EVALUATION

M2 ACQUISITION/RESTORATION/MANAGEMENT CRITERIA EVALUATION

The Hayashi property was reviewed relative to the the acquisition criteria of the M2 Acquisition/Restoration/Management Criteria. These criteria include the following.

M2 Acquisition/Restoration/Management Criteria	
Tier I	***Evaluation of Hayashi Property***
Aligns with Impacted Habitats. The site's vegetation is the same impacted by freeway projects (i.e., coastal sage scrub, riparian woodlands, grasslands, etc).	Eleven vegetation types occur on the Hayashi property including blue elderberry stand, bush mallow scrub, California walnut groves, California walnut groves/laurel sumac scrub association, coast live oak woodland, giant wild rye grassland, laurel sumac scrub, mulefat thicket, needle grass grassland, semi-natural herbaceous stands, and willow thickets. These vegetation types are similar to those vegetation types impacted by freeway projects. Therefore, the preservation and management of the Hayashi property will meet this Tier I Acquisition/Restoration/Management Criteria.
Conserves Sensitive Habitats. The site's habitat includes the conservation and possible restoration of habitats and species ranked as sensitive by the CNDDB.	A total of 249.25 acres of vegetation types of special concern to the resource agencies are present of the Hayashi property. This include 56.66 acres of sage scrub (including bush mallow scrub and laurel sumac scrub), 1.34 acres of giant wild rye grassland, 0.76 acre of blue elderberry stand, 2.13 acres of mulefat thickets, 1.79 acres of willow thickets, 11.55 acres of coast live oak woodland, 174.59 acres of California walnut groves (including 132.04 acres of California walnut groves and 42.55 acres of California walnut groves/laurel sumac scrub association), and 0.43 acre of needle grass grassland. These high value vegetation types represent approximately 85% of the entire site, illustrating the high occurrence of native vegetation types and limited presence of vegetation types that have been subject to type conversion (e.g. coastal sage scrub to non-native grassland). Portions of these habitats that contain non-native, invasive species could be enhanced through a variety of adaptive management activities that would increase the biological value of the site. The property also contains approximately 42 acres of grasslands dominated by invasive species such as ripgut grass, slender wild oat, and milk thistle. These areas have also been heavily disturbed by grazing. In addition, the site contains approximately three acres that are disturbed, and generally lack vegetation due to repeated human disturbance (e.g., dirt roads, trails). These grassland and disturbed areas could be restored and/or enhanced through a variety of adaptive management activities that would increase the biological value of the site for existing and future resources. Through preservation and management of sensitive habitat types, the Hayashi property will meet this Tier I Acquisition/Restoration/Management Criteria.
Contains Habitat for Covered Species. The site supports Endangered, Threatened, California Species of Special Concern, and other sensitive species impacted by freeway projects.	The Hayashi property contains suitable habitat for intermediate mariposa lily, southern tarplant, and many-stemmed dudleya. However, these species were not observed during focused botanical surveys on the property. The Hayashi property also contains suitable habitat and is within the known range of a variety of wildlife species proposed as Covered Species including coast horned lizard, orangethroat whiptail, pallid bat, western small-footed myotis, long-eared myotis, Yuma bat, big free-tailed bat, bobcat, and mountain lion. Yuma bat was detected in the immediate vicinity of the property during focused surveys. An addition Covered Species, the western pond turtle, is known to occur along Carbon Canyon Creek, adjacent to the property. It is anticipated that an expanding population of turtles within Carbon Canyon Creek could immigrate to suitable habitat with Soquel Canyon, which traverses the

M2 Acquisition/Restoration/Management Criteria	
	southwestern portion of the property. Yuma bat was detected in the immediate vicinity of the property during focused surveys. In addition to proposed Covered Species, the following special status wildlife species are either known to occur on site, or may occur onsite due to the presence of suitable habitat: western spadefoot, silvery legless lizard, coast patch-nosed snake, two-striped garter snake, south coast garter snake, red-diamond rattlesnake, Cooper's hawk, sharp-shinned hawk, golden eagle, northern harrier, white-tailed kite, merlin, prairie falcon, long-eared owl, olive-sided flycatcher, loggerhead shrike, yellow warbler, yellow-breasted chat, Southern California rufous-crowned sparrow, Bell's sage sparrow, northwestern San Diego pocket mouse, Los Angeles pocket mouse, San Diego desert woodrat, southern grasshopper mouse, ringtail, and American badger. The Hayashi property has an existing riparian corridor that has been historically disturbed by grazing, that may recover significantly to support the least Bell's vireo when grazing is removed. The least Bell's vireo is known to occur in areas adjacent to the Hayashi property, and as the riparian habitat recovers, there is a likelihood this area could support vireo in the future. These proposed Covered Species and other special status plant and wildlife species are similar to those species impacted by freeway projects. Therefore, the preservation and management of the Hayashi property will meet this Tier I Acquisition/Restoration/Management Criteria.
Enhances Natural Lands Connectivity, including significant Wildlife Corridors. The site connects to protected areas, supports multiple taxa, and/or is identified as an essential habitat linkage in regional or local plans.	Open space on the Hayashi property provides a critical connection between Chino Hills State Park property to the south and other open space to the north. The Hayashi property is part of an important major natural open space connecting Los Angeles, Orange, San Bernardino, and Riverside Counties through the Puente and Chino Hills. The hills and canyons of the property provide a large expanse of scrub, grasslands, and woodlands that support a variety of species that travel throughout this area. The movement opportunities throughout the site support larger ranging species such as the mountain lion, coyote, bobcat, and mule deer. This is consistent with the County of Orange General Plan, which identified this area as "Wildlife Habitat Areas (Generalized)" and a high priority for conservation. The preservation and management of the Hayashi property will meet this Tier I Acquisition/Restoration/Management Criteria.
Considers Property Acreage. Generally larger properties are better.	The Hayashi property is considered large at approximately 296 acres.
Enhances Natural Lands Contiguity. The site borders open space and acquisition increases the amount of core habitat or reduces edge effects.	The Hayashi property provides substantial acreage to the existing resources that are already protected to the south by Chino Hills State Park. In addition, the location of the property along the northwestern edge of the park provides a buffer to the core of the State Park that was not previously protected and subject to disturbance (e.g., grazing pressures, off road vehicle use). The site also provides a greater width of preserved connectivity between the Puente Hills and Chino Hills by increasing the permanent open space along Carbon Canyon. Therefore, the preservation and management of the Hayashi property will meet this Tier I Acquisition/Restoration/Management Criteria.

M2 Acquisition/Restoration/Management Criteria	
Tier II	***Evaluation of Hayashi Property***
Includes Habitat Diversity. The site includes variety of habitat types with an emphasis on various stages of vegetative structural diversity and functional ecosystem diversity.	The Hayashi property contains a diversity of habitats, represented by 11 vegetation types: blue elderberry stand, bush mallow scrub, California walnut groves, California walnut groves/laurel sumac scrub association, coast live oak woodland, giant wild rye grassland, laurel sumac scrub, mulefat thicket, needle grass grassland, semi-natural herbaceous stands, and willow thickets. The property contains grasslands (needle grass grassland, semi-natural herbaceous stands, giant wild rye grassland) that provide important habitat to many small mammals, which in turn provide a food source for a wide variety of birds of prey that are know or are expected to occur on site. The scrub and woodland areas (blue elderberry stand, bush mallow scrub, California walnut groves, California walnut groves/laurel sumac scrub association, coast live oak woodland, and laurel sumac scrub) provide the greatest vegetative structure and resources for on-site wildlife (foraging and nesting/denning opportunities). The riparian resources on site (i.e., mulefat thicket, willow thickets) provide a more limited opportunity for foraging and nesting; however, these areas are capable of increasing their vegetative structure and diversity with some adaptive management and enhancement practices that would be significantly beneficial to the on-site and off-site wildlife species that would rely on these areas and associated watercourses. Therefore, the preservation and management of the Hayashi property will meet this Tier II Acquisition/Restoration/Management Criteria.
Provides for Quality Habitat or Potential for Quality Habitat. The site includes mature habitats; has few constraints; and/or has high potential to support valuable habitat after acquisition.	The Hayashi property contains high quality habitat with native grasslands, scrub and woodland communities, and riparian habitats. In addition, the site does not appear to have been subject to farming or other active agricultural operations (except for grazing). The site has; however, been subject to repeated fire events (25 separate wildland fires since 1980, resulting in a total of 82,734 acres burned (OCFA 2008) that are likely to have affected the vegetation distribution through the site (e.g., more grasslands in areas that would normally constrain scrub or woodland communities). The site's location, proximity to other open space, lack of significant historical disturbance, and existing high quality vegetation types support the findings that the Hayashi property has few constraints and has a high potential to support valuable habitat after acquisition.
Considers the Extent of Isolation or Habitat Fragmentation. The site may be fragmented or isolated, reducing long-term biological value.	The Hayashi property is not, and cannot be in the future, either fragmented or isolated because of the site's location adjacent to Chino Hills State Park. In addition, the site also provides a greater width of preserved connectivity between the Puente Hills and Chino Hills by increasing the permanent open space along Carbon Canyon. Because of the connection to Chino Hills State Park and the other open space areas in the region, the long-term biological value of the site is expected to be maintained and/or improved by the preservation and management of the Hayashi property.

Attachment B

Plant and Wildlife Compendia

PLANT COMPENDIUM FOR THE HAYASHI SURVEY AREA

SPECIES	
***ANGIOSPERMAE* - FLOWERING PLANTS**	
MAGNOLIIDS	
***SAURURACEAE* - LIZARD'S-TAIL FAMILY**	
Anemopsis californica	yerba mansa
EUDICOTS	
***ADOXACEAE* - MUSKROOT FAMILY**	
Sambucus nigra ssp. *caerulea* [*S. mexicana*]	blue elderberry
***ANACARDIACEAE* - SUMAC FAMILY**	
Malosma laurina	laurel sumac
Rhus integrifolia	lemonadeberry
Rhus ovata	sugar bush
Toxicodendron diversilobum	western poison oak
***APIACEAE* - CARROT FAMILY**	
*Conium maculatum**	poison hemlock
Daucus pusillus	rattlesnake weed
*Foeniculum vulgare**	sweet fennel
*Torilis nodosa**	short sock-destroyer
***APOCYNACEAE* - DOGBANE FAMILY**	
Asclepias eriocarpa	kotolo, Indian milkweed
Asclepias fascicularis	narrow-leaf milkweed
Funastrum cynanchoides ssp. hartwegii [*Sarcostemma c.* ssp. *h.*]	climbing milkweed
***ASTERACEAE* - SUNFLOWER FAMILY**	
Acourtia microcephala	sacapellote
Ambrosia acanthicarpa	annual bur-sage
Ambrosia psilostachya	western ragweed
Artemisia californica	California sagebrush
Artemisia douglasiana	mugwort
Baccharis pilularis ssp. *consanguinea* [*B. pilularis*]	coyote brush
Baccharis salicifolia ssp. *salicifolia* [*B. salicifolia*]	mule fat
Brickellia californica	California brickellbush
Carduus pycnocephalus ssp. *pycnocephalus**	Italian thistle
Centaurea benedicta [*Cnicus benedictus*] *	blessed thistle
*Centaurea melitensis**	tocalote, Malta star-thistle
*Cirsium vulgare**	bull thistle
Corethrogyne filaginifolia	California-aster
*Cynara cardunculus**	cardoon, globe artichoke
Deinandra fasciculata [*Hemizonia f.*]	fascicled tarweed
Encelia californica	California brittlebush
Erigeron canadensis [*Conyza c.*]	common horseweed
Eriophyllum confertiflorum	golden-yarrow
Helminthotheca echioides [*Picris e.*]*	bristly ox-tongue
Heterotheca grandiflora	telegraph weed
*Hypochaeris radicata**	rough cat's-ear
Isocoma menziesii	coastal goldenbush

PLANT COMPENDIUM FOR THE HAYASHI SURVEY AREA

SPECIES	
*Lactuca serriola**	prickly lettuce
Logfia gallica [*Filago g.*]*	daggerleaf cottonrose
Malacothrix saxatilis var. *tenuifolia*	slender-leaved malacothrix
Pseudognaphalium biolettii [*Gnaphalium bicolor*]	bicolored everlasting, Bioletti's cudweed
Pseudognaphalium californicum [*Gnaphalium c.*]	California everlasting
Pseudognaphalium luteoalbum [*Gnaphalium l.*]*	weedy cudweed
*Silybum marianum**	milk thistle
Sonchus asper ssp. *asper**	prickly sow thistle
*Sonchus oleraceus**	common sow thistle
***BORAGINACEAE* - BORAGE FAMILY**	
Amsinckia intermedia	common fiddleneck
Eucrypta chrysanthemifolia	common eucrypta
Heliotropium curassavicum var. *oculatum*	salt heliotrope / alkali heliotrope
Phacelia cicutaria	caterpillar phacelia
Phacelia hubbyi	Hubby's phacelia
***BRASSICACEAE* - MUSTARD FAMILY**	
*Brassica nigra**	black mustard
*Hirschfeldia incana**	shortpod mustard
Lepidium lasiocarpum ssp. *lasiocarpum*	hairy peppergrass / sand peppergrass
Nasturtium officinale [*Rorippa nasturtium-aquaticum*]*	water cress
*Sisymbrium altissimum**	tumble mustard
***CAPRIFOLIACEAE* - HONEYSUCKLE FAMILY**	
Lonicera subspicata var. *denudata*	southern honeysuckle
Symphoricarpos mollis	creeping snowberry
***CARYOPHYLLACEAE* - PINK FAMILY**	
*Silene gallica**	small-flower catchfly
***CHENOPODIACEAE* - GOOSEFOOT FAMILY**	
*Chenopodium album**	lamb's quarters
*Salsola tragus**	Russian thistle
***CONVOLVULACEAE* - MORNING-GLORY FAMILY**	
Calystegia macrostegia	large-bracted morning-glory
Cuscuta californica	chaparral dodder
***CUCURBITACEAE* - GOURD FAMILY**	
Cucurbita foetidissima	coyote melon / calabazilla
Marah macrocarpus	wild cucumber / chilicothe
***EUPHORBIACEAE* - SPURGE FAMILY**	
Croton setigerus [*Eremocarpus s.*]	doveweed / turkey mullein
*Ricinus communis**	castor bean
***FABACEAE* - LEGUME FAMILY**	
Acmispon glaber var. *glaber* [*Lotus scoparius* var. *scoparius*]	coastal deerweed
Astragalus trichopodus	locoweed
Lupinus succulentus	arroyo lupine
*Medicago polymorpha**	California burclover
*Melilotus indica**	sourclover

PLANT COMPENDIUM FOR THE HAYASHI SURVEY AREA

SPECIES	
***FAGACEAE* - OAK / BEECH FAMILY**	
Quercus agrifolia	coast live oak
Quercus berberidifolia	scrub oak / California scrub oak
***GERANIACEAE* - GERANIUM FAMILY**	
*Erodium botrys**	long-beaked filaree
*Erodium brachycarpum**	short-fruited filaree
*Erodium cicutarium**	red-stemmed filaree
***GROSSULARIACEAE* - GOOSEBERRY FAMILY**	
Ribes malvaceum var. *viridifolium*	southern California currant
Ribes speciosum	fuchsia-flowered gooseberry
***JUGLANDACEAE* - WALNUT FAMILY**	
Juglans californica	Southern California black walnut
***LAMIACEAE* - MINT FAMILY**	
*Marrubium vulgare**	common horehound
Salvia apiana	white sage
Salvia leucophylla	purple sage
Salvia mellifera	black sage
Stachys ajugoides or *S. rigida*	hedge-nettle
Trichostema lanceolatum	vinegar weed
***MALVACEAE* - MALLOW FAMILY**	
Malacothamnus fasciculatus	chaparral bushmallow
*Malva parviflora**	cheeseweed
MYRSINACEAE - MYRSINE FAMILY	
*Anagallis arvensis**	scarlet pimpernel
***MYRTACEAE* - MYRTLE FAMILY**	
Eucalyptus sp.*	gum
***NYCTAGINACEAE* - FOUR-O'CLOCK FAMILY**	
Bougainvillea sp.*	bougainvillea
Mirabilis laevis var. *crassifolia* [*M. californica*]	wishbone bush / California wishbone bush
***OLEACEAE* - OLIVE FAMILY**	
Fraxinus cf. *uhleri**	shamel ash
***ONAGRACEAE* - EVENING PRIMROSE FAMILY**	
Epilobium canum	California fuchsia
Epilobium ciliatum	willow-herb
***PHRYMACEAE* - LOPSEED FAMILY**	
Mimulus aurantiacus	bush monkeyflower
Mimulus guttatus	seep monkeyflower
***PLANTAGINACEAE* - PLANTAIN FAMILY**	
Keckiella cordifolia	heart-leaved bush-penstemon
***POLYGONACEAE* - BUCKWHEAT FAMILY**	
Eriogonum fasciculatum var. *foliolosum*	leafy California buckwheat
***RANUNCULACEAE* - CROWFOOT FAMILY**	
Clematis lasiantha	chaparrl clematis, pipestem clematis
***RHAMNACEAE* - BUCKTHORN FAMILY**	
Rhamnus ilicifolia	hollyleaf redberry

PLANT COMPENDIUM FOR THE HAYASHI SURVEY AREA

SPECIES	
***ROSACEAE* - ROSE FAMILY**	
Adenostoma fasciculatum var. *fasciculatum*	common chamise
Heteromeles arbutifolia	toyon / Christmas berry
Rosa californica	California rose
Rubus ursinus	California blackberry
***RUBIACEAE* - MADDER FAMILY**	
Galium angustifolium	narrowly leaved bedstraw
***SALICACEAE* - WILLOW FAMILY**	
Salix gooddingii	Goodding's black willow
Salix lasiolepis	arroyo willow
***SOLANACEAE* - NIGHTSHADE FAMILY**	
Datura wrightii	jimson weed
*Nicotiana glauca**	tree tobacco
Solanum douglasii	Douglas' nightshade
Solanum umbelliferum	blue witch
***URTICACEAE* - NETTLE FAMILY**	
Urtica dioica ssp. *holosericea*	hoary nettle
*Urtica urens**	dwarf nettle
***VERBENACEAE* - VERVAIN FAMILY**	
Verbena lasiostachys var. *lasiostachys*	western verbena
***MONOCOTYLEDONES* - MONOCOTS**	
***ARECACEAE* - PALM FAMILY**	
*Washingtonia robusta**	Mexican fan palm
***IRIDACEAE* - IRIS FAMILY**	
Sisyrinchium bellum	western blue-eyed grass
***JUNCACEAE* - RUSH FAMILY**	
Juncus mexicanus	Mexican rush
Juncus textilis	basket rush
***POACEAE* - GRASS FAMILY**	
*Arundo donax**	giant reed
*Avena barbata**	slender wild oat
*Bromus diandrus**	ripgut grass
*Bromus hordeaceus**	soft chess
Bromus madritensis ssp. *rubens**	red brome
Distichlis spicata	salt grass
Elymus condensatus [*Leymus c.*]	giant wild rye
Elymus triticoides [*Leymus t.*]	beardless wild rye
Festuca myuros [*Vulpia m.*]*	foxtail fescue
Festuca perennis [*Lolium perenne, L. multiflorum*]*	perennial ryegrass
Hordeum murinum var. *leporinum**	hare barley
Melica imperfect	little California melic grass
*Polypogon monspeliensis**	annual beard grass
Polypogon viridis [*Agrostis v.*]*	water beard grass
Stipa lepida [*Nassella l.*]	foothill needlegrass
Stipa miliacea [*Piptatherum m.*]*	smilo grass

PLANT COMPENDIUM FOR THE HAYASHI SURVEY AREA

SPECIES	
Stipa pulchra [*Nassella p*.]	purple needlegrass
THEMIDACEAE **- BRODIAEA FAMILY**	
Bloomeria crocea	common goldenstar
TYPHACEAE **- CATTAIL FAMILY**	
Typha sp.	*cattail*
* non-native to the region it was found cf. appears similar to	

WILDLIFE COMPENDIUM FOR THE HAYASHI SURVEY AREA

Species	
REPTILES	
***LEPIDOSAURIA* - LIZARDS & SNAKES**	
PHRYNOSOMATIDAE - ZEBRA-TAILED, FRINGE-TOED, SPINY, TREE, SIDE-BLOTCHED, & HORNED LIZARDS	
Sceloporus occidentalis	western fence lizard
Uta stansburiana	side-blotched lizard
COLUBRIDAE - COLUBRID SNAKES	
Pituophis catenifer	gopher snake
Lampropeltis getula	common kingsnake
BIRDS	
***AVES* - BIRDS**	
ODONTOPHORIDAE - QUAILS	
Callipepla californica	California quail
ARDEIDAE - HERONS, BITTERNS, & ALLIES	
Ardea herodias	great blue heron
CATHARTIDAE - NEW WORLD VULTURES	
Cathartes aura	turkey vulture
ACCIPITRIDAE - HAWKS, KITES, EAGLES, & ALLIES	
Accipiter cooperii	Cooper's hawk
Buteo jamaicensis	red-tailed hawk
FALCONIDAE - FALCONS	
Falco sparverius	American kestrel
COLUMBIDAE - PIGEONS & DOVES	
Columba fasciata	band-tailed pigeon
Zenaida macroura	mourning dove
CUCULIDAE - CUCKOOS & ROADRUNNERS	
Geococcyx californianus	greater roadrunner
TYTONIDAE - BARN OWLS	
Tyto alba	barn owl
STRIGIDAE - TRUE OWLS	
Megascops kennicottii	western screech-owl
APODIDAE - SWIFTS	
Aeronautes saxatalis	white-throated swift
TROCHILIDAE - HUMMINGBIRDS	
Archilochus alexandri	black-chinned hummingbird
Calypte anna	Anna's hummingbird
Selasphorus sasin	Allen's hummingbird
PICIDAE - WOODPECKERS	
Melanerpes formicivorus	acorn woodpecker
Picoides nuttallii	Nuttall's woodpecker
TYRANNIDAE - TYRANT FLYCATCHERS	
Empidonax difficilis	Pacific-slope flycatcher
Sayornis nigricans	black phoebe
Sayornis saya	Say's phoebe
Myiarchus cinerascens	ash-throated flycatcher

WILDLIFE COMPENDIUM FOR THE HAYASHI SURVEY AREA

Species	
CORVIDAE - CROWS & JAYS	
Aphelocoma californica	western scrub-jay
Corvus brachyrhynchos	American crow
Corvus corax	common raven
HIRUNDINIDAE - SWALLOWS	
Stelgidopteryx serripennis	northern rough-winged swallow
Petrochelidon pyrrhonota	cliff swallow
AEGITHALIDAE - BUSHTITS	
Psaltriparus minimus	bushtit
SITTIDAE - NUTHATCHES	
Sitta carolinensis	white-breasted nuthatch
TROGLODYTIDAE - WRENS	
Thryomanes bewickii	Bewick's wren
Troglodytes aedon	house wren
POLIOPTILIDAE - GNATCATCHERS & GNATWRENS	
Polioptila caerulea	blue-gray gnatcatcher
SYLVIIDAE - SYLVIID WARBLERS	
Chamaea fasciata	wrentit
MIMIDAE - THRASHERS	
Mimus polyglottos	northern mockingbird
Toxostoma redivivum	California thrasher
PTILOGONATIDAE - SILKY-FLYCATCHERS	
Phainopepla nitens	phainopepla
PARULIDAE - WARBLERS	
Oreothlypis celata [*Vermivora c.*]	orange-crowned warbler
Geothlypis trichas	common yellowthroat
Setophaga petechia [*Dendroica p.*]	yellow warbler
Icteria virens	yellow-breasted chat
EMBERIZIDAE - SPARROWS & JUNCOS	
Pipilo maculatus	spotted towhee
Melozone crissalis [*Pipilo c.*]	California towhee
Aimophila ruficeps	rufous-crowned sparrow
Passerella iliaca	fox sparrow
Melospiza melodia	song sparrow
CARDINALIDAE - CARDINALS & ALLIES	
Pheucticus melanocephalus	black-headed grosbeak
Passerina caerulea	blue grosbeak
Passerina amoena	lazuli bunting
ICTERIDAE - BLACKBIRDS	
Molothrus ater	brown-headed cowbird
Icterus cucullatus	hooded oriole
Icterus bullockii	Bullock's oriole
FRINGILLIDAE - FINCHES	
Carpodacus mexicanus	house finch
Spinus psaltria [*Carduelis p.*]	lesser goldfinch

WILDLIFE COMPENDIUM FOR THE HAYASHI SURVEY AREA

Species	
PASSERIDAE - OLD WORLD SPARROWS	
Passer domesticus *	house sparrow
MAMMALS	
MAMMALIA **- MAMMALS**	
VESPERTILIONIDAE - VESPER BATS	
Myotis yumanensis	Yuma myotis
Lasiurus blossevillii	western red bat
Lasiurus cinereus	hoary bat
MOLOSSIDAE - FREE-TAILED BATS	
Tadarida brasiliensis	Brazilian free-tailed bat
LEPORIDAE - HARES & RABBITS	
Sylvilagus audubonii	desert cottontail
SCIURIDAE - SQUIRRELS	
Spermophilus beecheyi	California ground squirrel
GEOMYIDAE - POCKET GOPHERS	
Thomomys bottae	Botta's pocket gopher
CANIDAE - WOLVES & FOXES	
Canis latrans	coyote
CERVIDAE - DEER	
Odocoileus hemionus	mule deer
BOVIDAE - CATTLE, ANTELOPE, SHEEP, & GOATS	
Bos taurus *	domestic cattle
INVERTEBRATES	
INSECTA **- INSECTS**	
PAPILIONIDAE - SWALLOWTAIL BUTTERFLIES	
Papilio rutulus	western tiger swallowtail
PIERIDAE - WHITES, SULFURS, & ORANGETIPS	
Pieris rapae *	mustard white
Pontia protodice	common (checkered) white
HESPERIIDAE - SKIPPERS	
Pyrgus communis	common checkered-skipper
LIBELLULIDAE - COMMON SKIMMERS	
Libellula saturata	flame skimmer
* introduced species	

Baseline Biological Surveys Technical Report for the South County Properties

Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California

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TABLE OF CONTENTS

Section **Page**

1.0 Introduction 1
- 1.1 Background 1
- 1.2 Project Location and Physical Environmental Setting 2

2.0 Survey Methodologies 8
- 2.1 Literature Review 8
- 2.2 Vegetation Mapping and General Surveys 8
- 2.3 Focused Biological Surveys 9
- 2.4 Regulatory Surveys 14

3.0 Existing Biological Resources 16
- 3.1 Vegetation Types and Other Areas 16
- 3.2 Wildlife Populations and Movement Patterns 26
- 3.3 Special Status Biological Resources 31
- 3.4 Covered Species Summary 78

4.0 References 84

TABLES

Table **Page**

1 Summary of Survey Data for Special Status Plant Surveys 10
2 Summary of Survey Data and Conditions for Gnatcatcher/Cactus Wren Surveys 11
3 Summary of Jurisdictional Delineation Surveys 14
4 Vegetation Types and Other Areas on the Ferber Ranch Property 16
5 Vegetation Types and Other Areas on the O’Neill Oaks Property 21
6 Vegetation Types and Other Areas on the Hafen Property 23
7 Vegetation Types and Other Areas on the Saddle Creek South Property 24
8 “Waters of the U.S.” and “Waters of the State” on the South County Properties 36
9 Attribute Scores for South County Property Assessment Areas 38
10 Special Status Plant Species Known to Occur in the Vicinity of the South County Properties 39
11 Intermediate Mariposa Lily Populations Observed on the South County Properties 53
12 Ocelated Humboldt Lily Populations Observed on the Ferber Ranch Property 57
13 Chaparral Nolina Populations Observed on the South County Properties 58
14 Chaparral Rein-orchid Populations Observed on the Ferber Ranch Property 58
15 Fish’s Milkwort Populations Observed on the Ferber Ranch Property 59
16 Coulter’s Matilija Poppy Populations Observed on the Ferber Ranch Property 59
17 Special Status Wildlife Species Known to Occur in the Vicinity of the South County Properties 60
18 Summary of Covered Species 78

EXHIBITS

Exhibit		Follows Page
1	Regional Location	1
2	Local Vicinity	2
3	Soil Types	3
4	Regional Environmental Setting	4
5	Fire History	6
6	Vegetation Types	16
7	Vegetation Types	21
8	Vegetation Types	23
9	Vegetation Types	24
10	Jurisdictional Resources	36
11	Jurisdictional Resources	36
12	Jurisdictional Resources	36
13	Jurisdictional Resources	36
14A–D	Special Status Plant Locations	53
15A–D	Special Status Wildlife Locations	59

ATTACHMENTS

A Plant and Wildlife Compendia

1.0 INTRODUCTION

This Biological Technical Report has been prepared to support California Environmental Quality Act (CEQA) documentation and resource management planning for the Measure M2 Freeway Environmental Mitigation Program (EMP) Acquisition Properties Evaluation Project. The EMP project includes five separate Orange County Transportation Authority (OCTA) acquisition properties (Hayashi, Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South), located in unincorporated Orange County, California (Exhibit 1). Due to the regional separation between the Hayashi property (located in northeast Orange County) and the remaining four properties (located in southeast Orange County), this report only covers the four properties in southeast Orange County (hereinafter collectively referred to as the "south county properties"). A separate Biological Technical Report has been prepared for the Hayashi property.

This information has been reported in accordance with accepted scientific and technical standards that are consistent with the requirements of the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW[1]).

1.1 BACKGROUND

1.1.1 Project Description

In 2006, Orange County voters approved the renewal of Measure M, effectively extending the half-cent sales tax in the County from April 2011 to March 2041. Renewed Measure M (or Measure M2) will continue to provide funding for transportation projects and programs in the County, including select freeway and roadway improvements, transit programs, and two environmental programs.

OCTA's M2 Freeway EMP provides comprehensive mitigation to offset the environmental impacts of the 13 Measure M2-funded freeway projects. The EMP is spearheaded by the Environmental Oversight Committee (EOC), which is made up of OCTA Board members and representatives from the California Department of Transportation (Caltrans), resource agencies, environmental groups, and the public.

Instead of mitigating the natural resource impacts of Measure M2 freeway projects on a project-by-project basis, the EMP presents a comprehensive mitigation approach that not only replaces habitat, but also provides the opportunity to improve the overall functions and value of sensitive biological resources throughout Orange County. Working collaboratively with the resource and regulatory agencies, OCTA ultimately decided that creation of a Natural Community Conservation Plan (NCCP)/Habitat Conservation Plan (HCP) and programmatic wetland permitting would best serve as the main implementation tools for the EMP.

As one of the key components of the conservation strategy for the NCCP/HCP and wetlands permitting, OCTA has undertaken a systematic approach to identifying and acquiring habitat preserves to meet the goals and objectives of the NCCP/HCP and wetland mitigation programs. A formal conservation assessment was completed by Conservation Biology Institute (CBI) for Orange County that resulted in the identification of Priority Conservation Areas (PCA), which included candidate parcels and properties that could be considered for habitat and wildlife conservation purposes. OCTA solicited willing sellers and evaluated each property using standardized criteria and a prioritization process to rank properties for purchase. Properties for

[1] The California Department of Fish and Game (CDFG) changed its name to the California Department of Fish and Wildlife (CDFW) effective January 1, 2013.

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Regional Location

Exhibit 1

Measure M2 Acquisition Properties/Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South Properties

N W E S

6 3 0 6 Miles

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(Rev: 12-21-2012 JAZ) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\ex1_RL.pdf acquisition were selected based on conservation values, policy considerations, mitigation credits, mitigation plan review, and adoption and real estate value/economics.

The south county properties were selected and acquired in 2011. Baseline biological surveys were completed in 2012 with the following goals:

- A general biological assessment of the Preserve was completed to establish the baseline biological value of the property and identify any biological threats that have the potential to reduce the long-term biological value. In addition, information on the overall condition of the properties will guide the development of a site-specific Resource Management Plan (RMP).
- Comprehensive surveys of vegetation types and jurisdictional resources were completed to provide detailed knowledge of the natural habitat and a quantification of habitat type credits within the Preserve.
- Focused surveys for OCTA M2 NCCP/HCP Covered Species and their habitats were completed to establish a baseline of the Preserve status and conditions. Results of future biological monitoring will be compared to the baseline results to evaluate habitat and Covered Species trends.

1.2 PROJECT LOCATION AND PHYSICAL ENVIRONMENTAL SETTING

1.2.1 Property Locations and Physical Conditions

The south county properties are generally located in the community of Trabuco Canyon in unincorporated Orange County, California. All four properties are located on the U.S. Geological Survey's (USGS') Santiago Peak 7.5-minute topographic quadrangle (Exhibit 2). Ephemeral drainages are present on each property and may provide marginally suitable habitat for species such as western spadefoot (*Spea hammondii*) and Coast Range newt (*Taricha torosa*). Various soils on the properties may provide suitable habitat for different special status plant species. Soils on alluvial fans and floodplains may provide suitable habitat for species such as white rabbit-tobacco; granitic soils may provide habitat for species such as felt-leaved monardella; and alkaline soils may provide suitable habitat for species such as Coulter's saltbush and chaparral ragwort.

Ferber Ranch

The approximate 399-acre Ferber Ranch property extends to the north and east of the terminus of Trabuco Oaks Drive; Rose Canyon Road crosses the middle of the property. The southern boundary of the property is approximately one mile north of Trabuco Canyon Road. A small parcel at the northwestern corner of the property is separated from the main body of the property by Hickey Spur. The property is located at Township 6 South, Range 7 West, Section 3. Elevation on this property ranges from approximately 1,110 to 1,800 feet above mean sea level (msl). Several ephemeral drainages that flow in a southerly direction are located on this property. Three of these—Hickey Creek, Rose Canyon Creek, and an unnamed stream—appear on the USGS quadrangle as blueline streams. Soil types mapped on Ferber Ranch consist of Alo clay (15 to 30 percent slopes; 30 to 50 percent slopes), Alo variant clay (15 to 30 percent slopes), Blasingame stony loam (9 to 30 percent slopes), Bosanko clay (15 to 30 percent slopes), Calleguas clay loam (50 to 75 percent slopes, eroded), Capistrano sandy loam (2 to 9 percent slopes; 9 to 15 percent slopes), Cieneba sandy loam (30 to 75 percent slopes, eroded), Exchequer-rock outcrop complex (30 to 75 percent slopes), Modjeska gravelly loam (15 to 30 percent slopes), Myford sandy loam (2 to 9 percent slopes; 9 to 15 percent slopes; 15 to 30 percent slopes), riverwash, rock outcrop-Cieneba complex (30 to 75 percent slopes), Soboba cobbly loamy sand (0 to 15 percent slopes), Soper loam (30 to 50 percent slopes), and Yorba gravelly sandy loam (9 to 15 percent slopes) (Exhibit 3).

O'Neill Oaks

The approximate 119-acre O'Neill Oaks property occurs north of the point where Live Oak Canyon Road becomes Trabuco Canyon Road. This property is located at Township 6 South, Range 7 West, Section 10. Elevation on this property ranges from approximately 950 to 1,250 feet above msl. Three ephemeral drainages that flow in a westerly direction are located in the western half of the site and several small, southeast-flowing ephemeral drainages occur along the southeastern boundary of the site. Soil types mapped on the O'Neill Oaks property consist of Botella clay loam (9 to 15 percent slopes), Cieneba sandy loam (30 to 75 percent slopes, eroded), Soboba cobbly loamy sand (0 to 15 percent slopes), and Yorba gravelly sandy loam (15 to 30 percent slopes) (Exhibit 3).

Hafen

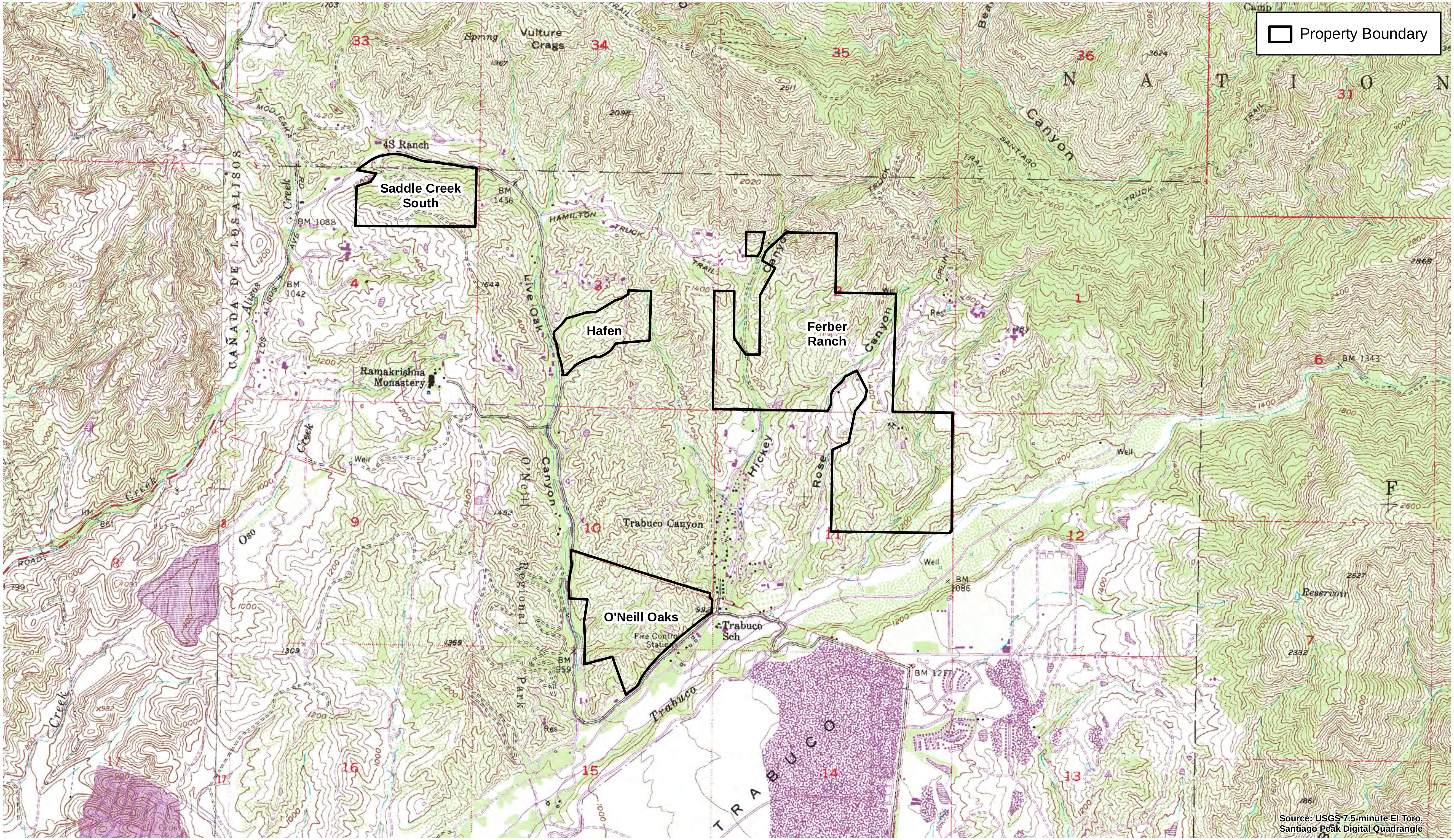
The approximate 48-acre Hafen property is immediately adjacent to the east side of Live Oak Canyon Road, north of its intersection with Shelter Canyon Road. This property is located at Township 6 South, Range 7 West, Section 3. Elevation on this property ranges from approximately 1,190 to 1,450 feet above msl. Two ephemeral drainages that flow in a westerly direction are located in the western half of this property. A larger ephemeral drainage is located along the eastern boundary of the property and appears on the USGS quadrangle as a blueline stream; several small ephemeral drainages flow into this drainage from within the property limits. Soil types mapped on the Hafen property consist of Botella clay loam (9 to 15 percent slopes), Cieneba sandy loam (30 to 75 percent slopes, eroded), and Soboba cobbly loamy sand (0 to 15 percent slopes) (Exhibit 3).

Saddle Creek South

The approximate 84-acre Saddle Creek South property is immediately adjacent to the south side of Live Oak Canyon Road, approximately 0.3 mile from its intersection with El Toro Road/Santiago Canyon Road. This property is located at Township 6 South, Range 7 West, Section 4. Elevation on this property ranges from approximately 1,160 to 1,600 feet above msl. Two principal ephemeral drainages that flow in a westerly direction occur on the property: one adjacent to Live Oak Canyon Road and the other in the center of the property. Soil types mapped on the Saddle Creek South property consist of Alo clay (15 to 30 percent slopes; 30 to 50 percent slopes), Balcom clay loam (15 to 30 percent slopes; 30 to 50 percent slopes), Botella clay loam (9 to 15 percent slopes), Calleguas clay loam (50 to 75 percent slopes, eroded), Cieneba sandy loam (30 to 75 percent slopes, eroded), and Sorrento loam (2 to 9 percent slopes) (Exhibit 3).

1.2.2 Regional Environmental Setting

The south county properties are located in the cismontane foothills of the Santa Ana Mountains. They are located between the large blocks of undeveloped land of O'Neill Regional Park to the west and the Cleveland National Forest to the east (Exhibit 4). This area is part of a 31-mile swath of continuous wildlife habitat that spans from the National Forest in the south to the west end of the Puente Hills, above Whittier Narrows, in the north. This represents the "last major natural open space resource connecting Los Angeles, Orange, San Bernardino, and Riverside Counties" (Los Angeles County et al. 2003). Specifically, the properties occur near the intersection of Trabuco Canyon with Live Oak Canyon, Hickey Canyon, and Rose Canyon. These canyons are part of the San Juan Hydrologic Unit of the Aliso-San Onofre Watershed. Drainages on Saddle Creek South property convey flow into Aliso Creek, which discharges into



Local Vicinity

Exhibit 2

Measure M2 Acquisition Properties/Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South Properties

N W E S

2,000 1,000 0 2,000 Feet

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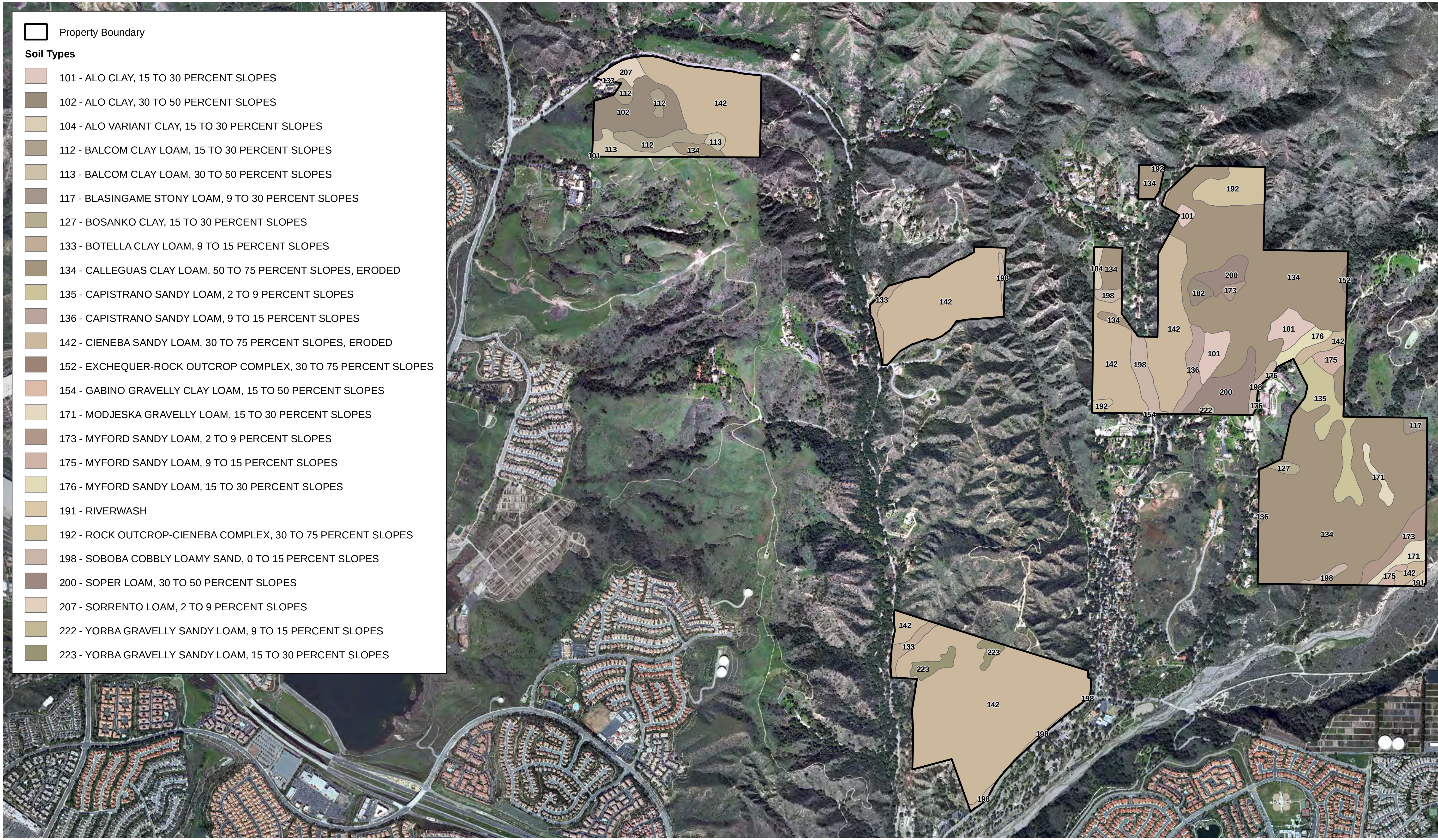

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Soil Types

Exhibit 3

Measure M2 Acquisition Properties/Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South Properties

N W E S

1,500 750 0 1,500 Feet

BonTerra CONSULTING

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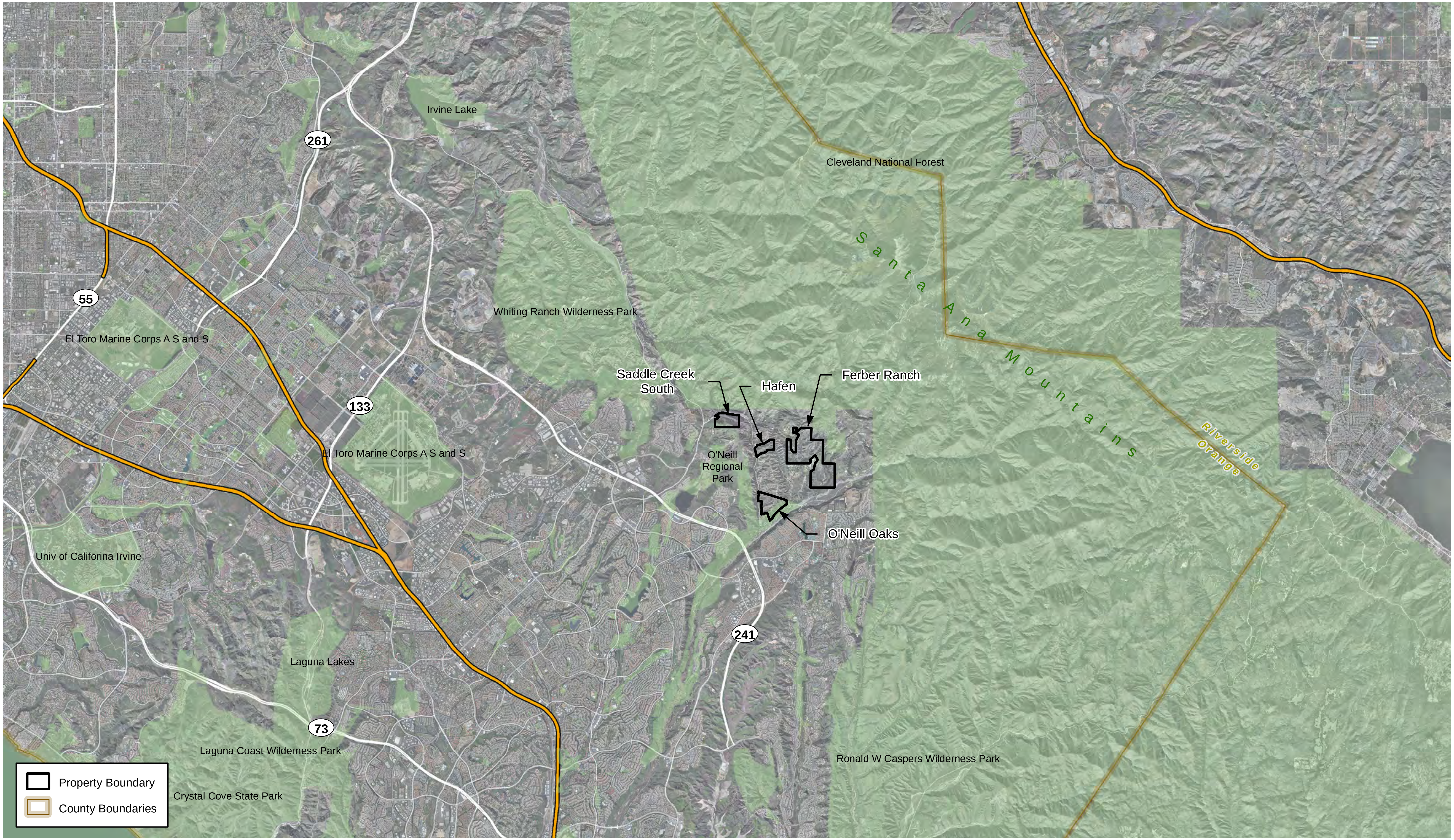

Regional Environmental Setting

Exhibit 4

Measure M2 Acquisition Properties/Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South Properties

N W E S

10,000 5,000 0 10,000 Feet

BonTerra CONSULTING

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the Pacific Ocean in the City of Laguna Beach approximately 14 miles away. Drainages on the Hafen, O'Neill Oaks and Ferber Ranch properties convey flow either directly into Trabuco Creek or first into Live Oak Canyon Creek; Trabuco Creek joins San Juan Creek approximately 12 miles away, which discharges into the Pacific Ocean in the City of Dana Point. A grant from the Wildlife Conservation Board (WCB), which provides funding for watershed-wide habitat enhancement, may be available.

The properties are all within the Foothill/Trabuco Specific Plan area. The purpose of the Foothill/Trabuco Specific Plan was to "set forth goals, policies, land use district regulations, development guidelines, and implementation programs in order to preserve the area's rural character and to guide future development in the Foothill/Trabuco area" (Orange County 1991). The Specific Plan identifies significant regional resources, such as wildlife corridors, oak woodlands, and streambeds in the planning area. Multiple designated wildlife corridors cross the Ferber Ranch property and a wildlife corridor, located along Live Oak Canyon Road, runs along the western edge of the O'Neill Oaks and Hafen properties. All of the properties contain designated oak woodlands. Designated streambeds cross the Ferber Ranch property and run along the western edge of the O'Neill Oaks and Hafen properties.

1.2.3 Fire History

There are various hypotheses regarding the fire history of Southern California, what constitutes a "natural" fire regime, and the role of fire for chaparral plant species. Traditionally, the fire season in Southern California is from May through September (OCFA 2007). In the past, fires were started by lightning and typically moved down slopes due to falling brands and coals. According to one school of thought, fires only occasionally formed the hot runs on steep slopes that are typical of today's fires and large, intense fires were uncommon (Howard 1992). This fire regime resulted in a mosaic of numerous small burns. New fires were limited by recently burned regions with very little fuel; dead wood and other fuels could not accumulate for long. However, an opposing hypothesis is that large, high-intensity chaparral fires were regular occurrences in the 19th century, often driven by severe weather that involved high temperatures, low humidity, and high winds (Keeley and Zedler 2009).

Mediterranean shrub communities, including those types found on the properties, are resilient to infrequent wildfires and historically burned at a frequency of every 30 to 150 years (Halsey 2005). Many plant species associated with chaparral and scrub communities exhibit characteristics that constitute adaptations to fire. A new fire will then typically burn hot and high into the canopy, killing much of the aboveground biomass. These canopy fires facilitate seed establishment by removing shrub cover and eliminating competitors. In the first few years after a fire, herbs and herbaceous shrubs—such as deerweed (*Acmispon glaber* [*Lotus scoparius*]), lupines (*Lupinus* spp.), paintbrushes (*Castilleja* spp.), and phacelias (*Phacelia* spp.)—are abundant. Because chaparral fires burn nitrogenous compounds in plant tissues and detritus, there is a large loss of nitrogen from the ecosystem. This allows species equipped with nitrogen-fixing bacteria to grow quickly after a fire.

While herbaceous species are establishing, the previously dominant chaparral species are also returning. Many chaparral species rely on fire to release and germinate seeds. Others resprout from roots or buds at the base of the stem. As the shrub canopy closes, whether due to resprouting of individuals burned by the fire or due to seedling growth, these herbaceous species decrease in abundance.

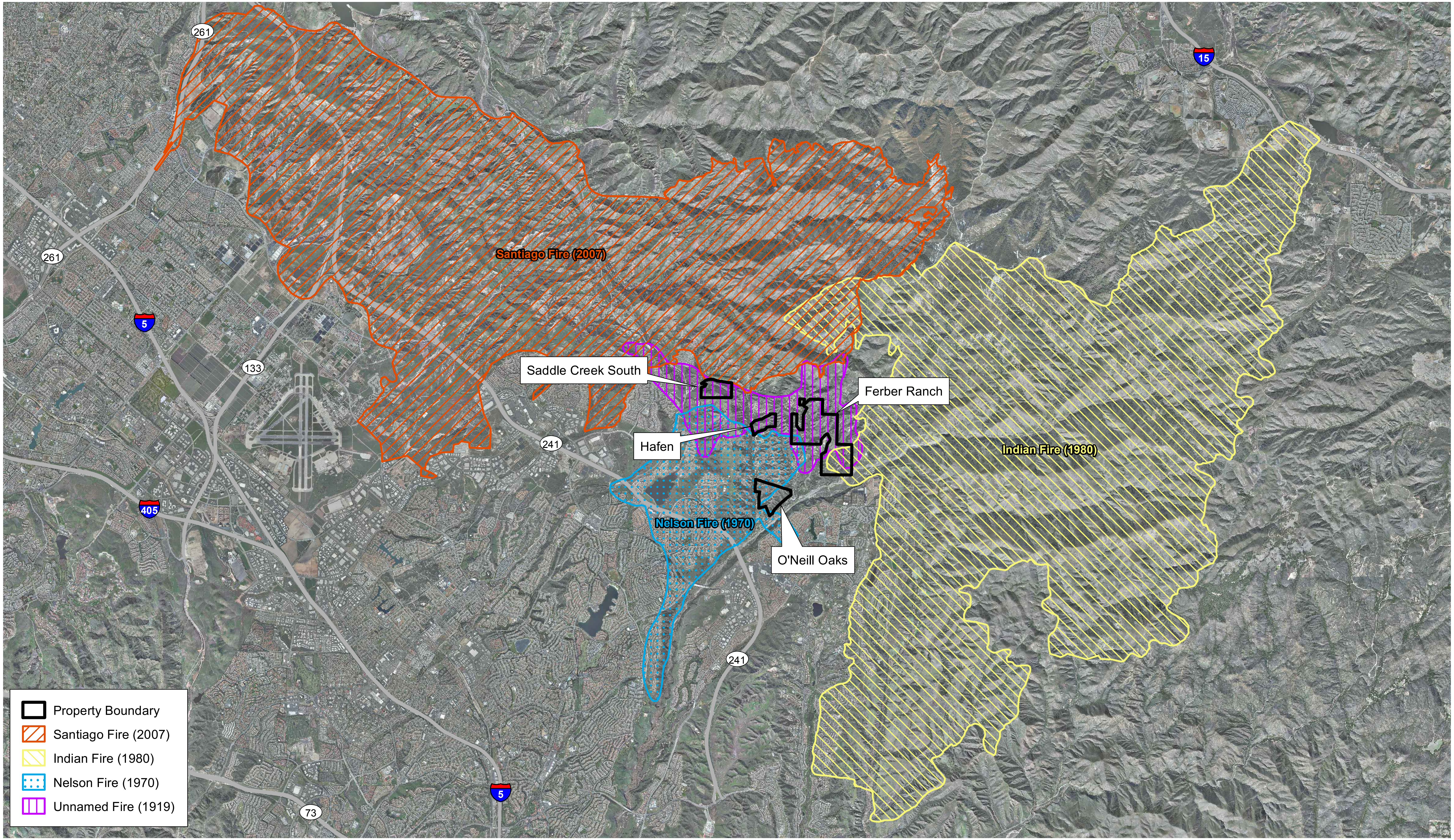
Fire is also a natural element of oak ecosystems and a decreasing fire frequency tends to favor development of oak woodland over scrub or chaparral. Coast live oak is especially fire resistant; trees can survive and resprout even after severe burning due to food reserves stored in the extensive root system (Steinberg 2002). Adaptations to fire include evergreen leaves, thick bark, and the ability to resprout (Steinberg 2002). Trees resprout from the main trunk and upper crown, but also from the root crown; resprouting may result in a multi-trunk tree. While acorns on the soil are killed, animal-buried acorns usually survive moderately severe fire which allows for high rates of post-fire establishment. Post-fire establishment may also be facilitated by western scrub-jays (*Aphelocoma californica*), which prefer burned areas for caching sites (Steinberg 2002). The frequent, low-intensity burning by Native Americans likely resulted in cohorts of large oak trees growing in open, savannah-like stands (McCreary 2004).

Although fires are a natural part of chaparral, scrub, and oak communities, both unnatural increases and decreases in fire frequency can have a negative impact. Now, nearly all wildfires are started by humans, either through arson or accidents (Schoenherr 1992). While the fire season traditionally occured from May through September, in the past 15 years, Orange County has experienced its most devastating wildfires from October through April (OCFA 2008). Drought conditions contribute to an increase in dead fuels; drier and more explosive fuels; and more intense fire behavior. In addition, sustained Santa Ana Winds increase the speed of fire and magnify the effects on the available fuel bed. Santa Ana Winds are strong, warm, and dry winds that flow down into the valleys when stable; during these conditions, high pressure air is forced across and then down the lee-side slopes of a mountain range. The descending air is warmed and dried, which produces critical fire weather conditions.

Anthropogenic increases in fire frequency can change the natural resilience of native communities. With a high frequency of fires, plants may not store enough energy between fires to resprout from roots or buds. In general, when an area burns too often for the community to mature, native plants may not be able to maintain dominance, often resulting in a habitat type conversion. Ruderal species, including annual grasses and invasive forbs, often thrive in post-fire conditions. As a result, fires often promote the spread of non-native species into native habitats. In turn, this high degree of non-native grass and forb cover can lead to more frequent fire return intervals (e.g., intervals of less than eight years have been reported) (Minnich and Dezzani 1998).

A decrease in fire frequency may also hinder reproduction of fire-adapted species. In the past, government agencies tried to prevent and stop the spread of wildfires through a policy of fire suppression. These efforts were found to be unsuccessful; they occasionally resulted in larger and more catastrophic fires. While they are less frequent, unnaturally large fires may burn so hot and intense that the canopy, roots, and even the seeds of fire-adapted plants are destroyed. Habitat type conversion may occur in scrub and chaparral communities where fire suppression allows oaks to increase in density (McCreary 2004). When fire isn't allowed to regenerate the understory of oak savannahs, the shrub component increases and more severe, crown-consuming fires may result.

Over the past 60 years, Orange County has experienced a number of major (i.e., burned greater than 2,000 acres, burned for an extended period or time, and/or resulted in extraordinary property loss) wildland fires, including 20 that burned over 2,000 acres (OCFA 2008). According to the Orange County Fire Authority (OCFA), the County has experienced 25 separate wildland fires since 1980, resulting in a total of 82,734 acres burned (OCFA 2008). The OCFA has identified Trabuco Canyon as being at high risk of a conflagration-type fire (i.e., large and destructive) due to construction of homes, lack of fuel modification protecting the community, and type of fuel and topography (OCFA 2007). The California Department of Forestry and Fire Protection (CAL FIRE) has also tracked significant fire events on the south county properties. Exhibit 5 shows the fire history of the properties. Ferber Ranch experienced an unnamed fire in 1919 (319.6 acres burned on site), the Nelson Fire in 1970 (12.5 acres burned on site), and the Indian Fire in 1980 (96.0 acres burned on site). The Nelson Fire also burned 55.1 acres on the O'Neill Oaks property. The unnamed 1919 fire and the Nelson Fire burned 45.4 acres and



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Fire History

Exhibit 5

Measure M2 Acquisition Properties Evaluation/Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South Properties

N W E S

1.5 0.75 0 1.5 Miles

BonTerra CONSULTING

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0.3 acres on the Hafen property, respectively. The unnamed 1919 fire and the Santiago Fire of 2007 burned 79.3 and 0.3 acres of the Saddle Creek South property, respectively (CAL FIRE 2011).

1.2.4 Climate

Southern California experiences a Mediterranean climate characterized by mild, rainy winters and hot, dry summers. There can also be dramatic differences in rainfall from year to year. Consequently, the vegetation types in the Southern California area consist of drought-tolerant, woody shrubs and trees and annual, fall/winter-sprouting grasses.

The temperature in Southern California is moderated by the coastal influence of the Pacific Ocean, which creates mild conditions throughout most of the year. The stable atmosphere creates cloudless conditions, producing dry summers and a subtropical climate with many days of sunshine (Ritter 2006). The most distinguishing characteristic of a Mediterranean climate is its seasonal precipitation. In Southern California, precipitation is characterized by brief, intense storms generally between November and March. It is not unusual for a majority of the annual precipitation to fall during a few storms over a close span of time. Rainfall patterns are subject to extreme variations from year to year and longer-term wet and dry cycles.

In the region, the average daily temperature in the summer is approximately 72 degrees Fahrenheit (°F) (measured at 71.6 °F in July between 1961 and 1990 [U.S. Bureau of Labor Statistics et al. 2009] and at 72.0 °F in the summer[2] between 2001 and 2011 [WRCC 2012]). The average daily temperature in the winter is approximately 54 °F (measured at 54.5 °F in January between 1961 and 1990 [U.S. Bureau of Labor Statistics et al. 2009] and at 54.0 °F in the summer between 2001 and 2011 [WRCC 2012]). The region receives an average of 11.8 inches of rain a year (U.S. Bureau of Labor Statistics et al. 2009). The majority of this rain falls in the winter months, which receive an average of 8.61 inches; summer rain is approximately 0.12 inch (WRCC 2012).

1.2.5 Anthropogenic Uses of the Property

According to the U.S. Forest Service (USFS), the area was inhabited by the Kumeyaay, Luiseño, Cahuilla, and Cupeño Native Americans, who would burn the brushlands along the coast and in the mountains. Juan Rodriguez Cabrillo arrived in 1542, but the land did not undergo significant change until the establishment of the California missions by Junipero Serra and a ranching culture. Trabuco Canyon was named in 1769 during a Spanish expedition led by Gaspar de Portolá. In 1846, the area became “Rancho Trabuco” under a Mexican land grant. Then, in the early 1900s, Trabuco Canyon was the site of a failed tin mine. Over this time, the landscape was altered by overgrazing, the invasion of exotic plant species, vegetation clearing, and widespread fire (USFS 2013).

Ferber Ranch

A review of historic aerial photographs of the property shows that, in general, vegetation communities have not significantly altered since 1946. Evidence of grazing is visible at that time. Low density development along Rose Canyon Road is present in aerial photographs as early as 1946, though development along Trabuco Oaks Drive has occurred since 1953.

[2] Seasons are climatological; winter is considered to be December, January, and February and summer is considered to be June, July, and August.

Horse stables are located immediately adjacent to the property; OCTA has been granted access through this private property. The property currently experiences equestrian use and horses and their sign were observed throughout the property during the 2012 biological surveys. The dirt trails on the property are also used by hikers and likely mountain bikers.

An old structure, built between 1946 and 1953, was observed near the center of the property, with an adjacent planting of ornamental gum trees (*Eucalyptus* sp.). A can/bottle scatter (see photograph) was observed near the canyon in the southern portion of the property. In addition, a radio antenna is present adjacent to a dirt road in the northern portion of the property.

O'Neill Oaks

A review of historic aerial photographs of the property shows that, in general, vegetation communities have not significantly altered since 1938. Buildings or otherwise significant structures are not identified in the historic aerials. The first dirt roads on the property were graded between 1938 and 1946. Additional roads in the northern portion of the property were graded by 1953, but these are largely overgrown at present.

While not formally used for cattle grazing at this time, cattle are known to cross the property boundary and were observed during the 2012 biological surveys. Derelict fencing runs across the middle of the property. Existing fencing on and around the property has not been adequate at preventing cattle encroachment.

Hafen

A review of historic aerial photographs of the property shows that, in general, vegetation communities have not been altered significantly since 1946. Buildings or otherwise significant structures are not identified in the historic aerials. Low density residential development is present immediately north and south of the property, with the latest house built within the past two years. An unpaved road on the property was graded some time between 1953 and 1975, though it is now largely overgrown. Evidence of grazing is not present on this property.

Saddle Creek South

A review of historic aerial photographs of the property shows that, in general, vegetation communities have not significantly altered since 1946. Buildings or otherwise significant structures are not identified in the historic aerials. Residential development in the immediate area (e.g., Portola Hills) was absent until the late 1980s and early 1990s.

While not formally used for cattle grazing at this time, the southern portion of the site appears grazed, and evidence of cattle was observed during the 2012 biological surveys. Existing fencing around the property has not been adequate at preventing cattle encroachment. Old ranch buildings and wooden utility poles are present on the property.

2.0 SURVEY METHODOLOGIES

This section describes the methodology used to conduct the literature review; perform general biological surveys and vegetation mapping, focused biological surveys, jurisdictional delineations, and California Rapid Assessment Method (CRAM) analyses; and assess the properties' potential to support special status species. A cumulative list of all plant and wildlife species observed on each property is included as Attachments A-1 and A-2, respectively.

2.1 LITERATURE REVIEW

BonTerra Consulting conducted a literature search to identify special status plants, wildlife, and habitats known to occur in the vicinity of the south county properties. This search included a review of the USGS' Black Star Canyon, Cañada Gobernadora, El Toro, and Santiago Peak quadrangles in the California Native Plant Society's (CNPS') Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2012) and the California Natural Diversity Database (CNDDB) (CDFG 2012a). In addition, a species list was obtained from the USFWS' Information, Planning, and Conservation System (IPaC) for the properties.

2.2 VEGETATION MAPPING AND GENERAL SURVEYS

BonTerra Consulting Biologists David Hughes and Allison Rudalevige conducted general surveys to describe and map the vegetation types on the properties on May 25 and July 17, 2012 (Ferber Ranch); May 30, 2012 (O'Neill Oaks); May 31, 2012 (Hafen); and May 31, 2012 (Saddle Creek South). Nomenclature for vegetation types generally follows *A Manual of California Vegetation* (Sawyer et al. 2009). Areas designated as a "sub-association" of a vegetation type contain a relatively high percentage of a particular species (e.g., chaparral nolina [*Nolina cismontana*] or coast prickly pear [*Opuntia littoralis*]), but the species composition is not formally recognized as an Alliance[3] or Association[4] in Sawyer et al. (2009). Vegetation was mapped in the field on an aerial photograph at a scale of 1 inch equals 200 feet (1″=200′).

The general surveys included an evaluation of the potential of each property to support special-status plant and wildlife species, with special focus on M2 NCCP/HCP Covered Species. Covered Species include intermediate mariposa lily (*Calochortus weedii* var. *intermedius*), southern tarplant (*Centromadia parryi* ssp. *australis* [*Hemizonia p.* ssp. *a.*]), many-stemmed dudleya (*Dudleya multicaulis*), arroyo chub (*Gila orcutti*), coast horned lizard (*Phrynosoma blainvillii*), Belding's orangethroat whiptail (*Aspidoscelis hyperythra* [*Cnemidophorus h.*]), Pacific [western] pond turtle (*Actinemys marmorata* [*Emys m.*]), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bells vireo (*Vireo bellii pusillus*), coastal cactus wren (*Campylorhynchus brunneicapillus sandiegensis*), coastal California gnatcatcher (*Polioptila californica californica*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor* [*Felis c.*]). Suitable habitat and/or observed individuals were documented in field notes and with global positioning system (GPS) units and a CNDDB form was filled out for each occurrence.

During field surveys, natural or physical resources and opportunities were identified (mapped and included in field notes) that "preserve, restore and enhance aquatic, riparian and terrestrial natural communities and ecosystems that support Covered Species" (OCTA 2010). Resources that provide valuable enhancement, restoration, or preservation opportunities (e.g., significant

3 Alliance is "a classification unit of vegetation, containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover" (Sawyer et al. 2009).

4 Association is "a vegetation classification unit defined by a diagnostic species, a characteristic range of species composition, physiognomy, and distinctive habitat conditions" (Sawyer et al. 2009).

stands of non-native species requiring eradication/control; presence of rock outcroppings that provide niche areas for unusual plants, bats, ringtails [*Bassariscus astutus*], or other species; nesting cavities; large mammal burrows; avian rookeries/roosts; and dens) were mapped and documented in field notes. This may include significant stands of invasive plant species based on the California Invasive Plant Council (Cal-IPC) Inventory. Anthropogenic influences/structures on the properties (i.e., paved and unpaved roads, trails, cell towers, water towers, abandoned vehicles and/or "dumped" trash or debris) were also documented. GPS devices were utilized for recording all point locations.

Plant species were identified in the field or collected for subsequent identification using keys in Baldwin et al. (2012), Munz (1974), Abrams (1923, 1944 1951), and Abrams and Ferris (1960). Taxonomy follows Baldwin et al. (2012) and current scientific data (e.g., scientific journals) for scientific and common names. Active searches for reptiles and amphibians included lifting, overturning, and carefully replacing rocks and debris. Birds were identified by visual and auditory recognition. Surveys for mammals were conducted during the day and included searching for and identifying diagnostic sign, including scat, footprints, burrows, and trails. Taxonomy and nomenclature for wildlife generally follows Crother (2008) for amphibians and reptiles, American Ornithologists' Union (AOU 2011) for birds, and Baker et al. (2003) for mammals. All species observed were recorded in field notes and are included in Attachment A.

2.3 FOCUSED BIOLOGICAL SURVEYS

Focused biological surveys were conducted in 2012 for special status plant species, coastal California gnatcatcher, coastal cactus wren, southwestern willow flycatcher, least Bell's vireo, and bats[5]. Surveys were conducted in suitable habitat, based on the Senior Biologists' best professional judgement.

2.3.1 Special Status Plant Species

Special status plant surveys were floristic in nature and were conducted following the Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFG 2009) and the CNPS' Botanical Survey Guidelines (CNPS 2001). Target species included the following Covered Species: intermediate mariposa lily, southern tarplant, and many-stemmed dudleya.

For special status plant surveys, rainfall received in the winter and spring determines the germination of many annual and perennial herb species. Rainfall data was retrieved from the California Data Exchange Center (CDEC) of the California Department of Water Resources (CDWR 2012). The Bell Canyon sensor (CDEC Station BEC), located approximately 7.4 to 9.7 miles from the properties, provides data for 2000 to 2011. The average precipitation for October to July was 12.69 inches. The precipitation between October 2011 and July 2012 was measured at 9.87 inches, which is 78 percent of average.

In years of low or unusual rainfall patterns, monitoring of reference populations is important in order to interpret survey results. Prior to conducting the field surveys, accessible reference populations of target species known from the Orange County area were monitored to ensure that the scheduled surveys were comprehensive and conducted during the appropriate blooming period for these species. Intermediate mariposa lily was observed flowering in Trabuco Canyon on May 29, 2012. Southern tarplant was observed flowering in San Juan Capistrano on May 21, 2012. Many-stemmed dudleya was observed flowering in San Juan Capistrano on April 18, 2012. Rainfall throughout the region was below average for the year.

[5] Surveys for bats were conducted because five bat species were originally proposed for coverage during the baseline surveys; these species have since been removed from the Covered Species list.

Although reference populations and regional rainfall amounts were monitored to ensure the scientific adequacy of these focused surveys, there is always a minimal potential for false negative survey results as species could possibly be present on a site but may not be detectable at the time of the surveys.

The properties were surveyed for special status plant species by several BonTerra Consulting biologists (Table 1). Systematic walking surveys were conducted in all areas of suitable special status plant habitat; inaccessible areas were viewed through binoculars. The habitat preferences of target species (see Table 5, below) were compared to the resources on site (e.g., community associations, soil, slope, shade) to determine which portions of the properties represented suitable habitat. All plant species observed were recorded in field notes. Plant species were identified in the field or collected for later identification. Plants were identified to the taxonomic level necessary to determine whether or not they are a special status species. Plants were identified using taxonomic keys, descriptions, and illustrations in Baldwin et al. (2012). Any voucher specimens collected will be deposited with the herbarium at Rancho Santa Ana Botanic Gardens in Claremont, California. Taxonomy and nomenclature follows the Baldwin et al. (2012), Hickman (1993), and current scientific journals for scientific and common names.

TABLE 1
SUMMARY OF SURVEY DATA FOR
SPECIAL STATUS PLANT SURVEYS

Date of Survey (2012)	Location	Personnel
May 29	Ferber Ranch	R.L. Allen, F.M. Roberts, Jr.
May 30	Ferber Ranch	R.L. Allen, F.M. Roberts, Jr.
May 31	Ferber Ranch	R.L. Allen, F.M. Roberts, Jr.
June 1	Ferber Ranch	R.L. Allen, L.A. Messett
June 5	O'Neill Oaks	R.L. Allen, D.T. Hughes
June 6	Saddle Creek South	R.L. Allen, D.T. Hughes
June 7	Hafen	R.L. Allen, D.T. Hughes
June 19	Ferber Ranch	R.L. Allen, D.E. Bramlet
July 17	Ferber Ranch	R.L. Allen, A.D. Rudalevige, F.D. Maxon, M.J. Bancroft
July 18	Ferber Ranch	R.L. Allen, A.D. Rudalevige, F.D. Maxon, M.A. Johnston
July 24	O'Neill Oaks	R.L. Allen, M.J. Bancroft
July 24	Saddle Creek South	R.L. Allen, M.J. Bancroft
July 25	Hafen	R.L. Allen, F.D. Maxon
Source: BonTerra Consulting 2013b.		

2.3.2 Coastal California Gnatcatcher and Coastal Cactus Wren

Surveys for the coastal California gnatcatcher were conducted in accordance with the guidelines issued by the USFWS for areas participating in a NCCP (USFWS 1997). These guidelines stipulate that three surveys must be conducted in suitable habitats with at least one week between site visits; the surveys can be conducted year-round. All visits must take place during the morning hours, and no more than 100 acres of suitable habitat may be surveyed per visit. Because of the habitat similarities, gnatcatcher and cactus wren surveys were conducted simultaneously.

BonTerra Consulting Senior Biologist Lindsay Messett (USFWS Permit No. PRT-067064-2) conducted all surveys on the Ferber Ranch property and Biologist Michael Couffer (USFWS

Permit No. TE-782703-8) conducted the surveys on the remaining properties. The surveys covered all potentially suitable habitats for the coastal California gnatcatcher and coastal cactus wren. A summary of the focused gnatcatcher/cactus wren survey dates and conditions is shown in Table 2 below.

TABLE 2
SUMMARY OF SURVEY DATA AND CONDITIONS FOR GNATCATCHER/CACTUS WREN SURVEYS

Date	Time	Surveyors	Weather Conditions: Temperature (°F) (Start/End)	Weather Conditions: Wind (mph) (Start/End)	Weather Conditions: Cloud Cover (%) (Start/End)
Ferber Ranch					
May 30, 2012	0600/1215	Messett	61/70	0–3/0–4	100/60
May 31, 2012	0605/1210	Messett	62/75	0–1/0–2	100/Clear
June 1, 2012	0600/1200	Messett	61/70	0–1/0–2	100/30
June 6, 2012	0610/1230	Messett	60/71	0–2/0–3	80/40
June 7, 2012	0600/1215	Messett	60/73	0–1/0–3	Clear/Clear
June 8, 2012	0600/1205	Messett	61/74	0–1/0–6	30/Clear
June 20, 2012	0620/1210	Messett	63/71	0–3/0–4	100/50
June 21, 2012	0610/1225	Messett	63/72	0–2/0–2	10/25
June 25, 2012	0600/1200	Messett	61/74	0–1/0–3	25/35
O'Neill Oaks					
May 31, 2012	0700/1145	Couffer	56/86	0–1/0–3	90/Clear
June 1, 2012	0620/1040	Couffer	57/76	0–1/0–1	100/Clear
June 8, 2012	0615/1155	Couffer	55/76	0–1/0–1	Clear/Clear
June 9, 2012	0635/1112	Couffer	56/72	0–1/0–1	Clear/Clear
June 16, 2012	0615/1200	Couffer	59/75	0–1/0–1	90/Clear
June 17, 2012	0615/1200	Couffer	61/81	0–1/0–2	70/Clear
Hafen					
June 5, 2012	0630/1050	Couffer	60/71	0–1/0–2	30/50
June 14, 2012	0615/1000	Couffer	58/66	0–1/0–1	100/10
June 22, 2012	0600/1045	Couffer	61/70	0–1/0–3	61/70
Saddle Creek South					
June 2, 2012	0645/1145	Couffer	61/74	0–1/0–6	100/Clear
June 12, 2012	0630/1026	Couffer	61/74	0–1/0–1	100/Clear
June 21, 2012	0600/1030	Couffer	60/73	0–1/0–2	90/Clear

°F: degrees Fahrenheit; mph: miles per hour.

Source: BonTerra Consulting 2012a.

Weather conditions met the USFWS survey protocol requirements for optimal gnatcatcher detection. Weather conditions that were too cold (below 55°F), too hot (above 95°F), or too windy (wind speed greater than 15 miles per hour) were avoided. Surveys were conducted by slowly walking through all appropriate habitats while listening and watching for gnatcatcher/cactus wren activity. A combination of recordings of gnatcatcher/cactus wren vocalizations and "pishing" sounds were used in an attempt to elicit responses from any gnatcatchers/cactus wren that might be present. The frequency of vocalization playback and "pishing" varied depending on conditions, such as habitat patch size and topography in each area. All bird species detected during the survey were recorded, including notable observations of special status wildlife species.

2.3.3 Southwestern Willow Flycatcher and Least Bell's Vireo

The USFWS protocol for the least Bell's vireo requires that at least eight surveys be conducted from April 10 to July 31 with a ten-day interval between each site visit (USFWS 2001). The USFWS protocol for the southwestern willow flycatcher requires a total of five surveys, with the first survey conducted between May 15 and May 31; the second and third surveys between June 1 and June 24; and the fourth and fifth surveys between June 25 and July 17 (Sogge et al. 2010). A total of eight surveys are typically required to satisfy the survey requirement of both species; however, only a total of three surveys conducted in the last two survey windows for the southwestern willow flycatcher were required for this project as agreed to previously by the OCTA and USFWS.

BonTerra Consulting Senior Biologist Brian Daniels (USFWS Permit No. TE-821401-3) conducted surveys at the properties and determined that only the Ferber Ranch property supported riparian habitat potentially suitable for occupation by breeding southwestern willow flycatcher and least Bell's vireo. Mr. Daniels performed modified survey protocol of three visits to the Ferber Ranch property on June 6, 21, and July 2, 2012. The survey focused on the willow (*Salix* sp.) dominated riparian habitat, which is the typical breeding habitat of the flycatcher, located on the southwest side of the property, but also included adjacent habitats on the property.

Taped vocalizations of southwestern willow flycatcher were used on all three surveys in an attempt to elicit a response from any potentially territorial southwestern willow flycatcher. If no southwestern willow flycatchers were detected after the initial tape playing, the recording was replayed where appropriate. As the least Bell's vireo survey protocol does not require the playback of least Bell's vireo vocalizations, no taped vocalizations of least Bell's vireo were used during these surveys. All surveys were conducted under optimal weather conditions and during early morning hours when bird activity is at a peak. Numbers were recorded for all bird species detected during the survey, including any observations of special status bird species.

2.3.4 Bats

Both visual and acoustic surveys for bat species (both common and special status) were conducted on the south county properties. During the day, visual surveys were conducted to locate potential roost sites and foraging areas. At dusk and after dark, bat activity was monitored both visually (with spotlights after dark) and acoustically with ultrasonic bat detectors.

Site Reconnaissance

Dr. Ed West and BonTerra Consulting Biologist Ann Johnston assessed the ecological status and condition of the properties on June 8, 2012. All passable roads were driven, and accessible trails suitable for survey transects were hiked. The general condition and use history of the properties was documented, and potential areas for bat roosts and foraging activity were identified.

Bat Monitoring

Acoustic monitoring was conducted on the properties between June 16 and July 7, 2012. Mobile surveys were conducted along all passable 4x4 roads on each property. On-foot hiking surveys were conducted along overgrown roads/trails that provided transects through representative habitats on each property. During the mobile surveys, two vertically mounted ultrasonic detector microphones were secured to the roof of a 4x4 Jeep Wrangler. The detectors were connected individually with cabling to an EM3 EchoMeter full spectrum bat detector (SMX-US microphone, Wildlife Acoustics, Inc.) and an Anabat SD2 CF bat detector (Standard Anabat microphone, Titley Scientific, Inc.) mounted on a platform in the vehicle. The EM3 detector was programed for .wav file format recording with a 256K sample rate. A GPS unit was connected to the EM3 unit to provide GPS locations of all recordings. All ultrasonic detections were digitally stamped with the date, time, and location of the recordings. The SD2 detector was programmed for active monitoring. During all hiking surveys, the bat detectors were hand held at above head height level with the microphones pointed vertically to optimize bat call detection.

During the mobile surveys, the roads were driven slowly and all bat detections were visually and aurally monitored by watching the EM3 real-time spectrogram and listening to the speaker output on both the EM3 and the SD2. When repeated detections occurred, the vehicle was often stopped and the site was monitored for 10 to 20 minutes. These sites were also often stopped at during subsequent surveys along the same route. Similar point monitoring procedures were implemented during the hiking surveys. Additionally, flying bats were visually searched for at dusk during each survey.

Bat Call Acoustic Analysis

Following each survey, the digital recordings of all the bat calls were downloaded to a computer and analyzed to identify which species were present. The EM3 recordings were analyzed using SonoBat 3.1 (June 2012 release, SonoBat™). All recordings obtained using the SMX-US microphone were acoustically adjusted to SonoBat standards using the SMX-UT conversion tool in the SM2 Batch Attributer program. This option was turned off for analysis of all recordings obtained using the internal SMX-UT microphone in the EM3 unit. Following batch scrubbing of extraneous ultrasonic recordings (i.e., removal of all recordings of leaf rustling noise, wind, etc.), the bat calls were automatically identified using the SonoBat SonoBatch feature. Call files (.wav format) were tagged with species codes whenever the call quality met the identification threshold standards of the SonoBat program. Call files were tagged with species codes whenever the call quality met the identification threshold standards of the SonoBat program.

Some call sequences recorded were not of sufficient quality (e.g., less than 10 clean calls per sequence, reduced amplitude, masked in noise) to allow for confident species determinations. However, many could be, and were, categorized into species groups by their characteristic minimum frequency. For example, species with minimum call frequencies (f_m) above 35 kilohertz (kHz) were grouped into a high frequency species category (HFSP), species between 25 and 35 kHz into the medium frequency category (MFSP), and species below 25 kHz into the low frequency species (LFSP) category.

Call files of lower quality were either tagged with a list of probable species or a general category identifying the general frequency range of the calls (e.g., High vs. Low). Calls with lower quality were not identified to species, but were tagged as being bat calls.

After the initial tagging and categorization of all the calls, they were each reviewed again visually and using SonoBat 3 to verify (or not) the species identifications. All calls without species ID code tags were visually examined to determine if the calls were embedded in noise that reduced their quality but were recognizable and could be digitally extracted and re-evaluated. These call files were then processed using Raven™ (Cornell Lab of Ornithology) to remove the extraneous noise. The cleaned-up files were then re-run through SonoBat 3.1 to obtain species identifications wherever possible.

All SonoBat and GPS files for calls for which species/species group identifications could be obtained were then converted to Google Earth™ KML files and mapped using Myotisoft™ Transect 1.0.5b (Beta release July, 2012).

All bat calls recorded on the Anabat SD2 units were downloaded to the computer using CFRead^{TM} (Titley Scientific) and sonograms were produced using AnalookW^{TM} (Titley Scientific). Each sonogram was then visually compared to sonograms of known species in a digital library to determine species/species group identities. Unique calls were identified and matched to the date-time sequencing of the SonoBat calls and wav. file tags were generated for the Myotisoft KML file creation and Google Earth mapping. Simultaneous SonoBat/Anabat recordings were mapped as single records.

2.4 REGULATORY SURVEYS

2.4.1 Jurisdictional Delineation

A jurisdictional delineation was conducted by BonTerra Consulting to describe and map the extent of resources under the jurisdiction of the U.S. Army Corps of Engineers (USACE), the Regional Water Quality Control Board (RWQCB), and the CDFW. Survey details are provided in Table 3. The delineation followed guidelines presented in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008). This regional supplement is designed for use with the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Both the 1987 Wetlands Manual and the Arid West Supplement to the manual provide technical methods and guidelines for determining the presence of “Waters of the U.S.” and wetland resources. A three-parameter approach—which requires evidence of wetland hydrology, hydrophytic vegetation, and hydric soils—was used to identify wetlands on the Project site and adjacent off-site areas. In order to be considered a wetland, an area must exhibit at least minimal hydric characteristics within the three parameters. However, problem areas may periodically or permanently lack certain indicators due to seasonal or annual variability of the nature of the soils or plant species on a project site. Atypical wetlands lack certain indicators due to recent human activities or natural events. Guidance for determining the presence of wetlands in these situations is presented in the Regional Supplement. Non-wetland “Waters of the U.S.” are delineated based on the limits of the Ordinary High Water Mark (OHWM), which can be determined by a number of factors including erosion, the deposition of vegetation or debris, and changes in vegetation.

TABLE 3
SUMMARY OF JURISDICTIONAL DELINEATION SURVEYS

Property	Initial Survey Date(s)	Field Verification Date(s)	Field Personnel
Ferber Ranch	July 2 and 3, 2012 February 26, 2013	November 12, 2013	G.A. Medeiros M.J. Bancroft
O’Neill Oaks	July 2 and 18, 2012	December 11, 2013	D.T. Hughes J.C. Aguayo
Hafen	July 6, 2012	December 12, 2013	D.T. Hughes F.D. Maxon
Saddle Creek South	July 3, 2012	December 11, 2013	G.A. Medeiros M.J. Bancroft
Source: BonTerra Consulting 2013a.			

It should be noted that the RWQCB shares the USACE jurisdiction unless isolated conditions are present. If isolated waters conditions are present, the RWQCB takes jurisdiction using the USACE’s definition of the OHWM and/or the three-parameter wetlands methodology pursuant to the 1987 Wetlands Manual. The CDFW’s jurisdiction is defined as the top of the bank of the stream, channel, or basin or the outer limit of riparian vegetation located within or immediately adjacent to the river, stream, creek, pond, or lake.

Field verification meetings with the USACE were held to review the existing jurisdictional resources and to verify the completeness of the jurisdictional delineation mapping on each of the properties. The dates of these meetings are provided in Table 3. The extent of jurisdictional features within this report has been updated to reflect the outcome of the USACE review.

2.4.2 California Rapid Assessment Method Analysis

A CRAM analysis was conducted by Mr. Hughes concurrent with the jurisdictional delineation surveys. Surveys were conducted in accordance with the CRAM for Wetlands User's Manual (Collins et al. 2008). The CRAM analysis for Riverine Wetlands[6] was used to establish and score 100-meter-long Assessment Areas (AAs) in the principal streambed features on the properties. The AA is the fundamental unit of evaluation for CRAM analysis. The AA width was defined as the outer canopy of vegetation that overhung the streambed.

Information recorded for the AA includes (1) the percentage of the AA that was surrounded by a buffer and the width of the buffer; (2) the water source for the AA; (3) the cross-sectional measurements to determine hydrologic connectivity to adjacent areas; (4) the number of plant layers within the AA; and (5) the number of co-dominant species and invasive species. Qualitative factors that were assessed include (1) the condition of the buffer surrounding the AA; (2) the channel stability; (3) the complexity of the channel's bank with regards to the number of surfaces or features that provide habitat for species and topography; and (4) the horizontal and vertical structure of the plant community. Individual scores are obtained by "choosing the best-fit set of narrative descriptions of observable conditions ranging from the worst commonly observed (D) to the best achievable for the wetland (A)" (Collins et al. 2008). Each description has a fixed numerical value. This information was used to assess four primary attributes (i.e., Buffer and Landscape Context, Hydrology, Physical Structure, and Biotic Structure). The attribute score is calculated by first adding the values of the chosen narrative descriptions for the attribute's component metrics, and then converting the sum into a percentage of the maximum possible score for the attribute. The overall AA score is the average of the final attribute scores.

AA scores range from 25 to 100. The maximum AA score possible represents how a wetland is doing relative to the best achievable conditions for that wetland type in the state. It is assumed that the same scores for different wetlands of the same type represent the same overall condition and functional capacity. Therefore, these scores may be used to track the progress of restoration efforts over time; to compare impacted sites to their in-kind mitigation sites; or to compare an individual wetland to the status and trends in ambient condition of its wetland type.

[6] CRAM uses the definition of a wetland provided by the USFWS National Wetland Inventory (NWI): "Wetlands are lands transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is not a soil and is saturated with water or covered by shallow water at some time during the growing season of each year" (Cowardin et al. 1979).

3.0 EXISTING BIOLOGICAL RESOURCES

This section describes the biological resources that occur or potentially occur on the four south county properties. Vegetation types, wildlife populations and movement patterns, and special status biological resources are discussed below.

3.1 VEGETATION TYPES AND OTHER AREAS

3.1.1 Ferber Ranch

Twenty-two vegetation types and other areas occur on the Ferber Ranch property, as shown in Table 4 and Exhibit 6. These vegetation types were cross-walked to the general vegetation types used in the NCCP/HCP Plan.

TABLE 4
VEGETATION TYPES AND OTHER AREAS ON THE FERBER RANCH PROPERTY

General Vegetation Types	Detailed Vegetation Types or Other Areas	Existing on Property (Acres)
Chaparral		
	Chamise Chaparral	11.90
	Chamise – Laurel Sumac – Lemonade Berry Chaparral with California Sagebrush Scrub	13.36
	Scrub Oak Chaparral	44.66
	Laurel Sumac – Lemonade Berry Chaparral with California Sagebrush – California Buckwheat Scrub	32.94
	Chaparral Subtotal	**102.86**
Scrub		
	California Sagebrush Scrub	149.57
	California Sagebrush Scrub/Needle Grass Grassland	0.28
	Coast Prickly Pear Scrub	6.50
	Scale Broom Scrub	0.30
	Scrub Subtotal	**156.65**
Grassland		
	Needle Grass Grassland	17.15
	Needle Grass Grassland/Semi-Natural Herbaceous Stands	3.94
	Giant Wild Rye Grassland	0.38
	Semi-Natural Herbaceous Stands[a]	7.37
	Grassland Subtotal	**28.84**
Riparian		
	White Alder Groves	0.45
	Arroyo Willow Thickets	1.87
	Mulefat Thickets	0.71
	Riparian Subtotal	**3.03**

TABLE 4
VEGETATION TYPES AND OTHER AREAS ON
THE FERBER RANCH PROPERTY

General Vegetation Types	Detailed Vegetation Types or Other Areas	Existing on Property (Acres)
Woodland		
	Coast Live Oak Woodland	**93.23**
Agriculture		
	Orchard	**1.51**
Barren		
	Cliff/Rock	**2.16**
Developed/Non-Native		
	Developed	0.61
	Disturbed	7.79
	Eucalyptus Grove	0.53
	Semi-Natural Woodland Stand	1.42
	Developed/Non-native Subtotal	**10.35**
	Total Acreage	***398.63***

[a] Portions of the semi-natural herbaceous stands (indicated by hatching on Exhibit 6) would be considered a "Developed/Non-native" general vegetation type.

Chaparral

Chamise Chaparral

A total of 11.90 acres of chamise chaparral occurs on slopes throughout the Ferber Ranch property. This vegetation type is dominated by chamise (*Adenostoma fasciculatum*). Subdominant species include California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), black sage (*Salvia mellifera*), and chaparral yucca (*Hesperoyucca whipplei* [*Yucca w*.]).

Chamise – Laurel Sumac – Lemonade Berry Chaparral with California Sagebrush Scrub

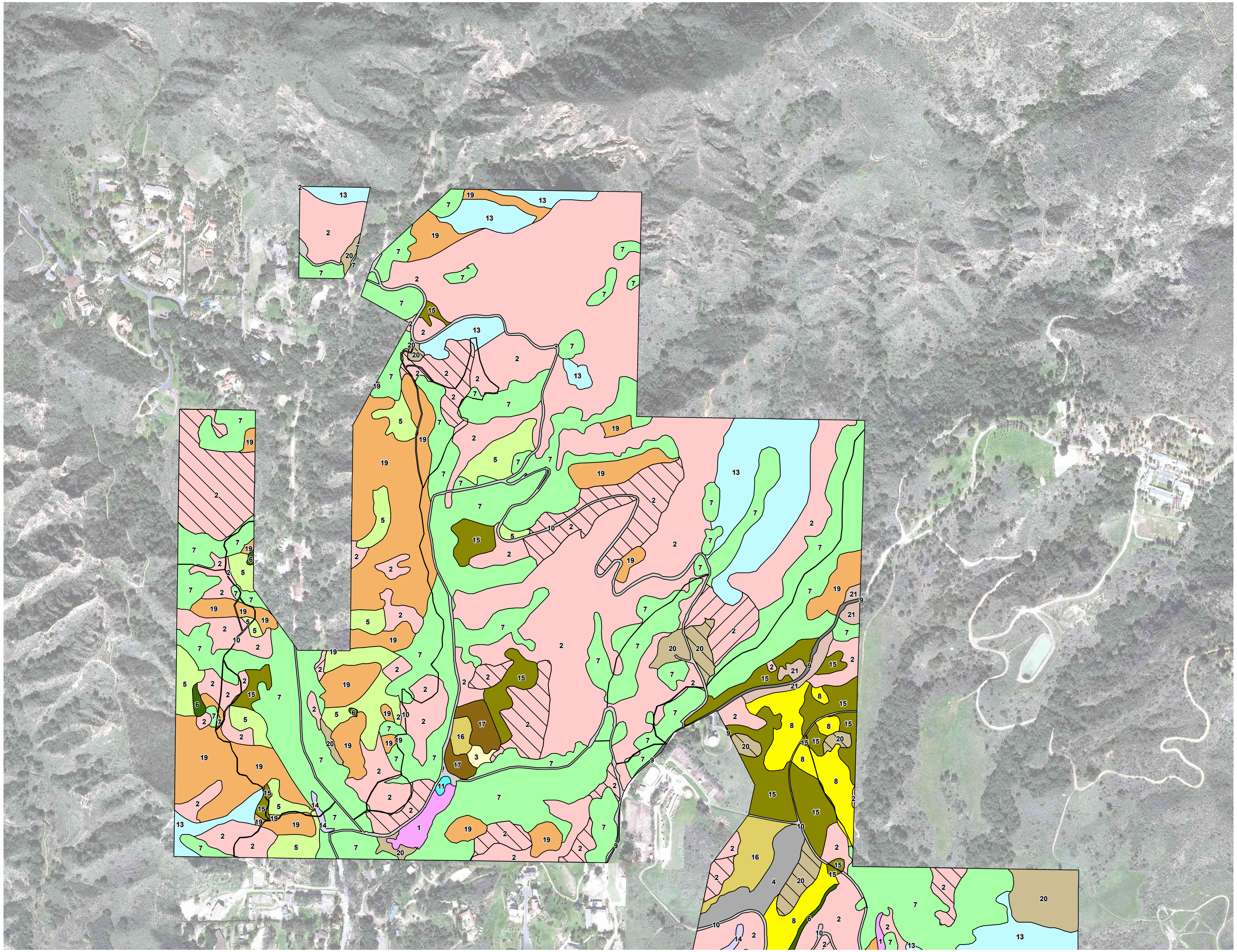
A total of 13.36 acres of chamise – laurel sumac – lemonade berry chaparral with California sagebrush scrub occurs in two large patches in the southern half of the Ferber Ranch property. It represents an ecotone between chaparral and scrub habitats. As such, this vegetation type is co-dominated with a variety of species such as chamise, laurel sumac (*Malosma laurina*), lemonade berry (*Rhus integrifolia*), and California sagebrush.

Scrub Oak Chaparral

A total of 44.66 acres of scrub oak chaparral occurs on slopes throughout the Ferber Ranch property. This vegetation type is dominated by dense scrub oak (*Quercus berberidifolia*); chamise is a subdominant species.

Laurel Sumac – Lemonade Berry Chaparral with California Sagebrush – California Buckwheat Scrub

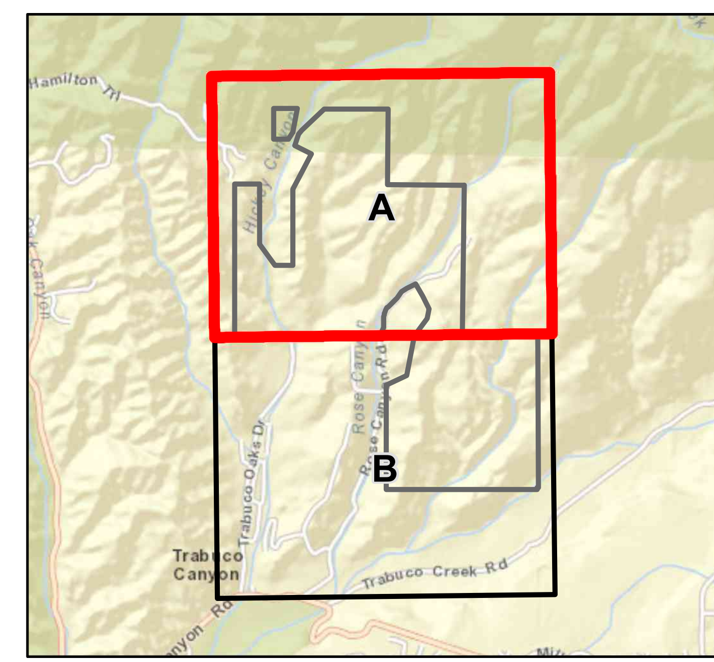
A total of 32.94 acres of laurel sumac – lemonade berry chaparral with California sagebrush – California buckwheat scrub occurs on the Ferber Ranch property. This vegetation type occurs on slopes throughout the property. It represents an ecotone between chaparral and scrub



1 - Arroyo Willow Thickets
2 - California Sagebrush Scrub
3 - California Sagebrush Scrub/Needle Grass Grassland
4 - Chamise - Laurel Sumac - Lemonade berry Chaparral with California Sagebrush Scrub
5 - Chamise Chaparral
6 - Cliff/Rock
7 - Coast Live Oak Woodland
8 - Coast Prickly Pear Scrub
9 - Developed
10 - Disturbed *
11 - Eucalyptus Grove
12 - Giant Wild Rye Grassland
13 - Laurel Sumac - Lemonade berry Chaparral with Califorina Sagebrush - California Buckwheat Scrub
14 - Mulefat Thickets
15 - Needle Grass Grassland
16 - Needle Grass Grassland/Semi-Natural Herbaceous Stands
17 - Orchard
18 - Scale Broom Scrub
19 - Scrub Oak Chaparral
20 - Semi-Natural Herbaceous Stands
21 - Semi-Natural Woodland Stand
22 - White Alder Groves

* Includes bare ground, dirt roads, and closed/permitted trails.

Note: Hatching indicates that the vegetation type has a subassociation.



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Vegetation Types

Measure M2 Acquisition Properties/Ferber Ranch Property

Exhibit 6A

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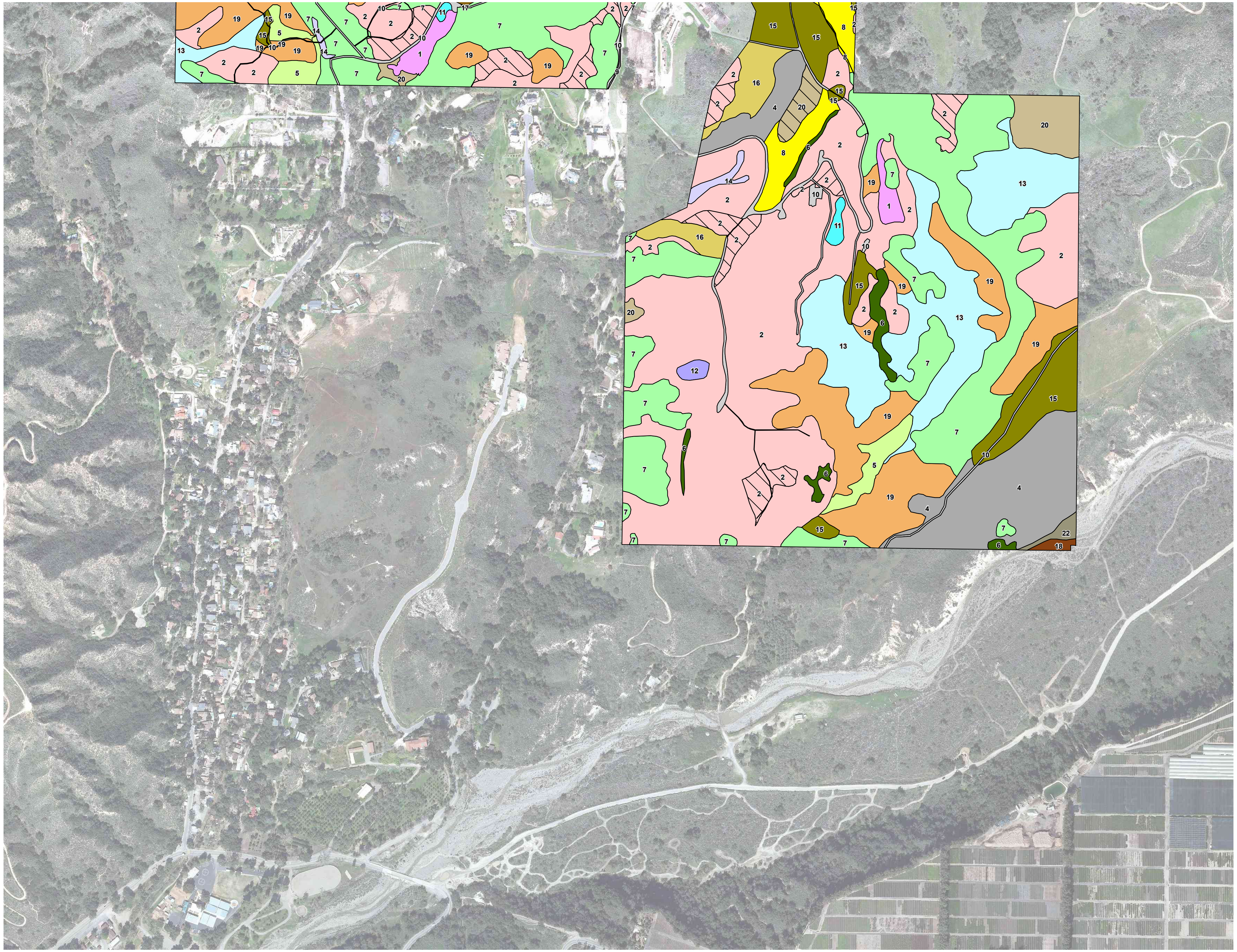
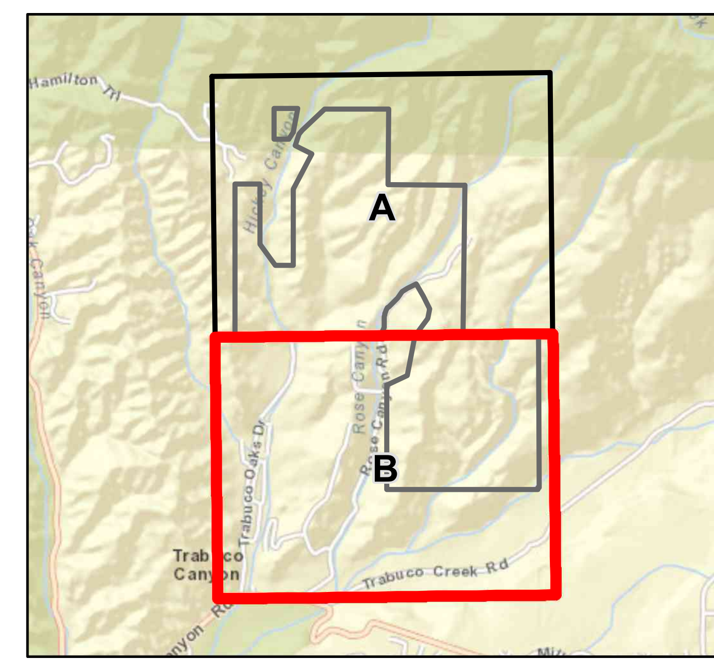


1 - Arroyo Willow Thickets
2 - California Sagebrush Scrub
3 - California Sagebrush Scrub/Needle Grass Grassland
4 - Chamise - Laurel Sumac - Lemonade berry Chaparral with California Sagebrush Scrub
5 - Chamise Chaparral
6 - Cliff/Rock
7 - Coast Live Oak Woodland
8 - Coast Prickly Pear Scrub
9 - Developed
10 - Disturbed *
11 - Eucalyptus Grove
12 - Giant Wild Rye Grassland
13 - Laurel Sumac - Lemonade berry Chaparral with California Sagebrush - California Buckwheat Scrub
14 - Mulefat Thickets
15 - Needle Grass Grassland
16 - Needle Grass Grassland/Semi-Natural Herbaceous Stands
17 - Orchard
18 - Scale Broom Scrub
19 - Scrub Oak Chaparral
20 - Semi-Natural Herbaceous Stands
21 - Semi-Natural Woodland Stand
22 - White Alder Groves

* Includes bare ground, dirt roads, and closed/permitted trails.

Note: Hatching indicates that the vegetation type has a subassociation.



Vegetation Types

Exhibit 6B

Measure M2 Acquisition Properties/Ferber Ranch Property

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habitats. It is similar to the chamise – laurel sumac – lemonade berry chaparral with California sagebrush scrub described above; however, it has California buckwheat as a co-dominant species and does not have a high percentage of chamise.

Scrub

California Sagebrush Scrub

A total of 149.57 acres of California sagebrush scrub occurs on slopes throughout the Ferber Ranch property. Most areas of this vegetation type are dominated by California sagebrush with California buckwheat, black sage, and less than 10 percent coast prickly-pear. A sub-association of this vegetation type (specifically those indicated by hatching within California sagebrush scrub on Exhibit 6) contains a moderate percentage (i.e., between 20 and 50 percent) of coast prickly-pear. Scattered patches of cardoon (*Cynara cardunculus*) were observed within this vegetation type, primarily in the southern portion of the property.

California Sagebrush Scrub/Needle Grass Grassland

A total of 0.28 acre of California sagebrush scrub/needle grass grassland occurs in a small patch near the center of the Ferber Ranch property. This vegetation type contains purple needlegrass (*Stipa pulchra* [*Nassella p*.]) and foothill needlegrass (*Stipa lepida* [*Nassella l*.]) intermixed with California sagebrush.

Coast Prickly Pear Scrub

A total of 6.50 acres of coast prickly pear scrub occurs near the center of the Ferber Ranch property. It is dominated by dense stands of coast prickly-pear (i.e., greater than 50 percent). Scattered California sagebrush, California buckwheat, and black sage are also present in this vegetation type.

Scale Broom Scrub

A total of 0.30 acre of scale broom scrub occurs on the Ferber Ranch property. This vegetation type is located adjacent to the low flow channel of Trabuco Creek at the southeastern corner of the property. It is characterized by the presence of scattered scale-broom (*Lepidospartum squamatum*); southern woolly lotus (*Acmispon heermannii* var. *heermanii*), California brickellbush (*Brickellia californica*), California buckwheat, and everlasting (*Pseudognaphalium canescens* [*Gnaphalium c*.]) are also present. This portion of the active floodplain is relatively open with loose sand and cobble.

Grassland

Needle Grass Grassland

A total of 17.15 acres of needle grass grassland occurs on gentle slopes throughout the Ferber Ranch property. This vegetation type is characterized by having at least 10 percent relative cover of purple needlegrass and foothill needlegrass which is intermixed with wild oat (*Avena* sp.). Blue-eyed grass (*Sisyrinchium bellum*) was prevalent in some patches.

Needle Grass Grassland/Semi-Natural Herbaceous Stands

A total of 3.94 acres of needle grass grassland/semi-natural herbaceous stands occurs on gentle slopes throughout the Ferber Ranch property. This vegetation type is similar to the needle grass grassland described above, but is heavily disturbed by the non-native cardoon.

This vegetation type would be an appropriate candidate for habitat restoration to native grassland, scrub, or woodland communities, depending on the slope, aspect, and soils present. Given that cardoon is prevalent in this area, it should be prioritized for weed treatment.

Giant Wild Rye Grassland

A total of 0.38 acre of giant wild rye grassland occurs on the Ferber Ranch property. This vegetation type is located in a small patch in the southwestern corner of the property. It is dominated by giant wild rye (*Elymus condensatus* [*Leymus c*.]).

Semi-Natural Herbaceous Stands

A total of 7.37 acres of semi-natural herbaceous stands occurs on the Ferber Ranch property. This vegetation type occurs on slopes and plateaus throughout the property. Some of these areas are dominated by non-native grasses such as ripgut grass (*Bromus diandrus*) and smilo grass (*Stipa miliacea* [*Piptatherum miliaceum*]) with scattered black mustard (*Brassica nigra*) and western ragweed (*Ambrosia psilostachya*). Other areas (specifically those indicated by hatching within semi-natural herbaceous stands on Exhibit 6) are dominated by cardoon.

The semi-natural herbaceous stands dominated by cardoon would be an appropriate candidate for habitat restoration to native grassland, scrub, or woodland communities, depending on the slope, aspect, and soils present. Given that cardoon is prevalent in this area, it should be prioritized for weed treatment.

Riparian

White Alder Groves

A total of 0.45 acre of white alder groves occur on the Ferber Ranch property. This vegetation type is located within the floodplain of Trabuco Creek. It is dominated by white alder (*Alnus rhombifolia*) trees. Sub-dominant species include arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), Goodding’s black willow (*Salix gooddingii*), western sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii* ssp. *fremontii*), and mule fat (*Baccharis salicifolia*). This area is characteristic of a dynamic riparian community where flood waters remove vegetation and deposit sediment; as such, the trees are immature and approximately ten feet tall.

Arroyo Willow Thickets

A total of 1.87 acres of arroyo willow thickets occurs in drainages on the Ferber Ranch property. This vegetation type is dominated by arroyo willow. Saltcedar (*Tamarix ramosissima*) is present in the understory, and patches of cattail (*Typha* sp.) occur along the edge.

The northernmost arroyo willow thicket contains a small amount of saltcedar. This area would be an appropriate candidate for habitat restoration. Given that saltcedar is present in this area, it should be prioritized for weed treatment.

Mulefat Thickets

A total of 0.71 acre of mulefat thickets occurs on the Ferber Ranch property. This vegetation type occurs in two small patches: one in a drainage adjacent to Trabuco Oaks Road and another in an upland area near the western edge of the property. It is dominated by mule fat. Scattered patches of mule fat vegetation in other areas were too small to be mapped separately.

Woodland

<u>Coast Live Oak Woodland</u>

A total of 93.23 acres of coast live oak woodland occurs on slopes and drainage bottoms throughout the Ferber Ranch property. This vegetation type is dominated by mature coast live oak (*Quercus agrifolia*). The understory in upland areas contains shrubs such as California sagebrush; the understory in riparian areas contains mugwort (*Artemisia douglasiana*), western poison oak (*Toxicodendron diversilobum*), hollyleaf redberry (*Rhamnus ilicifolia*), and tree tobacco (*Nicotiana glauca*).

Agriculture

<u>Orchard</u>

A total of 1.51 acres of orchard occurs along a trail near the center of the Ferber Ranch property. It consists of large olive (*Olea europaea*) trees that had been planted on the property in the past. It is not currently being maintained as an active orchard.

Barren

<u>Cliff/Rock</u>

A total of 2.16 acres of cliff/rock occurs on the Ferber Ranch property. This represents areas of exposed rock face throughout the site. The largest area, near the southern end of the site, is a deeply incised canyon with near-vertical walls that are eroding. This area is primarily unvegetated; scattered vegetation such as deerweed and California sagebrush has sprouted in eroded soil along the cliff faces and near the bottom of the cliff.

Developed/Non-Native

<u>Developed</u>

A total of 0.61 acre of developed areas occurs on the Ferber Ranch property. This mapping unit consists of the paved Rose Canyon Road. No vegetation is present in this area.

<u>Disturbed</u>

A total of 7.79 acres of disturbed areas occurs on the Ferber Ranch property. These areas consist of bare ground and contain little to no vegetation. Dirt roads, permitted trails, and closed trails are also included in this mapping unit.

<u>Eucalyptus Grove</u>

A total of 0.53 acre of eucalyptus grove occurs near the center of the Ferber Ranch property. It consists of a small stand of mature gum trees (*Eucalyptus* sp.) surrounded by California sagebrush scrub.

<u>Semi-Natural Woodland Stand</u>

A total of 1.42 acres of semi-natural woodland stands occurs on the Ferber Ranch property. This vegetation type is located adjacent to Rose Canyon Road. It consists of ornamental plantings of Aleppo pine (*Pinus halepensis*); the understory contains needlegrass (*Stipa* sp. [*Nassella* sp.]). The understory and surrounding grassland is periodically mowed.

O'Neill Oaks

Eight vegetation types and other areas occur on the O'Neill Oaks property, as shown in Table 5 and Exhibit 7.

TABLE 5
VEGETATION TYPES AND OTHER AREAS ON THE O'NEILL OAKS PROPERTY

General Vegetation Types	Detailed Vegetation Types or Other Areas	Existing on Property (Acres)
Chaparral		
	Chamise – Laurel Sumac – Lemonade Berry Chaparral with California Sagebrush – California Buckwheat Scrub	11.63
	Scrub Oak – Toyon Chaparral Association	44.06
	Laurel Sumac Scrub – Chamise Chaparral Association	5.80
	Chaparral Subtotal	**61.49**
Scrub		
	California Sagebrush Scrub	21.43
	California Sagebrush – California Buckwheat Scrub	17.73
	Scrub Subtotal	**39.16**
Woodland		
	Coast Live Oak Woodland	**13.12**
Barren		
	Cliff/Rock	**0.12**
Developed/Non-native		
	Disturbed/Ruderal	**3.65**
	Total Acreage	***117.54***

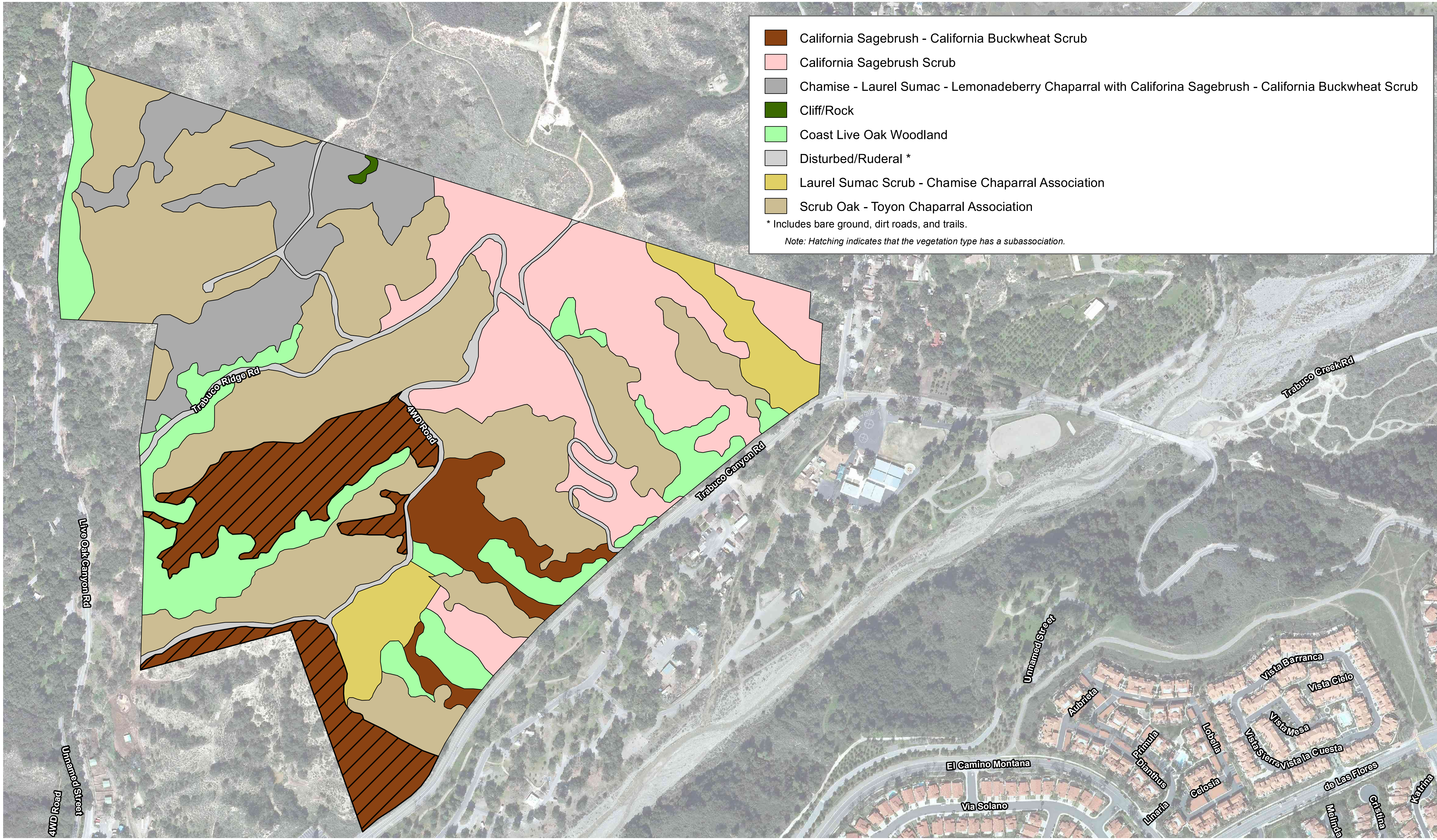
Chaparral

Chamise – Laurel Sumac – Lemonade Berry Chaparral with California Sagebrush – California Buckwheat Scrub

A total of 11.63 acres of chamise – laurel sumac – lemonade berry chaparral with California sagebrush – California buckwheat scrub occurs on the O'Neill Oaks property. This vegetation type is located on southeast-facing slopes in the northwestern corner of the property. It represents an ecotone between chaparral and scrub habitats. As such, it is co-dominated by a variety of species such as chamise, laurel sumac, lemonade berry, California sagebrush, California buckwheat, and deerweed.

Scrub Oak – Toyon Chaparral Association

A total of 44.06 acres of scrub oak – toyon chaparral association occurs on north-facing slopes throughout the O'Neill Oaks property. This vegetation type is co-dominated by scrub oak and toyon (*Heteromeles arbutifolia*). Subdominant species include laurel sumac, chaparral nolina, and chamise. Sawyer et al. (2009) recognize this vegetation type as an association.



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Vegetation Types

Exhibit 7

Measure M2 Acquisition Properties/O'Neill Oaks Property

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<u>Laurel Sumac Scrub – Chamise Chaparral Association</u>

A total of 5.80 acres of laurel sumac scrub – chamise chaparral association occurs on 2 slopes on the O'Neill Oaks property. This vegetation type is co-dominated by laurel sumac and chamise. Scrub oak and scrub species such as California sagebrush also occur in this vegetation type. Sawyer et al. (2009) recognize chamise chaparral – laurel sumac scrub as an association.

Scrub

<u>California Sagebrush Scrub</u>

A total of 21.43 acres of California sagebrush scrub occurs on the O'Neill Oaks property. This vegetation type is located on primarily southwest-facing slopes in the eastern half of the property. It is dominated by California sagebrush; coast prickly-pear is a sub-dominant species.

<u>California Sagebrush – California Buckwheat Scrub</u>

A total of 17.73 acres of California sagebrush – California buckwheat scrub occurs on the O'Neill Oaks property. This vegetation type is located on southerly-facing slopes in the eastern half of the property. It is co-dominated by California sagebrush, California buckwheat, and deerweed. Subdominant species include coast prickly-pear, golden-yarrow (*Eriophyllum confertiflorum*), and lemonade berry. A subassociation of this vegetation type (indicated by hatching on Exhibit 7) contains a high density of chaparral nolina, a special status plant species (i.e., it has a California Rare Plant Rank [CRPR] of 1B.2).

Woodland

<u>Coast Live Oak Woodland</u>

A total of 13.12 acres of coast live oak woodland occurs in drainage bottoms throughout the O'Neill Oaks property. This vegetation type is dominated by mature coast live oaks.

Barren

<u>Cliff/Rock</u>

A total of 0.12 acre of cliff/rock occurs on the O'Neill Oaks property. This exposed rock face is located along the northern boundary of the property within the chaparral – scrub ecotone described above.

Developed/Non-native

<u>Disturbed/Ruderal</u>

A total of 3.65 acres of disturbed/ruderal vegetation occurs on the O'Neill Oaks property. Disturbed/ruderal areas consist of the dirt access roads and trails throughout the property. The majority of these roads and trails are primarily bare ground, but some areas are somewhat overgrown by non-native ruderal species such as black mustard, goldentop (*Lamarckia aurea*), and Bermuda grass (*Cynodon dactylon*). It should be noted that the northwest-southeast running trail in the northwest portion of the property is entirely overgrown with native shrubs and herbs (e.g., California sagebrush, western ragweed, and sapphire woollystar [*Eriastrum sapphirinum*]); these species are also establishing on the northwesternmost trail. Inclusion of these areas entirely overgrown with native vegetation in the disturbed/ruderal vegetation type reflects the graded nature of the trail as opposed to its current vegetation cover.

Hafen

Five vegetation types and other areas occur on the Hafen property, as shown in Table 6 and Exhibit 8.

TABLE 6
VEGETATION TYPES AND OTHER AREAS ON THE HAFEN PROPERTY

General Vegetation Types	Detailed Vegetation Types or Other Areas	Existing on Property (Acres)
Chaparral		
	Scrub Oak Chaparral	**30.56**
Scrub		
	California Sagebrush – California Buckwheat Scrub	**11.61**
Riparian		
	Coast Live Oak – California Sycamore Woodland Association	**2.35**
Woodland		
	Coast Live Oak Woodland	**3.61**
Developed/Non-native		
	Disturbed	**0.12**
	Total Acreage	***48.25***

Chaparral

Scrub Oak Chaparral

A total of 30.56 acres of scrub oak chaparral occurs on north-facing slopes throughout the Hafen property. This vegetation type is dominated by dense scrub oak. Toyon and chamise are subdominant species.

Scrub

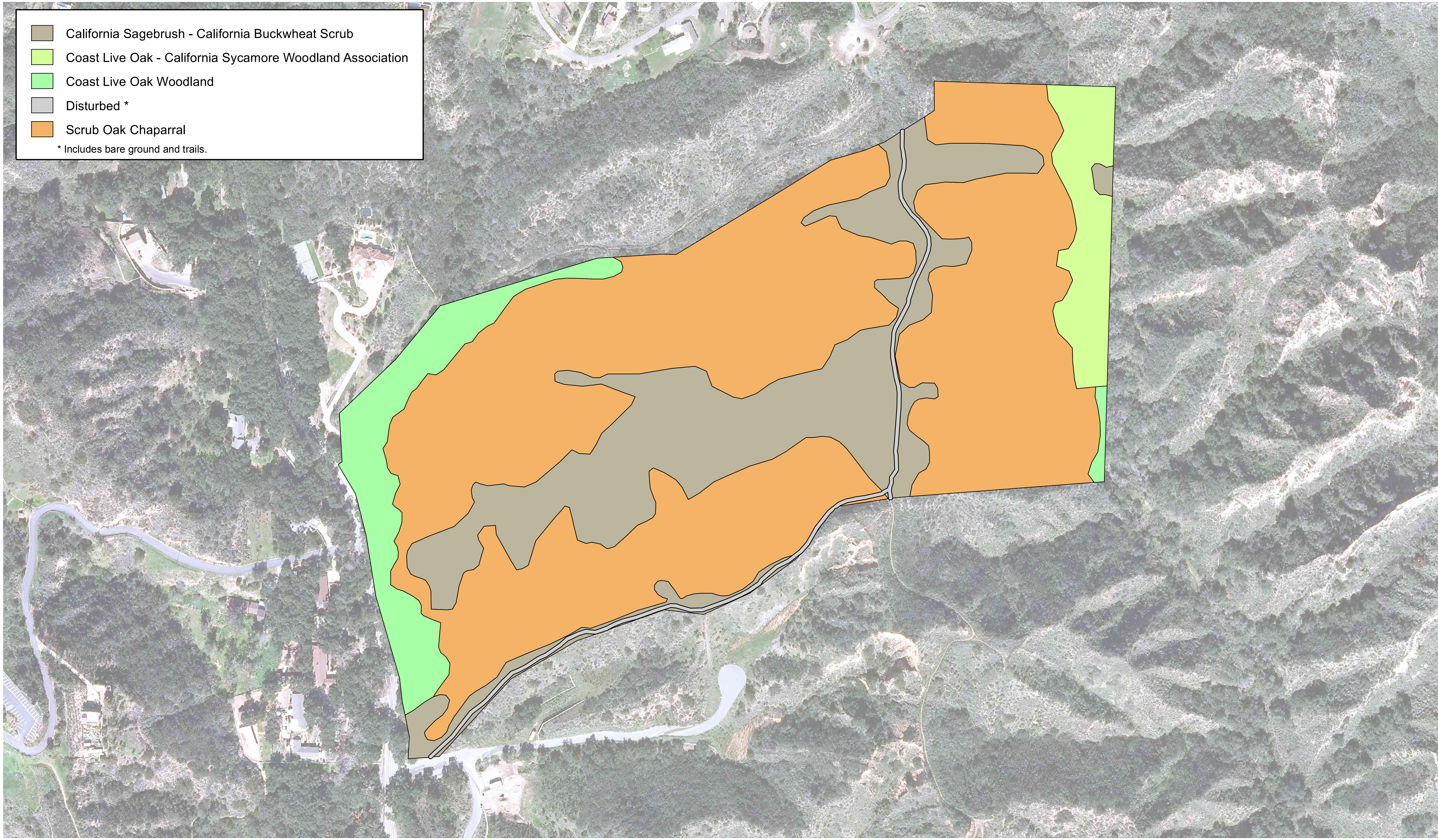
California Sagebrush – California Buckwheat Scrub

A total of 11.61 acres of California sagebrush – California buckwheat scrub occurs on the Hafen property. This vegetation type is located on the south-facing slopes of the property and along the ridgeline that runs north-south across the property. It is co-dominated by a variety of scrub species such as California sagebrush, California buckwheat, black sage, and deerweed. Chaparral nolina, a special status plant species (i.e., with a CRPR of 1B.2), is also prevalent in this vegetation type.

Riparian

Coast Live Oak – California Sycamore Woodland Association

A total of 2.35 acres of coast live oak – California sycamore woodland association occurs on the Hafen property. This vegetation type occurs along the drainage bottom at the eastern edge of the property. It is dominated by mature coast live oak and western sycamore trees. Common



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Vegetation Types

Exhibit 8

Measure M2 Acquisition Properties/Hafen Property

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understory species include mugwort and mule fat. Sawyer et al. (2009) recognize California sycamore – coast live oak woodland as an association.

Woodland

Coast Live Oak Woodland

A total of 3.61 acres of coast live oak woodland occurs on the Hafen property. This vegetation type occurs in drainage bottoms along the western edge of the property adjacent to Live Oak Canyon Road and at the northwest and southeast corners of the property. It is dominated by mature coast live oaks. The understory includes smilo grass, western poison oak, and Italian thistle (*Carduus pycnocephalus* ssp. *pycnocephalus*).

Developed/Non-Native

Disturbed

A total of 0.12 acre of disturbed areas occurs on the Hafen property. These areas consist of bare ground and contain little to no vegetation. Trails are also included in this mapping unit.

Saddle Creek South

Nine vegetation types and other areas occur on the Saddle Creek South property, as shown in Table 7 and Exhibit 9.

TABLE 7
VEGETATION TYPES AND OTHER AREAS ON THE SADDLE CREEK SOUTH PROPERTY

General Vegetation Types	Detailed Vegetation Types or Other Areas	Existing on Property (Acres)
Chaparral		
	Scrub Oak Chaparral	31.41
	Laurel Sumac Scrub – Toyon Chaparral Association	4.82
	Chaparral Subtotal	**36.23**
Scrub		
	California Sagebrush Scrub	6.04
	California Sagebrush – White Sage Scrub Association	2.53
	Scrub Subtotal	**8.57**
Grassland		
	Needle Grass Grassland	1.06
	Semi-Natural Herbaceous Stands	14.26
	Grassland Subtotal	**15.32**
Riparian		
	California Sycamore Woodland	**0.25**
Woodland		
	Coast Live Oak Woodland	**19.09**
Developed/Non-native		
	Disturbed	**2.68**
	Total Acreage	***82.14***

Chaparral

Scrub Oak Chaparral

A total of 31.41 acres of scrub oak chaparral occurs on north-facing slopes throughout the Saddle Creek South property. This vegetation type is dominated by scrub oak; toyon is a subdominant species. Pockets of scrub species, such as California sagebrush and black sage, also occur in this vegetation type.

Laurel Sumac Scrub – Toyon Chaparral Association

A total of 4.82 acres of laurel sumac scrub – toyon chaparral association occurs on the Saddle Creek South property. This vegetation type is located primarily on south-facing slopes along the southern and eastern edges of the property; one small patch of laurel sumac scrub – toyon chaparral association is located near the center of the property. It is co-dominated by a variety of chaparral and scrub species such as laurel sumac, toyon, scrub oak, California sagebrush, bush monkeyflower (*Mimulus aurantiacus*), and golden-yarrow. Sawyer et al. (2009) recognize toyon chaparral – laurel sumac scrub as an association

Scrub

California Sagebrush Scrub

A total of 6.04 acres of California sagebrush scrub occurs on the Saddle Creek South property. This vegetation type is located on a south-facing slope that runs east-west across the property. It is dominated by California sagebrush with a moderate percentage (i.e., between 20 and 50 percent) of coast prickly-pear. Subdominant species include deerweed, desert brittlebush (*Encelia farinosa*), and bush monkeyflower.

California Sagebrush – White Sage Scrub Association

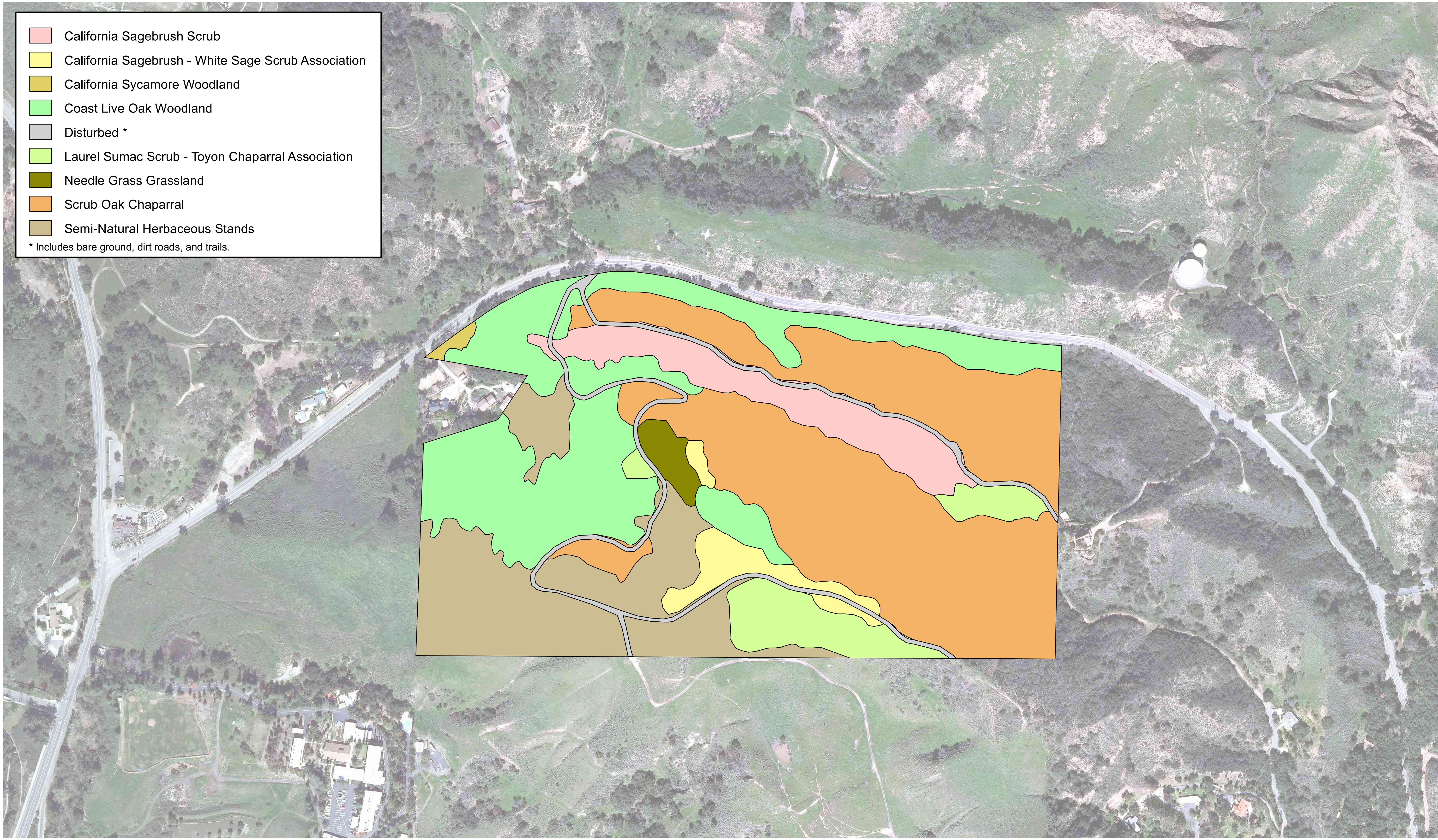
A total of 2.53 acres of California sagebrush – white sage scrub association occurs on the Saddle Creek South property. This vegetation type is located on a northwest- to northeast-facing slope near the center of the property. It is co-dominated by California sagebrush and white sage (*Salvia apiana*). Sawyer et al. (2009) recognize white sage scrub – California sagebrush scrub as an association.

Grassland

Needle Grass Grassland

A total of 1.06 acres of needle grass grassland occurs on a moderate north-facing slope near the center of the Saddle Creek South property. This vegetation type is characterized by having at least ten percent relative cover of purple needlegrass. This vegetation type has been heavily disturbed by grazing and has a high proportion of non-native species such as red brome (*Bromus madritensis* ssp. *rubens*), ripgut grass, goldentop, and cardoon. Coastal goldenbush (*Isocoma menziesii*) is a prevalent emergent shrub in this area.

This vegetation type would be an appropriate candidate for habitat restoration to native grassland, scrub, or woodland communities, depending on the slope, aspect, and soils present. Given that cardoon is prevalent in this area, it should be prioritized for weed treatment.



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Vegetation Types

Exhibit 9

Measure M2 Acquisition Properties/Saddle Creek South Property

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Semi-Natural Herbaceous Stands

A total of 14.26 acres of semi-natural herbaceous stands occurs on the Saddle Creek South property. This vegetation type extends downslope from the ridgeline at the southwest corner of the property and in a patch adjacent to off-site development on the western edge of the property. It is co-dominated by cardoon and a variety of non-native grasses including perennial ryegrass (*Festuca perennis* [*Lolium perenne*]), barley (*Hordeum murinum*), ripgut grass, and soft chess (*Bromus hordeaceus*). Coastal goldenbush is a prevalent emergent shrub in this area.

This vegetation type would be an appropriate candidate for habitat restoration to native grassland, scrub, or woodland communities, depending on the slope, aspect, and soils present. Given that cardoon is prevalent in this area, it should be prioritized for weed treatment.

Riparian

California Sycamore Woodland

A total of 0.25 acre of California sycamore woodland occurs on the Saddle Creek South property. This vegetation type is located in the northwest corner of the property adjacent to Live Oak Canyon Road. It consists of a mix of mature western sycamore and olive trees.

Woodland

Coast Live Oak Woodland

A total of 19.09 acres of coast live oak woodland occurs on the Saddle Creek South property. This vegetation type is located along Live Oak Canyon Road and on north-facing slopes in the western half of the property. It is dominated by mature coast live oak trees. Scattered olive trees are also present in this vegetation type. The understory includes Italian thistle and barley.

Developed/Non-Native

Disturbed

A total of 2.68 acres of disturbed areas occurs on the Saddle Creek South property. These areas consist of bare ground and contain little to no vegetation. Dirt roads and trails are included in this mapping unit.

3.2 WILDLIFE POPULATIONS AND MOVEMENT PATTERNS

Vegetation on and adjacent to the south county properties provides potential habitat for a number of wildlife species. Common wildlife species observed or expected to occur on the properties and/or in adjacent off-site areas are discussed below. Some species were observed on all four properties while other species were observed on only one or some of the properties.

3.2.1 Fish

Most creeks and waterways in Southern California are subject to periods of high water flow in winter and spring and little to no flow during the late summer and fall. Most drainages occurring on the properties are expected to convey water only following storm events. No fish species were observed on the south county properties. Fish species, such as western mosquitofish (*Gambusia affinis*), would only be expected to occur in Trabuco Creek on the Ferber Ranch property during periods of high flow.

3.2.2 Amphibians

Amphibians require moisture for at least a portion of their life cycle and many require standing or flowing water for reproduction. Terrestrial species may or may not require standing water for reproduction; they survive in dry areas by aestivating (i.e., remaining beneath the soil in burrows or under logs and leaf litter, and emerging only when temperatures are low and humidity is high). Many of these species' habitats are associated with water and they emerge to breed once the rainy season begins. Soil moisture conditions can remain high throughout the year in some habitat types depending on factors such as amount of vegetation cover, elevation, and slope/aspect.

Marginally suitable habitat for amphibian species occurs in the drainages on each property. No amphibian species were observed on the south county properties. Common amphibian species that may occur on the properties include garden slender salamander (*Batrachoseps major*), western toad (*Anaxyrus boreas*), and Pacific treefrog (*Pseudacris* [*Hyla*] *regilla*).

3.2.3 Reptiles

Reptiles are well-adapted to life in arid habitats. They have several physiological adaptations that allow them to conserve water. Reptiles can also become dormant during weather extremes, allowing them to survive prolonged droughts and paucity of food (Ruben and Hillenius 2005). Reptilian diversity and abundance typically varies with vegetation type and character. Many species prefer only one or two vegetation types; however, most species will forage in a variety of habitats. Most reptile species that occur in open areas will excavate a burrow or use rodent burrows for cover, protection from predators, and refuge during extreme weather conditions.

Lizard species observed on the properties include western fence lizard (*Sceloperus occidentalis*) and side-blotched lizard (*Uta stansburiana*). One snake species was observed on the properties: gopher snake (*Pituophis catenifer*).

3.2.4 Birds

A variety of bird species are expected to be residents on the south county properties, using the habitats throughout the year. Other species are present only during certain seasons. For example, the white-crowned sparrow (*Zonotrichia leucophrys*) is expected to occur on the properties during the winter season, but would not occur in the summer season because it migrates north to its breeding range.

Resident bird species observed on the properties include California quail (*Callipepla californica*), acorn woodpecker (*Melanerpes formicivorus*), Nuttall's woodpecker *(Picoides nuttallii*), northern flicker (*Colaptes auratus*), western scrub-jay, common raven (*Corvus corax*), oak titmouse (*Baeolophus inornatus*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), house wren (*Troglodytes aedon*), wrentit (*Chamaea fasciata*), California thrasher (*Toxostoma redivivum*), common yellowthroat (*Geothlypis trichas*), spotted towhee (*Pipilo maculatus*), California towhee (*Pipilo crissalis*), and song sparrow (*Melospiza melodia*). Urban-tolerant species that occur in disturbed areas and in natural vegetation types that were also observed on the properties include mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), black phoebe (*Sayornis nigricans*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), house finch (*Carpodacus mexicanus*), and lesser goldfinch (*Spinus* [*Carduelis*] *psaltria*).

Wintering birds are those species that generally breed outside the region but migrate to the area for the winter season. Wintering species observed on the properties include fox sparrow (*Passerella iliaca*). Summer residents are species that migrate into the region to breed, but generally winter south of the region. Summer breeders observed during the surveys include black-chinned hummingbird (*Archilochus alexandri*), western wood-pewee (*Contopus sordidulus*), Pacific-slope flycatcher (*Empidonax difficilis*), western kingbird (*Tyrannus verticalis*), cliff swallow (*Petrochelidon pyrrhonota*), hooded oriole (*Icterus cucullatus*), and Bullock's oriole (*Icterus bullockii*). During spring and fall migration, the Project site also provides foraging habitat for a variety of migratory species.

Birds of prey (raptors) observed on the properties include turkey vulture (*Cathartes aura*) (a scavenger), northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), barn owl (*Tyto alba*), and great horned owl (*Bubo virginianus*).

3.2.5 Mammals

Active burrows are present throughout the properties and could provide cover for a number of small mammal species. Small ground-dwelling mammals or their sign observed on the properties include California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), dusky-footed woodrat (*Neotoma fuscipes*), and desert woodrat (*Neotoma lepida*).

Open grassland communities and the leafy understory of scrub and woodland communities provide excellent foraging habitat for herbivorous mammals. Common herbivores observed during field surveys include mule deer (*Odocoileus hemionus*) and desert cottontail (*Sylvilagus audubonii*).

Medium to larger mammalian predators (both carnivorous and omnivorous species) that were observed or are expected on the property in a variety of habitats include common striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), and mountain lion.

Five bat species were identified from the acoustic analysis: Yuma myotis (*Myotis yumanensis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*). The most common species was the Brazilian free-tailed bat, which was found on all four properties. Most of the bat activity documented on the properties occurred in the lower elevation canyons and ravines where the bats are most likely to find more abundant insect food. Ferber Ranch provides a diversity of habitats suitable for foraging, as well as potential roost habitats for small numbers of bats in snags, under bark, or in tree foliage. No suitable cliffs, buildings, or other man-made structures that would be suitable for roosting are present on the Ferber Ranch property. O'Neill Oaks has some potential to support roosting bats in tree snags or under bark; however, the closed nature of the chaparral habitat provides limited open areas suitable for foraging. Hafen supported relatively few bats, possibly due to the closed nature of the chaparral habitat and lack of open areas. An abandoned homestead with several dilapidated buildings was located on the Saddle Creek South property; however, no bats or bat sign (e.g., droppings, urine stains) were observed.

3.2.6 Wildlife Movement

Wildlife corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization creates isolated "islands" of wildlife habitat. In the absence of habitat linkages that allow movement to adjoining open space areas, various studies have concluded that some wildlife species, especially the larger and more mobile mammals, will not likely persist over time in fragmented or isolated habitat areas because they prohibit the infusion of new individuals and genetic information (MacArthur and Wilson 1967; Soule 1987; Harris and Gallagher 1989; Bennett 1990). Corridors mitigate the effects of this fragmentation by (1) allowing animals to move between remaining habitats, thereby permitting depleted populations to be replenished and promoting genetic exchange; (2) providing escape routes from fire, predators and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or local species extinction; and (3) serving as travel routes for individual animals as they move in their home ranges in search of food, water, mates, and other necessary resources (Noss 1983; Fahrig and Merriam 1985; Simberloff and Cox 1987; Harris and Gallagher 1989).

Wildlife movement activities usually fall into one of three movement categories: (1) dispersal (e.g., juvenile animals from natal areas or individuals extending range distributions); (2) seasonal migration; and (3) movements related to home range activities (e.g., foraging for food or water, defending territories or searching for mates, breeding areas, or cover). A number of terms such as "wildlife corridor", "travel route", "habitat linkage", and "wildlife crossing" have been used in various wildlife movement studies to refer to areas in which wildlife move from one area to another. To clarify the meaning of these terms and to facilitate the discussion on wildlife movement in this analysis, these terms are defined as follows:

- ***Travel route –*** a landscape feature (such as a ridgeline, drainage, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and to provide access to necessary resources (e.g., water, food, cover, den sites). The travel route is generally preferred because it provides the least amount of topographic resistance in moving from one area to another. It contains adequate food, water, and/or cover while moving between habitat areas and it provides a relatively direct link between target habitat areas.

- ***Wildlife corridor –*** a piece of habitat, usually linear in nature, that connects two or more habitat patches that would otherwise be fragmented or isolated from one another. Wildlife corridors are usually bound by urban land areas or other areas unsuitable for wildlife. The corridor generally contains suitable cover, food, and/or water to support species and to facilitate movement while in the corridor. Larger, landscape-level corridors (often referred to as "habitat linkages" or "landscape linkages") can provide both transitory and resident habitat for a variety of species.

- ***Wildlife crossing –*** a small, narrow area, relatively short in length and generally constricted in nature that allows wildlife to pass under or through an obstacle or barrier that otherwise hinders or prevents movement. Crossings typically are man-made and include culverts, underpasses, drainage pipes, and tunnels to provide access across or under roads, highways, pipelines, or other physical obstacles. These often represent "choke points" along a movement corridor, which may impede wildlife movement and increase the risk of predation.

It is important to note that in a large open space area where there are few or no man-made or naturally occurring physical constraints to wildlife movement, wildlife corridors (as defined above) may not yet exist. Given an open space area that is both large enough to maintain viable populations of species and to provide a variety of travel routes (e.g., canyons, ridgelines, trails, riverbeds, and others), wildlife will use these "local" routes while searching for food, water, shelter, and mates and will not need to cross into other large open space areas. Based on their size, location, vegetative composition and availability of food, some of these movement areas (e.g., large drainages and canyons) are used for longer lengths of time and serve as source areas for food, water and cover, particularly for small- and medium-sized animals. This is especially true if the travel route is within a larger open space area. However, once open space areas become constrained and/or fragmented as a result of urban development or construction of physical obstacles (such as roads and highways), the remaining landscape features or travel routes that connect the larger open space areas become corridors as long as they provide adequate space, cover, food and water, and do not contain obstacles or distractions (e.g., man-made noise, lighting) that would generally hinder wildlife movement.

In general, animals discussed within the context of movement corridors typically include larger, more mobile species (such as mule deer, black bear [*Ursus americanus*], mountain lion, fox [*Urocyon* sp.], and coyote) and even some of the mid-sized mammals (such as raccoon [*Procyon lotor*], striped skunk, American badger [*Taxidea taxus*], and Virginia opossum [*Didelphis virginiana*]). Most of these species have relatively large home ranges through which they move to find adequate food, water, and breeding and wintering habitat. It is assumed that corridors that serve larger, more vagile species also serve as corridors for many smaller, less mobile species, such as reptiles, amphibians, and rodents (generally discussed within the context of local movement). Regional movement for these species facilitates gene flow and requires at least some local "stepping stone" movement of individuals between populations.

The availability of open space corridors is generally considered less important for bird species. Most bird species are believed to fly in more or less direct paths to desired locations; however, some habitat-specific species may not move great distances from their preferred habitat types, and are believed to be less inclined to travel across unsuitable areas.

Ideally, an open space corridor should encompass a heterogeneous mix of vegetation types to accommodate the ecological requirements of a wide variety of resident species in any particular region. Most species typically prefer adequate vegetation cover during movement, which can serve as both a food source and as protection from weather and predators. Drainages, riparian areas, and forested canyon bottoms typically serve as natural movement corridors because these features provide cover, food, and often water for a variety of species. Very few species will move across large expanses of open, uncovered habitat unless it is the only option available to them. For some species, landscape linkages must be able to support animals for sustained periods, not just for travel. Smaller or less mobile animals (such as rodents and reptiles) require long periods to traverse a corridor, so the corridor must contain adequate food and cover for survival.

Regional Movement

Open space on each of the properties is contiguous with larger areas of open space in the region. The landscape matrix around the properties is generally undeveloped, broken primarily by Live Oak Canyon Road and rural residential development primarily along Trabuco Canyon Road, Live Oak Canyon Road, and Rose Canyon Road. The northern end of the Ferber Ranch property directly abuts the Cleveland National Forest. The southeastern edge of the O'Neill Oaks property directly abuts the O'Neill Regional Park boundary. The remainder of these two properties, as well as the Hafen and Saddle Creek South properties, generally border privately owned open space (currently undeveloped, but unprotected private property) that connects to O'Neill Regional Park or the Cleveland National Forest. The relatively undeveloped nature of the landscape is highly conducive to regional wildlife movement.

Local Movement

The south county properties contain numerous ridgelines and canyons that provide a variety of travel routes for local wildlife movement. The trails and access roads on the properties may also be used for movement. Movement is expected to occur on the properties, as well as between each property and contiguous off-site habitat. Wildlife species that require relatively large home ranges, such as coyote, bobcat, or mule deer, were observed on the Ferber Ranch, O'Neill Oaks, and Saddle Creek South properties.

3.3 SPECIAL STATUS BIOLOGICAL RESOURCES

The following section addresses special status biological resources that were observed, reported, or have the potential to occur on the property or in adjacent off-site areas. These resources include plant and wildlife species that have been afforded special status and/or recognition by federal and State resource agencies and private conservation organizations. In general, the principal reason an individual taxon (i.e., species, subspecies, or variety) is given such recognition is the documented or perceived decline or limitations of its population size, geographic range, and/or distribution resulting in most cases from habitat loss. Tables 10 and 17 respectively provide a summary of special status plant and wildlife species known to occur in the Project vicinity (i.e., the USGS' Black Star Canyon, Cañada Gobernadora, El Toro, and Santiago Peak 7.5-minute quadrangles) and include information on the status; habitat; potential for occurrence; results of focused survey efforts; and definitions for the various status designations. Generally, this list includes species reported by the CNDDB and CNPS, supplemented with species from the author's experience that either occur nearby or could occur based on the presence of suitable habitat. In addition to species, special status biological resources include vegetation types and habitats that are either unique; of relatively limited distribution in the region; or of particularly high wildlife value. These resources have been defined by federal, State, and local government conservation programs. Sources used to determine the status of biological resources are listed below.

- ***Plants –*** Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2012); the CNDDB (CDFG 2012a); various USFWS *Federal Register* notices regarding listing status of plant species; and the *List of Special Vascular Plants, Bryophytes, and Lichens* (CDFG 2012b).

- ***Wildlife –*** California Wildlife Habitat Relationships Database System (CDFG BDB 2012); the CNDDB (CDFG 2012a); various USFWS *Federal Register* notices regarding listing status of wildlife species; and the *List of Special Animals* (CDFG 2011).

- ***Habitats –*** CNDDB (CDFG 2012a) and the *List of California Natural Communities* (CDFG 2010).

3.3.1 Definitions of Special Status Biological Resources

A **federally Endangered species** is one facing extinction throughout all or a significant portion of its geographic range. A **federally Threatened species** is one likely to become Endangered in the foreseeable future throughout all or a significant portion of its range. The presence of any federally Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in "take" of the species or its habitat. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct. Harm, in this sense, can include any disturbance of habitats used by the species during any portion of its life history.

Proposed species or **Candidate species** are those officially proposed by the USFWS for addition to the federal Threatened and Endangered species list. Because proposed species may soon be listed as Threatened or Endangered, these species could become listed prior to or during implementation of a proposed project. The presence of a Proposed or Candidate species within a project impact area may impose constraints on development if they are listed prior to issuance of project permits, particularly if a project would result in "take" of the species or its habitat.

The State of California considers an **Endangered species** as one whose prospects of survival and reproduction are in immediate jeopardy; a **Threatened species** as one present in such small numbers throughout its range that it is likely to become an Endangered species in the near future in the absence of special protection or management; and a **Rare species** as one present in such small numbers throughout its range that it may become Endangered if its present environment worsens. Rare species applies only to California native plants. State-listed Threatened and Endangered species are protected against take unless an Incidental Take Permit is obtained from the resource agencies. The presence of any State-listed Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in “take” of the species or its habitat.

California Species of Special Concern is an informal designation used by the CDFW for some declining wildlife species that are not State Candidates. This designation does not provide legal protection, but signifies that these species are recognized as special status by the CDFW. Recently, the CDFW downgraded some of these species from Species of Special Concern to the **Watch List**.

Species that are **California Fully Protected** and **Protected** include those protected by special legislation for various reasons, such as the mountain lion and white-tailed kite (*Elanus leucurus*). Fully Protected species may not be taken or possessed at any time. California Protected species include those species that may not be taken or possessed at any time except under special permit from the CDFW issued pursuant to the *California Code of Regulations* (Title 14, §§650, 670.7) or Section 2081 of the *California Fish and Game Code.*

Species of **Local Concern** are those that have no official status with the resource agencies, but are being watched because there is either a unique population in the region or the species is declining in the region.

Special Animal is a general term that refers to species that the CNDDB is interested in tracking, regardless of legal or protective status. This term includes species designated as any of the above terms, but also includes species that may be considered biologically rare; restricted in distribution; declining throughout their range; have a critical, vulnerable stage in their life cycle that warrants monitoring; are on the periphery of their range and are threatened with extirpation in California; are associated with special status habitats; or are considered by other State or federal agencies or private organizations to be sensitive or declining.

The California Rare Plant Rank (CRPR), formerly known as CNPS List, is a ranking system by the Rare Plant Status Review group[7] and managed by the CNPS and the CDFW. A CRPR summarizes information on the distribution, rarity, and endangerment of California’s vascular plants. Plants with a CRPR of **1A** are presumed extinct in California because they have not been seen in the wild for many years. Plants with a CRPR of **1B** are Rare, Threatened, or Endangered throughout their range. Plants with a CRPR of **2A** are presumed extirpated from California, but are more common elsewhere. Plants with a CRPR of **2B** are considered Rare, Threatened, or Endangered in California, but are more common elsewhere. Plants with a CRPR of **3** require more information before they can be assigned to another rank or rejected; this is a “review” list. Plants with a CRPR of **4** are of limited distribution or infrequent throughout a broader area in California; this is a “watch” list. The CRPR Threat Rank is an extension added onto the CRPR to designate the level of endangerment by a 1 to 3 ranking (CNPS 2011). An extension of **.1** is assigned to plants that are considered to be “seriously threatened” in California (i.e., over 80 percent of the occurrences threatened or having a high degree and immediacy of threat). Extension **.2** indicates the plant is “fairly threatened” in California (i.e.,

7 This group consists of over 300 botanical experts from the government, academia, non-governmental organizations, and the private sector.

between 20 and 80 percent of the occurrences threatened or having a moderate degree and immediacy of threat). Extension **.3** is assigned to plants that are considered “not very threatened” in California (i.e., less than 20 percent of occurrences threatened or having a low degree and immediacy of threat or no current threats known). The absence of a threat code extension indicates plants lacking any threat information.

3.3.2 Vegetation Types

In addition to providing an inventory of special status plant and wildlife species, the CNDDB also provides an inventory of vegetation types that are considered special status by the State and federal resource agencies, academic institutions, and various conservation groups (such as the CNPS). Determination of the level of imperilment (i.e., exposure to injury, loss, or destruction) is based on the NatureServe Heritage Program Status Ranks that rank both species and vegetation types on a global (G) and statewide (S) basis according to their rarity, trend in population size or area, and recognized threats (e.g., proposed developments, habitat degradation, and non-native species invasion) (Faber-Langendoen et al. 2009). The ranks are scaled from 1 to 5. NatureServe considers **G1** or **S1** communities to be critically imperiled and at a very high risk of extinction or elimination due to extreme rarity, very steep declines, or other factors; **G2** or **S2** communities to be imperiled and at high risk of extinction or elimination due to very restricted range, very few populations or occurrences, steep declines, or other factors; **G3** or **S3** communities to be vulnerable and at moderate risk of extinction or elimination due to a restricted range, relatively few populations or occurrences, recent and widespread declines, or other factors; **G4** or **S4** communities to be apparently secure and uncommon but not rare with some cause for long-term concern due to declines or other factors; and **G5** or **S5** communities to be secure. A question mark (?) denotes an inexact numeric rank, but existing information points to this rank (Faber-Langendoen et al. 2009). For vegetation alliances[8] that have State ranks of S1–S3, all associations within the alliance are considered to be highly imperiled.

Special status vegetation types observed the properties are described further below.

Chaparral Communities

Various chaparral communities occur on the south county properties, though they fall into three broad categories: chamise-dominated, scrub oak-dominated, and laurel sumac-dominated.

Scrub oak chaparral is the most abundant vegetation community on the O’Neill Oaks (44.06 acres of scrub oak – toyon chaparral association), Hafen (30.56 acres), and Saddle Creek South (31.41 acres) properties; it is also prevalent on the Ferber Ranch property (44.66 acres). The forms of chaparral dominated by a mix of large evergreen shrubs—such as laurel sumac, toyon, lemonade berry, and/or chamise—often intermixed with sage scrub species, are also prevalent on the south county properties. Ferber Ranch contains 13.36 acres of chamise – laurel sumac – lemonade berry chaparral with California sagebrush scrub; 11.90 acres of chamise chaparral; and 32.94 acres of laurel sumac – lemonade berry chaparral with California sagebrush – California buckwheat scrub. The O’Neill Oaks property contains 11.63 acres of chamise – laurel sumac – lemonade berry chaparral with California sagebrush – California buckwheat scrub and 5.80 acres of laurel sumac scrub – chamise chaparral association. Saddle Creek South contains 4.82 acres of laurel sumac scrub – toyon chaparral association.

Chaparral is a “drought tolerant plant community dominated by sclerophyllous, woody shrubs shaped by a Mediterranean-type climate and naturally recurring wildfires” (Halsey 2007). It is

8 A vegetation alliance is “a classification unit of vegetation, containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover” (Sawyer et al. 2009).

the most extensive vegetation community in California and is not presently considered to have special status, though its status in the future may be uncertain given continuing drought conditions; increased fire frequencies; and limited understanding of the system. In general, chaparral vegetation types on the properties are considered secure or apparently secure. Scrub oak chaparral is ranked by the CDFW as G4 S4. At the alliance level, chamise chaparral is ranked as G5 S5 and laurel sumac scrub is ranked as G4 S4; associations of these alliances would not be considered highly imperiled. One chaparral vegetation type on the south county properties would be considered vulnerable at the State level: toyon chaparral – laurel sumac scrub (ranked as G5 S3).

Sage Scrub Communities

California sagebrush scrub is the most abundant vegetation type on the Ferber Ranch property (149.57 acres); it also occurs on the O'Neill Oaks (21.43 acres) and Saddle Creek South properties (6.04 acres). In addition, California sagebrush scrub/needle grass grassland (0.28 acre), coast prickly pear scrub (6.50 acre), and scale broom scrub (0.30 acre) occur on the Ferber Ranch property. California sagebrush – California buckwheat scrub occurs on the O'Neill Oaks (17.73 acres) and Hafen (11.61 acres) properties, and California sagebrush – white sage scrub association (2.53 acres) occurs on the Saddle Creek South property.

California sagebrush scrub is ranked by the CDFW as G5 S5, the California sagebrush – California buckwheat scrub alliance is ranked as G4 S4, the white sage – California sagebrush alliance is ranked as G4 S3, coast prickly pear scrub is ranked as G4 S3, and scale broom scrub is ranked as G3 S3. While the Global/State rankings of California sagebrush scrub indicate that it is secure, it is of local concern as part of the larger coastal sage scrub community. Coastal sage scrub had, as a whole, declined approximately 70 to 90 percent in its historic range in California by the mid-1990s (Noss and Peters 1995). Sage scrub has largely been lost to land use changes in Southern California basins and foothills. The ecological function of Southern California's remaining sage scrub is threatened by habitat fragmentation and degradation, which is largely the result of invasive non-native species, livestock grazing, off-highway vehicles, altered fire regime, and air pollution (O'Leary 1995; Allen et al. 2000). Scalebroom scrub once occurred along intermittent streams and gently sloping fans in Los Angeles and Orange counties, but few stands remain (Sawyer et al. 2009). Construction of houses and golf courses, agriculture, dams, gravel mining, and stream channelization have interrupted the natural fluvial processes that are a part of this habitat.

Grassland Communities

Needle grass grassland occurs on the Ferber Ranch (17.15 acres) and Saddle Creek South (1.06 acres) properties; needle grass grassland/semi-natural herbaceous stands (3.94 acres) and giant wild rye grassland (0.38 acre) also occur on the Ferber Ranch property.

Needle grass grassland is ranked according to its degree of imperilment by the CDFW; the *Nassella pulchra* (purple needle grass grassland) Provisional Alliance is ranked as G4 S3?[9] and the *Nassella lepida* (foothill needle grass grassland) Provisional Alliance is ranked as G3? S3?. Giant wild rye grassland is ranked G3 S3. Vegetation types ranked as S3 are considered of special concern. Native grasslands are believed to have covered nearly $^1/_5$ of the state and have declined by approximately 99 percent in their historic range in California (Barry 1972; Noss and Peters 1995). In the mid-nineteenth century, heavy grazing by cattle and sheep caused native perennials to be replaced by fast-growing annual grasses, which are able to take advantage of spring rains and produce seeds before the dry heat of summer. The native perennial grasses,

9 A question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank.

which are more palatable to livestock than annuals, were damaged by grazing and trampling. Native grasslands have also been lost to development and conversion to agriculture. Most of the needle grass grassland on the Ferber Ranch property is relatively undisturbed, supporting a high percent cover of native bunch grasses. The needlegrass grassland on the Saddle Creek South property has been disturbed by the presence of non-native grasses and would, therefore, not be considered as biologically valuable as undisturbed types.

Giant wild rye grassland is described under the Herbaceous Alliances and Stands and this alliance tends to be short lived because it is stimulated by fire and fairly quickly taken over by native shrubs of the coastal sage scrub zone following fire (Sawyer et al. 2009). Giant wild rye was one of the species whose abundance was maintained by Native American burning (Sawyer et al. 2009). Giant wild rye does occur after fires; however, it may persist independently of fire in areas of human disturbance and urban runoff or in areas of coastal sage scrub where natural slumping and seepage occur (Sawyer et al. 2009).

Woodland Communities

Coast live oak woodland occurs on all four south county properties (93.23 acres on Ferber Ranch, 13.12 acres on O'Neill Oaks, 3.61 acres on Hafen, and 19.09 acres on Saddle Creek South).

Coast live oak woodland is ranked as G5 S4. Oak woodlands are declining throughout California due to residential, commercial, and industrial development. Woodlands are an important resource in California that provide aesthetic, cultural, economic, and environmental value, in addition to wildlife habitat. In addition, some woodlands on the properties are associated with jurisidictional resources, discussed below.

Riparian Communities

Various riparian communities are present on the Ferber Ranch property. A total of 1.87 acres of arroyo willow thickets, 0.71 acre of mulefat thicket, and 0.45 acre white alder groves occurs on the property. In addition, 2.35 acres of coast live oak – California sycamore woodland association occurs on the Hafen property and 0.25 acre of California sycamore woodland occurs on the Saddle Creek South property.

While these are included within the jurisdiction of the USACE, the RWQCB, and/or the CDFW, they are also ranked by the CDFW according to their degree of imperilment. Arroyo willow thickets are ranked as G4 S4, mulefat thickets are ranked as G5 S4, and white alder groves are ranked as G4 S4. The California sycamore – coast live oak woodland association is ranked as G3 S3, and California sycamore woodland is ranked as G3 S3.

Typically, riparian vegetation provides important biological functions for an ecosystem such as (1) for cover and water sources for wildlife; (2) for filtration of runoff water and groundwater to be recharged; and (3) for flood control and sediment stabilization purposes. Riparian habitats are biologically productive as well as diverse, and are the exclusive habitat of several special status species. As a result, the resource agencies often consider riparian vegetation types to be important resources. It is estimated that as much as 95 to 97 percent of historic riparian habitats in Southern California had been lost by the late 1980s due to agriculture, urban development, flood control, and other human-caused impacts (Faber et al. 1989; Bell 1997). Additionally, since the 1970s, giant reed has become the greatest threat to the remaining riparian resources in coastal Southern California (Bell 1997). This invasive species competes with native species such as willows (*Salix* spp.), mule fat, and cottonwoods (*Populus* spp.); is difficult to control; and apparently does not provide food or nesting habitat for native species (Bell 1997).

Jurisdictional Areas

The south county properties are within the San Juan Hydrologic Unit. All drainages on the Ferber Ranch, O'Neill Oaks, and Hafen properties flow into Trabuco Creek; the drainages on the Saddle Creek South property flow into Aliso Creek. Trabuco Creek and Aliso Creek eventually connect with the Pacific Ocean, a Traditional Navigable Water (TNW), as designated by the USACE. The tributaries of Trabuco Creek and Aliso Creek do not satisfy the USACE criteria for Relatively Permanent Waters (RPW); however, they have a connection to those larger creeks either directly, through an underground drainage system, or via sheet flow over upland areas. "Waters of the U.S." on the Ferber Ranch property exhibited the three parameters (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology) to be considered a wetland; therefore, a total of 0.45 acre of wetlands occurs on the Ferber Ranch property. A total of 4.80 acres, 1.07 acres, 0.76 acre, and 0.45 acre of non-wetland "Waters of the U.S." occur on the Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South properties, respectively (Exhibits 10, 11, 12, and 13; Table 8). A total of 53.30 acres, 11.47 acres, 4.35 acres, and 7.33 acres under the jurisdiction of the CDFW occur on the Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South properties, respectively (Exhibits 10, 11, 12, and 13; Table 8).

TABLE 8
"WATERS OF THE U.S." AND "WATERS OF THE STATE"
ON THE SOUTH COUNTY PROPERTIES

	Jurisdictional Feature			
	USACE/RWQCB		RWQCB only	CDFW Jurisdictional Limits
Mitigation Property	Non-wetland "waters of the U.S."	Wetlands	Isolated Feature	
Ferber Ranch	4.80	0.45	0.00	53.30
O'Neill Oaks	1.07	0.00	0.00	11.47
Hafen	0.76	0.00	0.00	4.35
Saddle Creek South	0.45	0.00	0.00	7.33
Total	**7.08**	**0.45**	**0.00**	**76.45**
USACE: U.S. Army Corps of Engineers; RWQCB: Regional Water Quality Control Board; CDFW: California Department of Fish and Wildlife.				

Should jurisdictional resources be impacted by management activities on the properties, permits/agreements from the regulatory agencies would be required. This would consist of a USACE Section 404 Permit and/or Letters of Permission;[10] an RWQCB Section 401 Water Quality Certification; and a CDFW Section 1602 Streambed Alteration Agreement.

CRAM is a tool for assessing the overall condition[11] of a wetland; it was developed by a consortium of federal, State, and local scientists and managers. The results of a condition assessment can be used to infer the ability to provide various functions or services to which a wetland is most suited. This analysis can be used for a variety of applications, such as in evaluating a project site to inform regulatory decisions (e.g., Section 401 and 404 permitting) or restoration or mitigation site evaluation.

As stated previously, AA scores range from 25 to 100. The maximum AA score possible represents how a wetland is doing relative to the best achievable conditions for that wetland type in the state. It is assumed that the same scores for different wetlands of the same type

[10] The Hafen, O'Neill Oaks, and Ferber Ranch properties are located within the San Juan Creek/Western San Mateo Creek Watershed Special Area Management Plan; all Nationwide Permits were revoked as part of the approval for this plan. As such, permiting through the USACE would be authorized through the Letters of Permission process or the Standard Individual Permit process.

[11] "Condition" is defined as the state of a wetland AA's physical and biological structure, the hydrology, and its buffer and landscape context relative to the best achievable states for the same type of wetland (CWMW 2012).

represent the same overall condition and functional capacity. Therefore, these scores may be used to track the progress of restoration efforts over time; to compare impacted sites to their in-kind mitigation sites; or to compare an individual wetland to the status and trends in ambient condition of its wetland type.

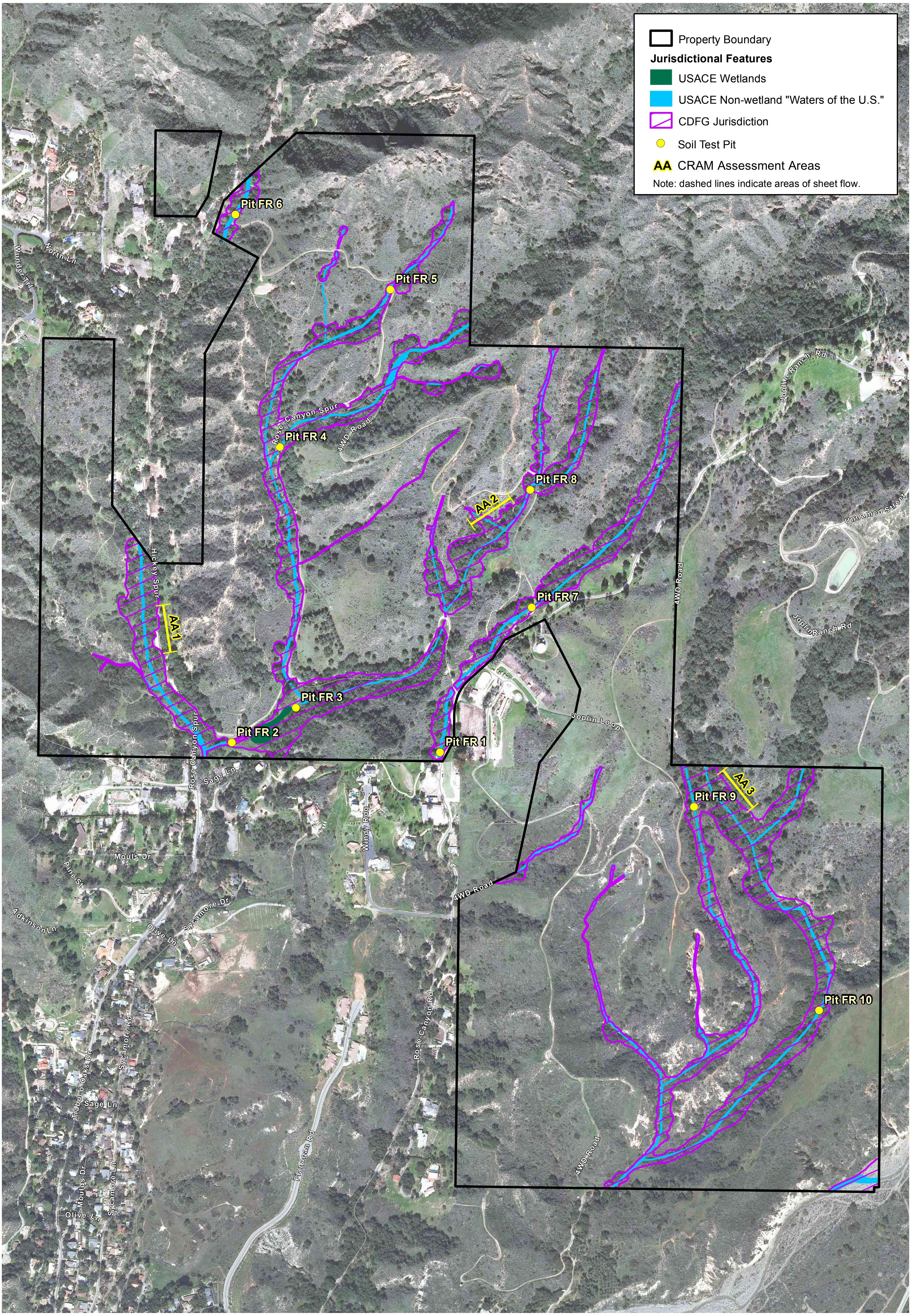
Ten 100-meter-long AAs were scored for the CRAM analysis of the south county properties (Ferber Ranch – 3, O'Neill Oaks – 3, Hafen – 3, Saddle Creek South – 1) (Exhibits 10, 11, 12, and 13). The overall AA scores range from 61.6 to 88.9 (Table 9). The Buffer and Landscape Context attribute scores range from 55.8 to 100.0; the Hydrology attribute scores were all 100.0; the Physical Structure attribute scores range from 37.5 to 75.0; and the Biotic Structure attribute scores range from 47.2 to 80.6. These scores reflect the generally natural condition of the properties. Specifically, the scores are very high for buffer condition and hydrology at all sites. This reflects the large amount of open space surrounding the drainages and lack of disturbance to the water sources resulting in little or no channel degradation. The generally low scores for Physical Structure are a reflection of the type of riparian system (i.e., generally ephemeral and uniform) as opposed to the result of anthropogenic disturbance. Because most of the jurisdictional resources are dominated by coast live oak riparian habitat, the natural density of these woodlands has limited the establishment of understory species and inhibited the scores for Biotic Structure (specifically, the number of co-dominant species, plant zonation, and vertical biotic structure). The scores for Landscape Connectivity are the most variable, with streambeds unaffected by nearby development (within 500 meters upstream or downstream) receiving the maximum score, while drainages with nearby development receiving the lowest score.

There are enhancement opportunities that would likely result in higher CRAM scores. Enhancement measures are aimed to improve scores associated with the Buffer and Landscape Context and Biotic Structure attributes. Measures aimed at changing the Hydrology and Physical Structure attributes would require changes outside the ability of an individual landowner and/or require changes in the physical structure of the bed and bank of the system that are not recommended.

There are opportunities on the O'Neill Oaks property to enhance and restore streambed areas that have been damaged by cattle grazing. Overgrazing may negatively impact the quality of drainages and surrounding buffer (e.g., through soil compaction, erosion, and facilitating the spread and persistence of non-native species) (Schoenherr 1992). Enhancement measures (e.g., elimination of grazing, targeted removal of species such as Italian thistle and tree tobacco, and restoration of native species) have the potential to increase the CRAM scores for the number of co-dominant species, percent of invasive co-dominant species, and the vertical biotic structure metrics. Due to the largely natural condition of the Ferber Ranch, Hafen, and Saddle Creek South properties, enhancement activities are not likely to significantly increase CRAM scores. However, elimination of grazing, where present, and management of non-native invasive species would help to maintain the natural conditions of these sites.

3.3.3 Special Status Plants

Based on the results of the literature review, 40 special status plant species are known to occur in the vicinity of the south county properties. These species and their potential for occurrence (which is based on the presence of suitable habitat) are summarized in Table 10. Note that these species are listed alphabetically according to their scientific name. Six special status plant species were observed on the south county properties. These species are discussed after the table.



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Jurisdictional Resources

Exhibit 10

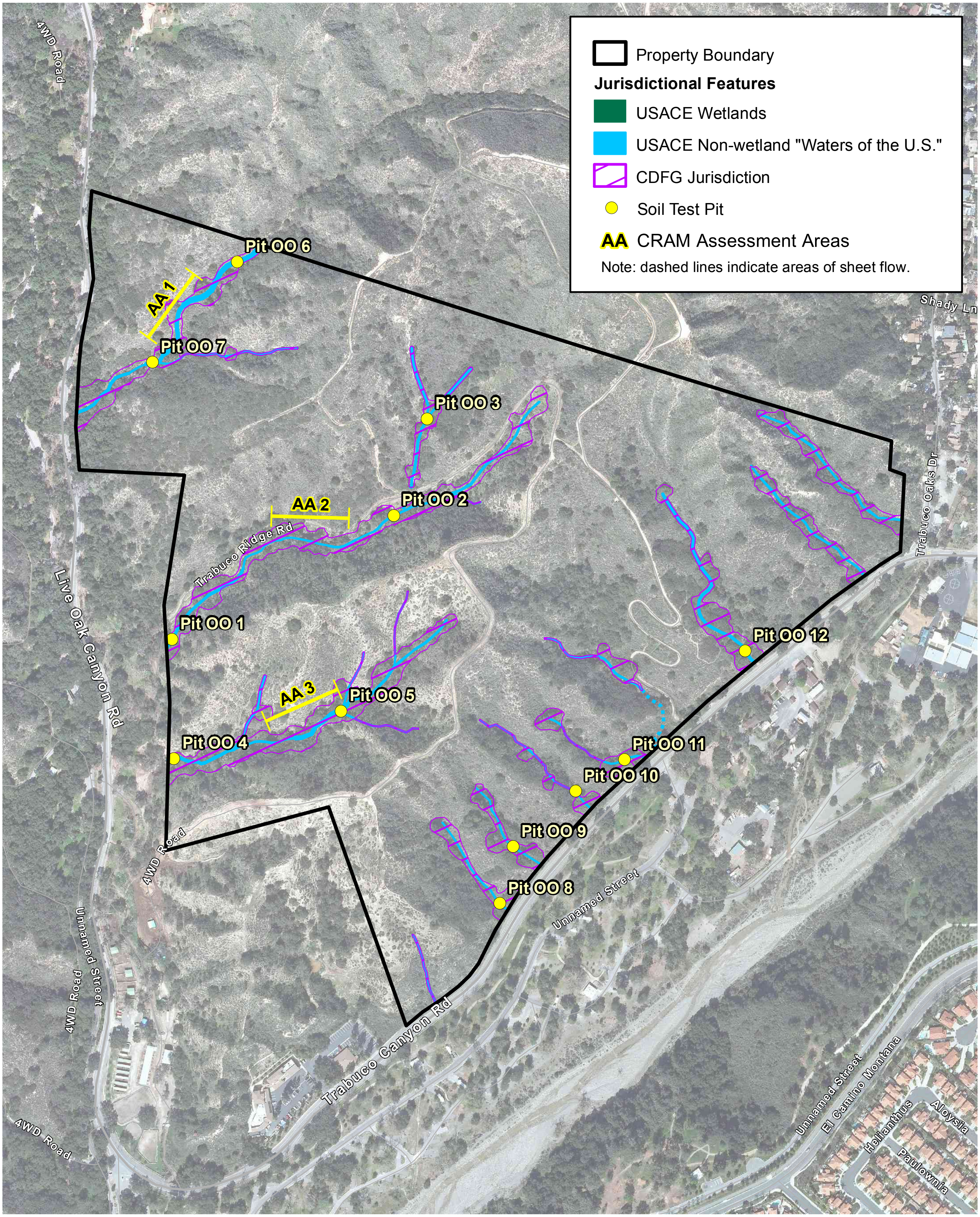
Measure M2 Acquisition Properties/Ferber Ranch Property

N W E S

550 275 0 550 Feet

BonTerra CONSULTING

(Rev: 12-24-2013 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex10_JD_Ferber.pdf



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Jurisdictional Resources

Exhibit 11

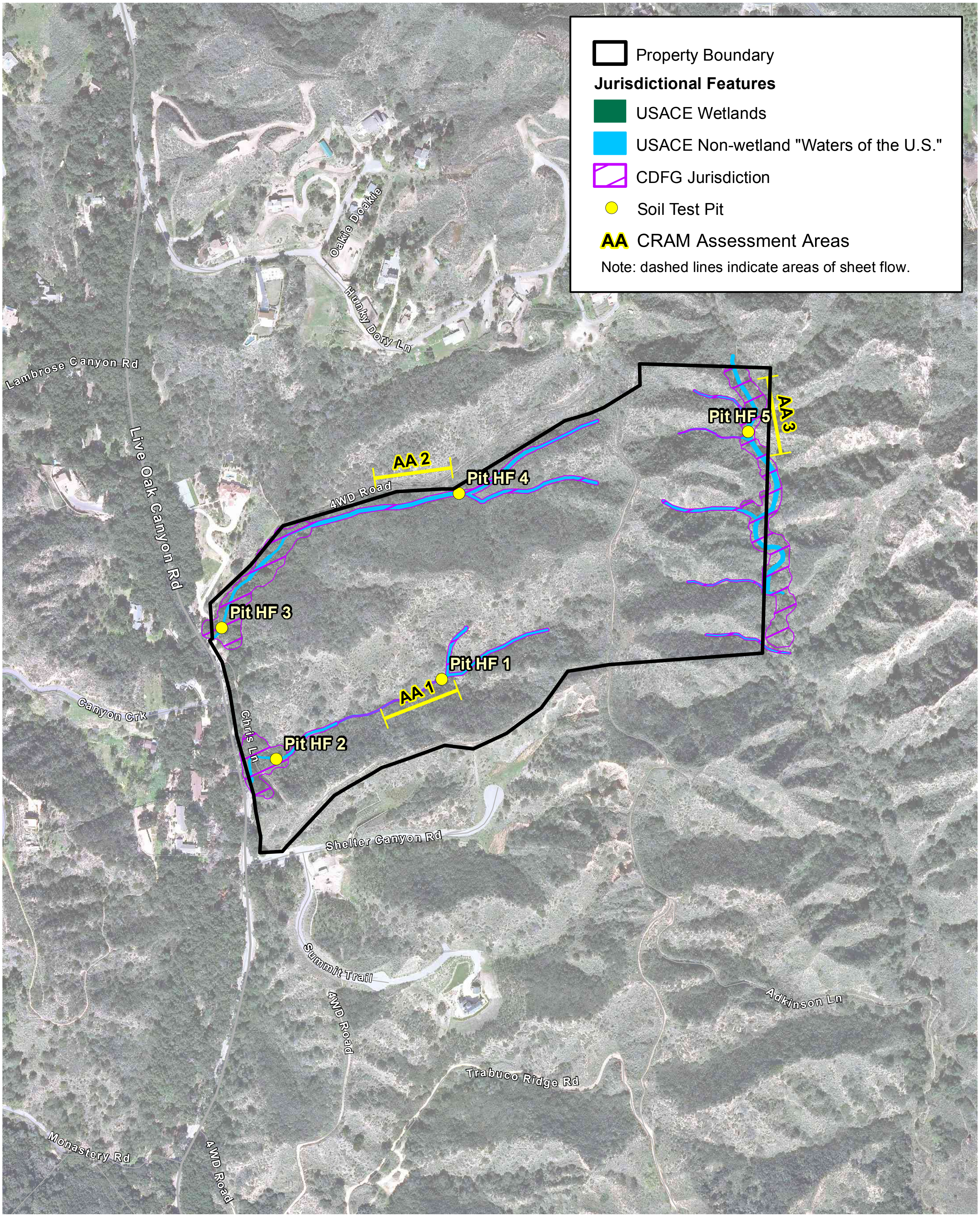
Measure M2 Acquisition Properties/O'Neill Oaks Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-2013 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex11_JD_ONeill.pdf



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Jurisdictional Resources

Exhibit 12

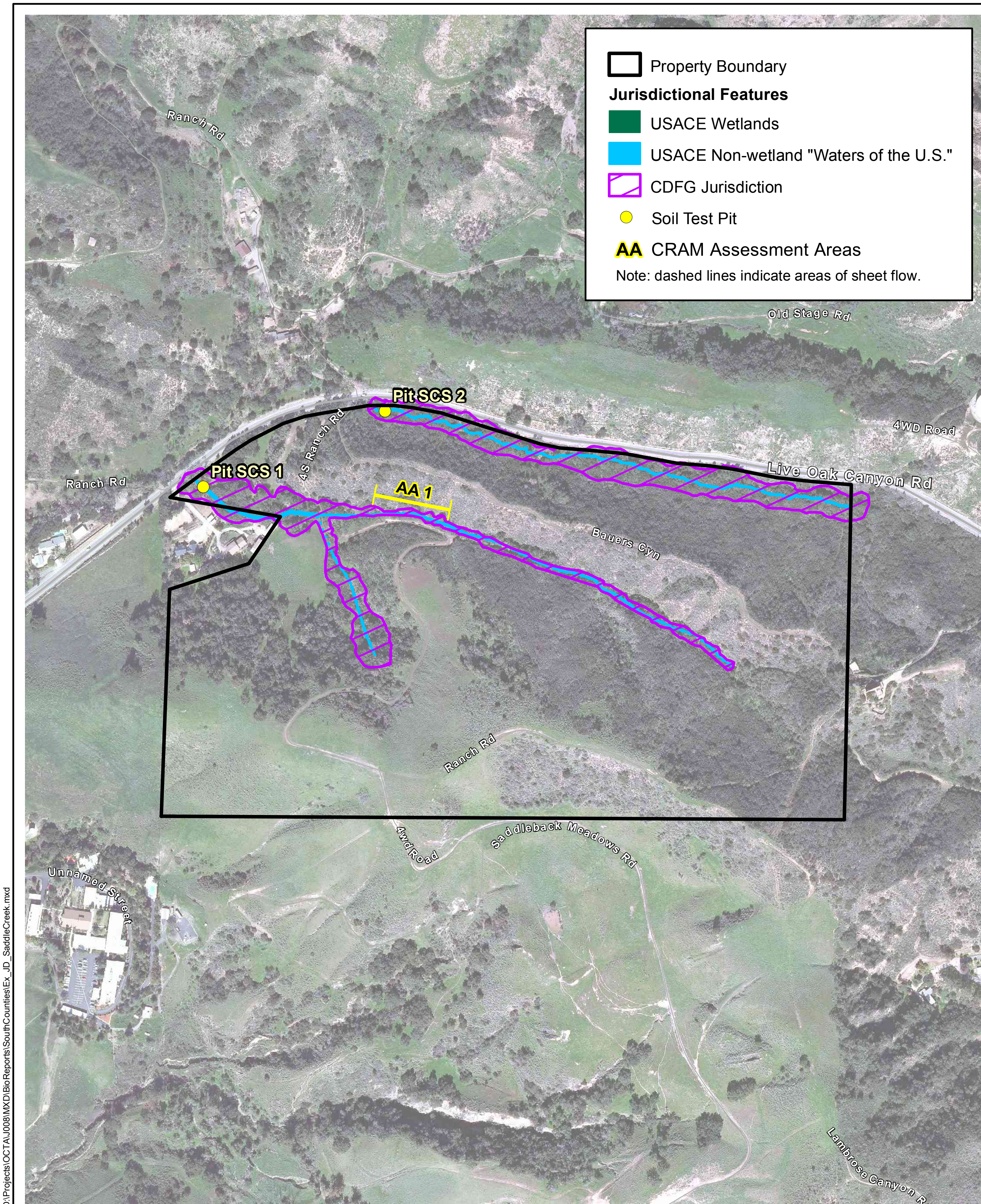
Measure M2 Acquisition Properties/Hafen Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-2013 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex12_JD_Hafen.pdf



Jurisdictional Resources

Exhibit 13

Measure M2 Acquisition Properties/Saddle Creek South Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-2013 JAZ) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex13_JD_SaddleCreek.pdf

TABLE 9
ATTRIBUTE SCORES FOR SOUTH COUNTY PROPERTY ASSESSMENT AREAS

Attribute	Metric	CRAM Scores[a]									
		Ferber Ranch			O'Neill Oaks			Hafen			Saddle Creek South
		AA1	AA2	AA3	AA1	AA2	AA3	AA1	AA2	AA3	AA1
Buffer and Landscape Context	Landscape Connectivity	D (3)	A (12)	A (12)	D (3)	D (3)	D (3)	D (3)	D (3)	A (12)	D (3)
	Buffer Condition (submetrics below)										
	Percentage of Assessment Area with Buffer	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)
	Average Buffer Width	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	B (9)	A (12)	A (12)	B (9)
	Buffer Condition	B (9)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)
	Attribute Score	*55.8*	*100.0*	*100.0*	*62.5*	*62.5*	*62.5*	*59.0*	*62.5*	*100.0*	*59.0*
Hydrology	Water Source	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)
	Hydroperiod/Channel Stability	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)
	Hydrologic Connectivity	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)
	Attribute Score	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Physical Structure	Structural Patch Richness	D (3)	D (3)	D (3)	D (3)	D (3)	D (3)	D (3)	D (3)	B (9)	D (3)
	Topographic Complexity	C (6)	C (6)	C (6)	B (9)	C (6)	C (6)	C (6)	C (6)	B (9)	C (6)
	Attribute Score	*37.5*	*37.5*	*37.5*	*50.0*	*37.5*	*37.5*	*37.5*	*37.5*	*75.0*	*37.5*
Biotic Structure	Plant Community (submetrics below)										
	Number of Plant Layers	B (9)	A (12)	B (9)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)	A (12)
	Number of Co-dominant Species	C (6)	C (6)	C (6)	A (12)	B (9)	B (9)	B (9)	B (9)	B (9)	C (6)
	Percent of Invasive Co-dominant Species	A (12)	B (9)	B (9)	A (12)	B (9)	D (3)	A (12)	A (12)	A (12)	B (9)
	Horizontal Interspersion/Plant Zonation	C (6)	D (3)	D (3)	C (6)	D (3)	D (3)	C (6)	C (6)	B (9)	D (3)
	Vertical Biotic Structure	C (6)	B (9)	B (9)	C (6)	C (6)	C (6)	B (9)	B (9)	B (9)	C (6)
	Attribute Score	*58.3*	*58.3*	*55.6*	*66.7*	*52.8*	*47.2*	*72.2*	*72.2*	*80.6*	*50.0*
Overall Assessment Area Score[b]		***62.9***	***74.0***	***73.3***	***69.8***	***63.2***	***61.8***	***67.2***	***68.1***	***88.9***	***61.6***

CRAM: California Rapid Assessment Method; AA: Assessment Area.

[a] CRAM scores are indicated by the letter score (A through D) that is assigned to each metric and the corresponding numeric value of that score is in parentheses.

[b] The overall CRAM score is calculated by averaging the four attribute scores.

Source: BonTerra Consulting 2013a.

TABLE 10
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

	Status						Potential to Occur on Each Property/Results of Focused Surveys			
Species	**USFWS**	**CDFW**	**CRPR**	**Blooming Period**	**Habitat**	**Range**	**Ferber Ranch**	**O'Neill Oaks**	**Hafen**	**Saddle Creek South**
Abronia villosa var. *aurita* chaparral sand-verbena	—	—	1B.1	Between January and September.	Sandy places, primarily in coastal sage scrub and chaparral habitats and alluvial washes and river benches.	Central and southern South Coast and western Sonoran (Colorado) Desert; between sea level and 5,250 feet above msl.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Astragalus brauntonii Braunton's milk-vetch	FE	—	1B.1	Between March and July.	Recent burns or disturbed areas in chaparral and tecate cypress forest.	Western Transverse Ranges, San Gabriel Mountains possibly to the South Coast, and northern Peninsular Ranges; between sea level and 2,133 feet above msl.	Only known from northern Santa Ana Mountains (Gypsum and Coal Canyons) in Orange County. Not expected to occur.	Outside known range (Gypsum and Coal Canyons) in Orange County. Not expected to occur.	Outside known range (Gypsum and Coal Canyons) in Orange County. Not expected to occur.	Outside known range (Gypsum and Coal Canyons) in Orange County. Not expected to occur.
Atriplex coulteri Coulter's saltbush	—	—	1B.2	Between March and October.	Alkaline soils or clay barrens in open areas of perennial grasslands, coastal sage scrub, and coastal bluff scrub.	South Coast and Channel Islands to Baja California, Mexico; sea level to 1,640 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Baccharis malibuensis Malibu baccharis	—	—	1B.1	Between August and September.	Grassy openings in chaparral.	Western Transverse Ranges and Peninsular Ranges; between 164 and 984 feet above msl.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Brodiaea filifolia thread-leaved brodiaea	FT	SE	1B.1	Between March and June.	Grasslands and vernal pools.	South Coast, San Bernardino Mountains, and western Peninsular Ranges; 80 to 2,820 feet above msl.	Suitable habitat present. Surveys conducted at end of or past blooming period.	Suitable habitat present. Surveys conducted at end of or past blooming period.	Suitable habitat present. Surveys conducted at end of or past blooming period.	Suitable habitat present. Surveys conducted at end of or past blooming period.
Calochortus catalinae Catalina mariposa lily	—	—	4.2	Between March and June, uncommonly as early as February.	Heavy soils in open grasslands, coastal sage scrub, and chaparral.	Southern Central Coast, western South Coast, and Channel Islands; sea level to 2,300 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Calochortus plummerae Plummer's mariposa lily	—	—	4.2	Between May and July.	Coastal sage scrub; dry, rocky chaparral; and yellow-pine forest.	South Coast and Peninsular Ranges; sea level to 5,580 feet above msl.	Outside known range. Not expected to occur.	Outside known range. Not expected to occur.	Outside known range. Not expected to occur.	Outside known range. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Calochortus weedii var. *intermedius* intermediate mariposa lily*	—	—	1B.2	Between May and July.	Coastal sage scrub and chaparral on dry, rocky, open slopes.	South Coast and northern Peninsular Ranges; sea level to 2,230 feet above msl.	**Suitable habitat present. Observed on the property.**	**Suitable habitat present. Observed on the property.**	**Suitable habitat present. Observed on the property.**	**Suitable habitat present. Observed on the property.**
Camissoniopsis lewisii Lewis' evening-primrose	—	—	3	Between March and June.	Sandy or clay soils of coastal grassland.	South Coast, western Peninsular Ranges, and northern Baja California, Mexico; between sea level and 984 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Centromadia parryi ssp. *australis* southern tarplant*	—	—	1B.1	Between May and November.	Seasonally moist, silty, alkaline soils in salt marshes, alkali meadows, mesic grasslands, vernal pools, ditches, and coastal scrub.	South Coast to northwestern Baja California, Mexico; sea level to 655 feet above msl.	No suitable habitat; outside known elevational range. Not expected to occur.	No suitable habitat; outside known elevational range. Not expected to occur.	No suitable habitat; outside known elevational range. Not expected to occur.	No suitable habitat; outside known elevational range. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Chorizanthe parryi var. *fernandina* San Fernando Valley spineflower	FC	SE	1B.1	Between April and June.	Sandy areas.	Laskey Mesa in Ventura County and the northern Santa Susana Mountains of Los Angeles County; between 295 and 1,640 feet above msl.	Outside known range; no suitable habitat. Not expected to occur.	Outside known range; no suitable habitat. Not expected to occur.	Outside known range; no suitable habitat. Not expected to occur.	Outside known range; no suitable habitat. Not expected to occur.
Chorizanthe polygonoides var. *longispina* long-spined spineflower	—	—	1B.2	Between April and June.	Sandy areas.	Peninsular Ranges; between 98 and 4,921 feet above msl.	Only known from northern Santa Ana Mountains (Gypsum Canyon) in Orange County. Not expected to occur.	Only known from northern Santa Ana Mountains (Gypsum Canyon) in Orange County. Not expected to occur.	Only known from northern Santa Ana Mountains (Gypsum Canyon) in Orange County. Not expected to occur.	Only known from northern Santa Ana Mountains (Gypsum Canyon) in Orange County. Not expected to occur.
Clinopodium chandleri San Miguel savory	—	—	1B.2	Between March and July.	Rocky slopes in chaparral, oak woodland, and riparian forest.	Peninsular Ranges to northern Baja California, Mexico; between sea level and 3,609 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status: USFWS	Status: CDFW	Status: CRPR	Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys: Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Comarostaphylis diversifolia ssp. *diversifolia* summer holly	—	—	1B.2	Between May and June.	Chaparral.	South Coast and Peninsular Ranges to northern Baja California, Mexico; between 328 and 1,804 feet above msl.	Not expected to occur. Not observed during focused surveys.	Not expected to occur. Not observed during focused surveys.	Not expected to occur. Not observed during focused surveys.	Not expected to occur. Not observed during focused surveys.
Dodecahema leptoceras slender-horned spineflower	FE	SE	1B.1	Between April and June.	Sandy or gravelly areas.	East-central South Coast, adjacent foothills of the Transverse Ranges, and Peninsular Ranges; 655 to 2,295 feet above msl.	Outside known range. Not expected to occur.	Outside known range. Not expected to occur.	Outside known range. Not expected to occur.	Outside known range. Not expected to occur.
Dudleya cymosa ssp. *ovatifolia* Santa Monica dudleya	FT	—	1B.2	Between May and June.	Shaded, rocky outcrops and slopes in volcanic or sedimentary soils.	The Santa Monica Mountains in the southern Western Transverse Ranges and Peninsular Ranges; between 492 and 1,640 feet above msl.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Dudleya multicaulis many-stemmed dudleya*	—	—	1B.2	Between April and July.	Heavy (often clayey) soils in coastal sage scrub and native grassland on coastal plains and sandstone outcrops.	South Coast; sea level to 1,970 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Dudleya viscida sticky dudleya	—	—	1B.2	Between May and June.	Bluffs, canyon walls, and rocky cliffs.	Southern South Coast of Orange and San Diego counties; between sea level and 1,476 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Marginally suitable habitat present. Not observed during focused surveys.	Marginally suitable habitat present. Not observed during focused surveys.	Marginally suitable habitat present. Not observed during focused surveys.
Eriastrum densifolium ssp. *sanctorum* Santa Ana River woollystar	FE	SE	1B.1	Between May and September.	Washes, floodplains, and dry river beds.	Eastern South Coast (i.e., the Santa Ana River drainage and southwestern San Bernardino County); sea level to 1,640 feet above msl.	No suitable habitat. Considered extirpated from Orange County.	No suitable habitat. Considered extirpated from Orange County.	No suitable habitat. Considered extirpated from Orange County.	No suitable habitat. Considered extirpated from Orange County.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Hesperocyparis forbesii Tecate cypress	—	—	1B.1	—	Chaparral.	Western Peninsular Ranges to northwestern Baja California, Mexico; planted outside native range; between 1,476 and 4,921 feet above msl.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Hordeum intercedens bobtail barley	—	—	3.2	Between March and June.	Vernal pools; dry, saline streambeds; and alkaline flats.	San Joaquin Valley, outer South Coast Ranges, South Coast, Channel Islands, and Peninsular Ranges to northwestern Baja California, Mexico; between sea level and 1,640 feet above msl.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Imperata brevifolia California satintail	—	—	2B.1	Between September and May.	Wet springs, meadows, streambanks, and floodplains.	Outer North Coast Ranges, Cascade Range foothills, southern Sierra Nevada foothills, San Joaquin Valley, South Coast, Transverse Ranges, and deserts to Utah, Texas, and Mexico; sea level and 1,640 feet above msl.	Potentially suitable habitat present; known from only one location in Orange County. Not observed during focused surveys.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Lepechinia cardiophylla heart-leaved pitcher sage	—	—	1B.2	Between April and July.	Chaparral.	Peninsular Ranges; between 1,969 and 3,937 feet above msl.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.
Lepidium virginicum var. *robinsonii* Robinson's pepper-grass	—	—	4.3	Between January and July.	Dry sandy or thin soils in coastal sage scrub and chaparral.	Southwestern California and Baja California, Mexico; sea level and 1,640 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Lilium humboldtii ssp. *ocellatum* ocellated Humboldt lily	—	—	4.2	Between May and August.	Oak canyons, chaparral, and yellow-pine forest.	Southern, central-western, and southwestern California; between sea level and 5,906 feet above msl.	**Suitable habitat present. Observed on the property.**	No suitable habitat. Not expected to occur.	Suitable habitat present. Not observed during focused surveys.	No suitable habitat. Not expected to occur.
Monardella hypoleuca ssp. *lanata* felt-leaved monardella[a]	—	—	1B.2	Between May and October.	On rocky, granitic slopes or hillsides in chaparral.	Southwesstern Peninsular Ranges of San Diego County to northern Baja California, Mexico; between 984 and 4,920 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Monardella macrantha ssp. *hallii* Hall's monardella	—	—	1B.3	Between May and August.	Chaparral and woodland.	Southern San Bernardino Mountains and Peninsular Ranges; between 1,968 and 6,562 feet above msl.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR
IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Nama stenocarpum mud nama	—	—	2B.2	Between March and October.	Intermittently wet areas, margins of vernal pools and ponds.	San Joaquin Valley, South Coast, southern Channel Islands, western Peninsular Ranges, southeastern Sonoran Desert to Texas and northern Mexico; sea level to 2,657 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Nolina cismontana peninsular nolina	—	—	1B.2	Between May and July.	Dry chaparral or coastal mountains.	South Coast, Western Transverse Ranges, and Peninsular Ranges; 655 to 4,265 feet above msl.	**Suitable habitat present. Observed on the property.**	**Suitable habitat present. Observed on the property.**	**Suitable habitat present. Observed on the property.**	Suitable habitat present. Not observed during focused surveys.
Penstemon californicus California beardtongue	—	—	1B.2	Between May and June.	Sandy soils of yellow-pine forest or pinyon/juniper woodland.	Peninsular Ranges and Mexico; between 3,937 and 7,546 feet above msl.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR
IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Pentachaeta aurea ssp. *allenii* Allen's pentachaeta	—	—	1B.1	Between March and May.	Grassy areas.	Southern South Coast and Peninsular Ranges of Orange County; sea level to 1,640 feet above msl.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Phacelia keckii Santiago Peak phacelia	—	—	1B.3	Between May and June.	Open chaparral.	The Santa Ana Mountains of the Peninsular Ranges; 1,640 to 5,249 feet above msl.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.
Piperia cooperi chaparral rein-orchid	—	—	4.2	Between June and August.	Generally dry sites in scrub, chaparral, woodland, or forest.	South Coast, San Gabriel Mountains, Peninsular Ranges, Santa Catalina Island, to Baja California, Mexico; between sea level and 4,921 feet above msl.	**Suitable habitat present. Observed on the property.**	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Polygala cornuta var. fishiae Fish's milkwort	—	—	4.3	Between May and August.	Chaparral and oak woodland.	Southern Outer South Coast Ranges, Western Transverse Ranges, San Gabriel Mountains, and Peninsular Ranges to northern Baja California, Mexico; between 295 and 4,167 feet above msl.	**Suitable habitat present. Observed on the property.**	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Pseudognaphalium leucocephalum white rabbit-tobacco	—	—	2B.2	Between August and November, uncommonly as early as July or as late as December.	Sandy or gravelly benches, dry stream bottoms, and canyon bottoms.	South Coast, San Bernardino Mountains, and Peninsular Ranges to Arizona, New Mexico, and Mexico; sea level to 1,640 feet above msl.	Suitable habitat present. Not observed during focused surveys.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Quercus dumosa Nuttall's scrub oak	—	—	1B.1	Between February and April, uncommonly as late as August.	Generally in sandy soils near the coast, sandstone, chaparral, or coastal sage scrub.	South Coast, Peninsular Ranges, and Baja California, Mexico; sea level to 656 feet above msl.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.	Outside known elevation range. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Romneya coulteri Coulter's matilija poppy	—	—	4.2	Between March and July.	Dry washes and canyons.	South Coast, Western Transverse Ranges, and Peninsular Ranges; sea level to 3,937 feet above msl.	**Suitable habitat present. Observed on the property.**	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.	Suitable habitat present. Not observed during focused surveys.
Senecio aphanactis chaparral ragwort	—	—	2B.2	Between January and April.	Alkaline flats and dry, open rocky areas of coastal bluff scrub and coastal sage scrub.	Central Western California and South Coast to Baja California, Mexico; 30 to 1,805 feet above msl.	Suitable habitat present. Surveys not conducted during blooming period.	Suitable habitat present. Surveys not conducted during blooming period.	Suitable habitat present. Surveys not conducted during blooming period.	Suitable habitat present. Surveys not conducted during blooming period.
Sidalcea neomexicana salt spring checkerbloom	—	—	2B.2	Between March and June.	Alkaline seeps, springs, and marshes.	South Coast, San Gabriel Mountains, San Bernardino Mountains, Peninsular Ranges, and southwestern Mojave Desert to New Mexico and northern Mexico; possibly extirpated from the Western Transverse Ranges; sea level to 4,920 feet above msl.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 10 (Continued)
SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW	CRPR				Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Tetracoccus dioicus Parry's tetracoccus	—	—	1B.2	Between April and May.	Dry slopes, chaparral.	Southern South Coast of San Diego County, western Peninsular Ranges, and Baja California, Mexico; sea level to 3,281 feet above msl.	Known from only one location in Orange County (San Juan Canyon). Not observed during focused surveys.	Known from only one location in Orange County (San Juan Canyon). Not observed during focused surveys.	Known from only one location in Orange County (San Juan Canyon). Not observed during focused surveys.	Known from only one location in Orange County (San Juan Canyon). Not observed during focused surveys.

USFWS: U.S. Fish and Wildlife Service; CDFW: California Department of Fish and Wildlife; CRPR: California Rare Plant Rank; msl: mean sea level

LEGEND

Federal (USFWS)
FE Endangered
FT Threatened
FC Candidate

State (CDFW)
SE Endangered

California Rare Plant Rank (CRPR)

1B Plants Rare, Threatened, or Endangered in California and Elsewhere
2B Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
3 Plants about which we need more information – A Review List
4 Plants of Limited Distribution – A Watch List

CRPR Threat Code Extensions
.1 Seriously Threatened in California (over 80% of occurrences threatened; high degree and immediacy of threat)
.2 Fairly Threatened in California (20–80% of occurrences threatened; moderate degree and immediacy of threat)
.3 Not Very Threatened in California (<20% of occurrences threatened; low degree and immediacy of threat or no current threats known)

* Proposed covered species in the NCCP/HCP
[a] CNDDB reports this plant from the Santa Ana Mountains. However Elvin and Sanders (2009) studied these plants from the Santa Ana Mountains and determined them to be an undescribed taxon, not felt-leaved monardella. They described the plant as intermediate monardella (*Monardella hypoleuca* ssp. *intermedia*), which is not a special status plant. The CNDDB has not yet been updated with this information. Some individuals of intermediate monardella were found on the Ferber Ranch property.

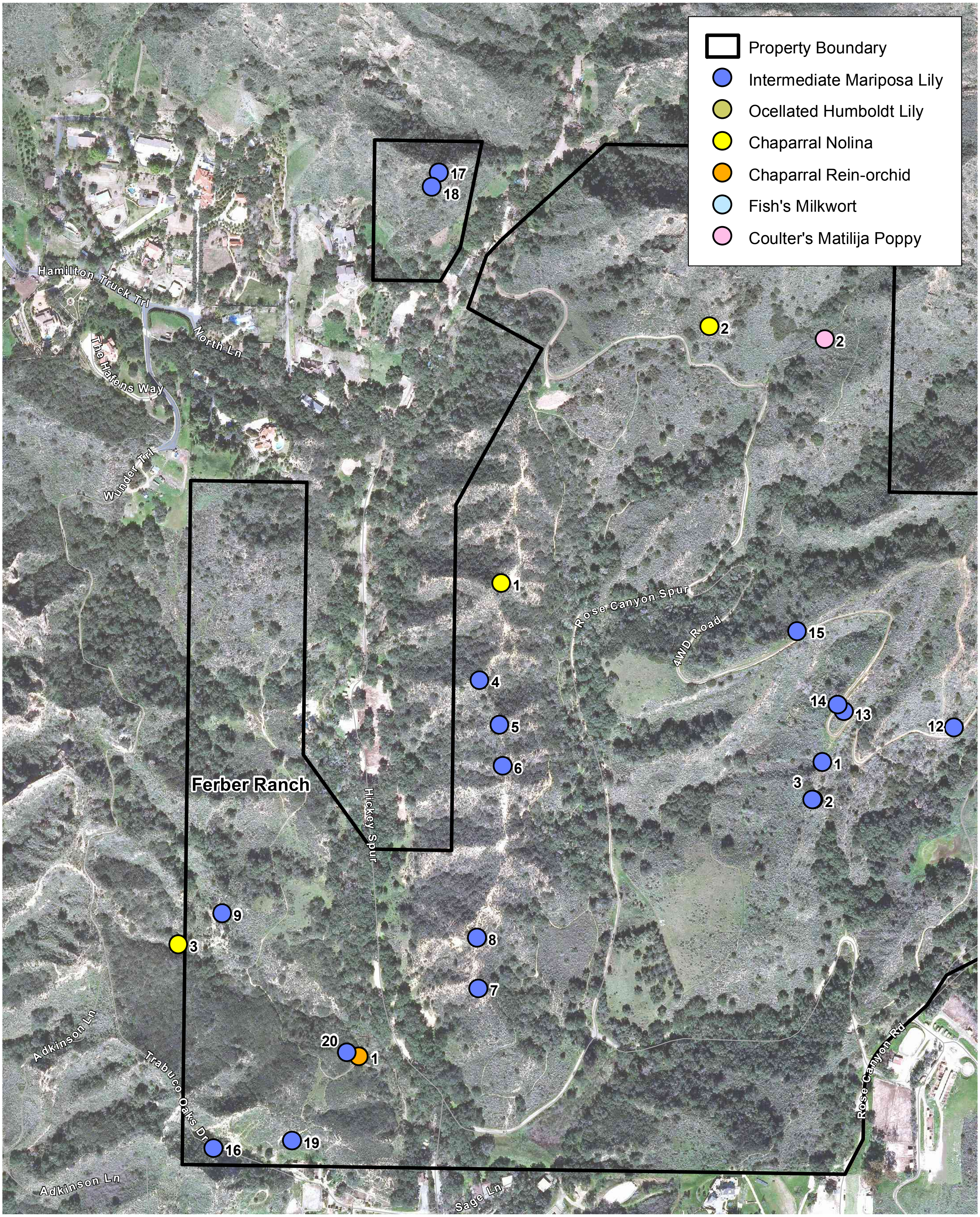
Source: BonTerra Consulting 2013b.

Intermediate Mariposa Lily

Intermediate mariposa lily was observed on all four south county properties. Populations were observed throughout the Ferber Ranch, O'Neill Oaks, and Hafen properties; one population was observed in the drainage running through the center of the Saddle Creek South property. Details on the occurrences are summarized in Table 11 and illustrated on Exhibits 14A, 14B, 14C, and 14D.

TABLE 11
INTERMEDIATE MARIPOSA LILY POPULATIONS OBSERVED ON THE SOUTH COUNTY PROPERTIES

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
Ferber Ranch					
F-1	1	Rocky clay soil on south-facing slope; associated with California sagebrush, black sage, chaparral yucca, and deerweed.	100%	0	0
F-2	4	Rocky clay soil on ridgeline; associated with deerweed and California sagebrush.	0	0	100%
F-3	2	Rocky clay soil on ridgeline; associated with California sagebrush, black sage, chaparral yucca, and deerweed	50%	50%	0
F-4	12	Rocky clay soil on ridgeline; associated with California buckwheat, white sage, chaparral yucca, and large-bracted morning-glory (*Calystegia macrostegia*).	75%	25%	0
F-5	12	Rocky clay soil on ridgeline; associated with California buckwheat, white sage, chaparral yucca, and large-bracted morning-glory.	75%	25%	0
F-6	4	Rocky sandy soil on ridgeline; associated with California sagebrush, deerweed, and white sage.	100%	0	0
F-7	3	Sandy soil on ridgeline; associated with scrub oak and crested needlegrass (*Stipa coronata*).	100%	0	0
F-8	2	Sandy clay soil on ridgeline; associated with California sagebrush and everlasting.	100%	0	0
F-9	2	Ridgeline; associated with chamise.	50%	50%	0
F-10	3	Sandy soil with some clay pockets; associated with chaparral yucca, California sagebrush, bedstraw (*Galium* sp.), and California buckwheat.	100%	0	0
F-11	1	Reddish clay loam soil; associated with chaparral yucca, needlegrass (*Stipa* sp.), black sage, and California sagebrush.	100%	0	0
F-12	3	Gravelly sandy soil on southeast-facing slope; associated with chaparral yucca, black sage, bedstraw, orange bush monkeyflower (*Mimulus aurantiacus* ssp. *puniceus*), and dune bentgrass (*Agrostis pallens*).	100%	0	0
F-13	4	Gravelly sandy soil on southeast-facing slope; associated with chaparral yucca, black sage, bedstraw, orange bush monkeyflower, and dune bentgrass.	100%	0	0



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Special Status Plant Locations

Exhibit 14A

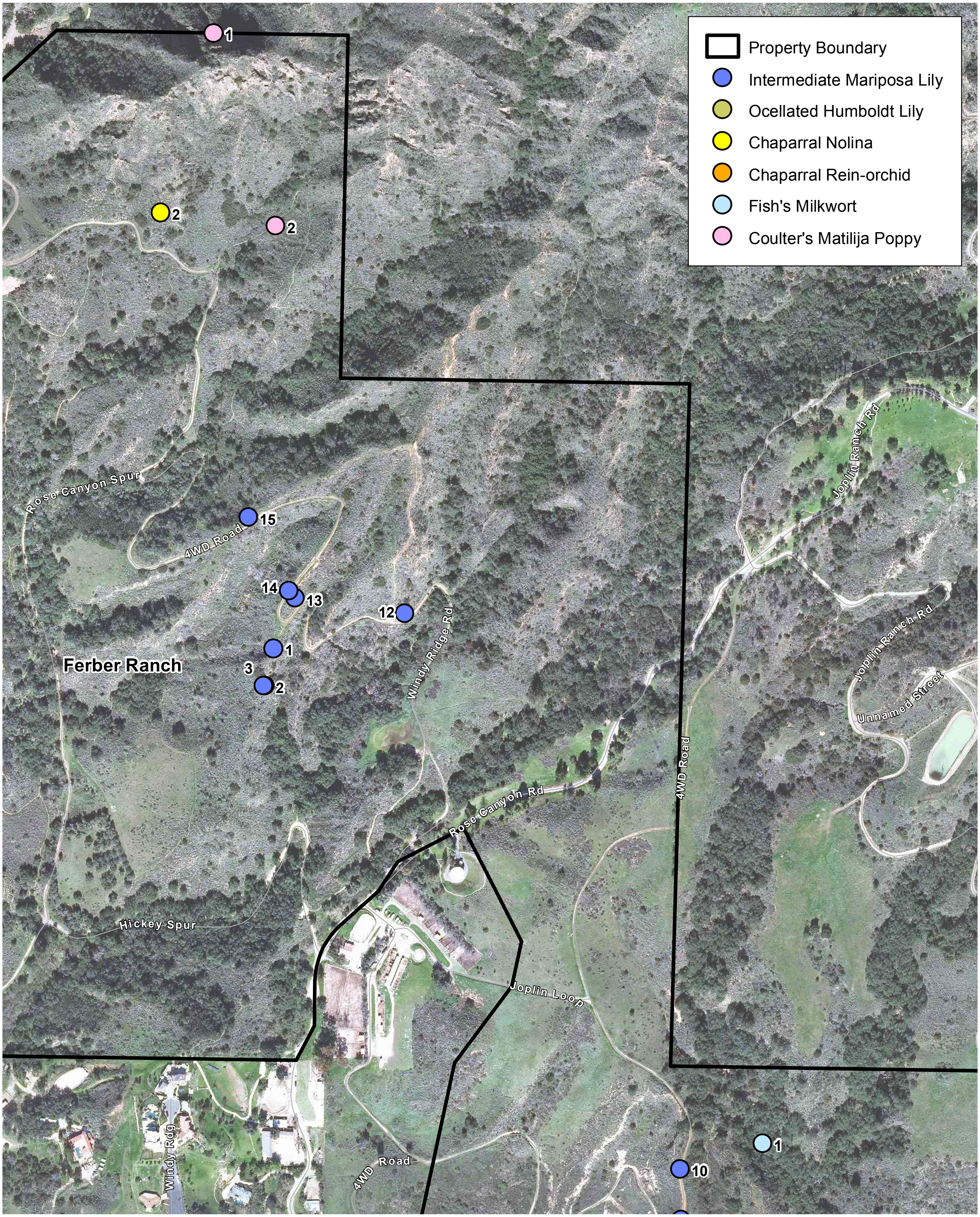
Measure M2 Acquisition Properties/Ferber Ranch Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-13 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex14A_SSplant_Ferber.pdf



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Special Status Plant Locations

Exhibit 14A

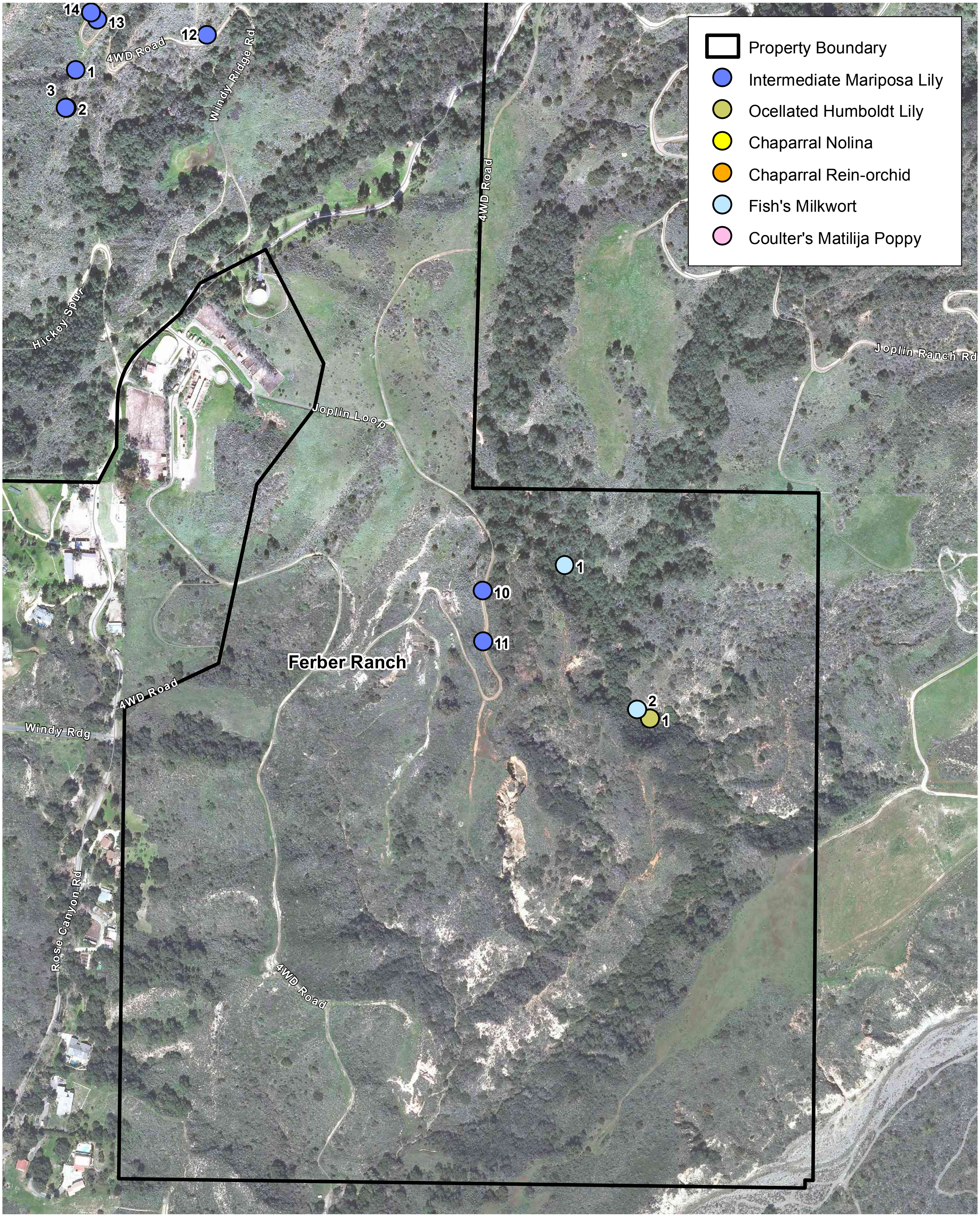
Measure M2 Acquisition Properties/Ferber Ranch Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-13 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex14A_SSplant_Ferber.pdf



Special Status Plant Locations

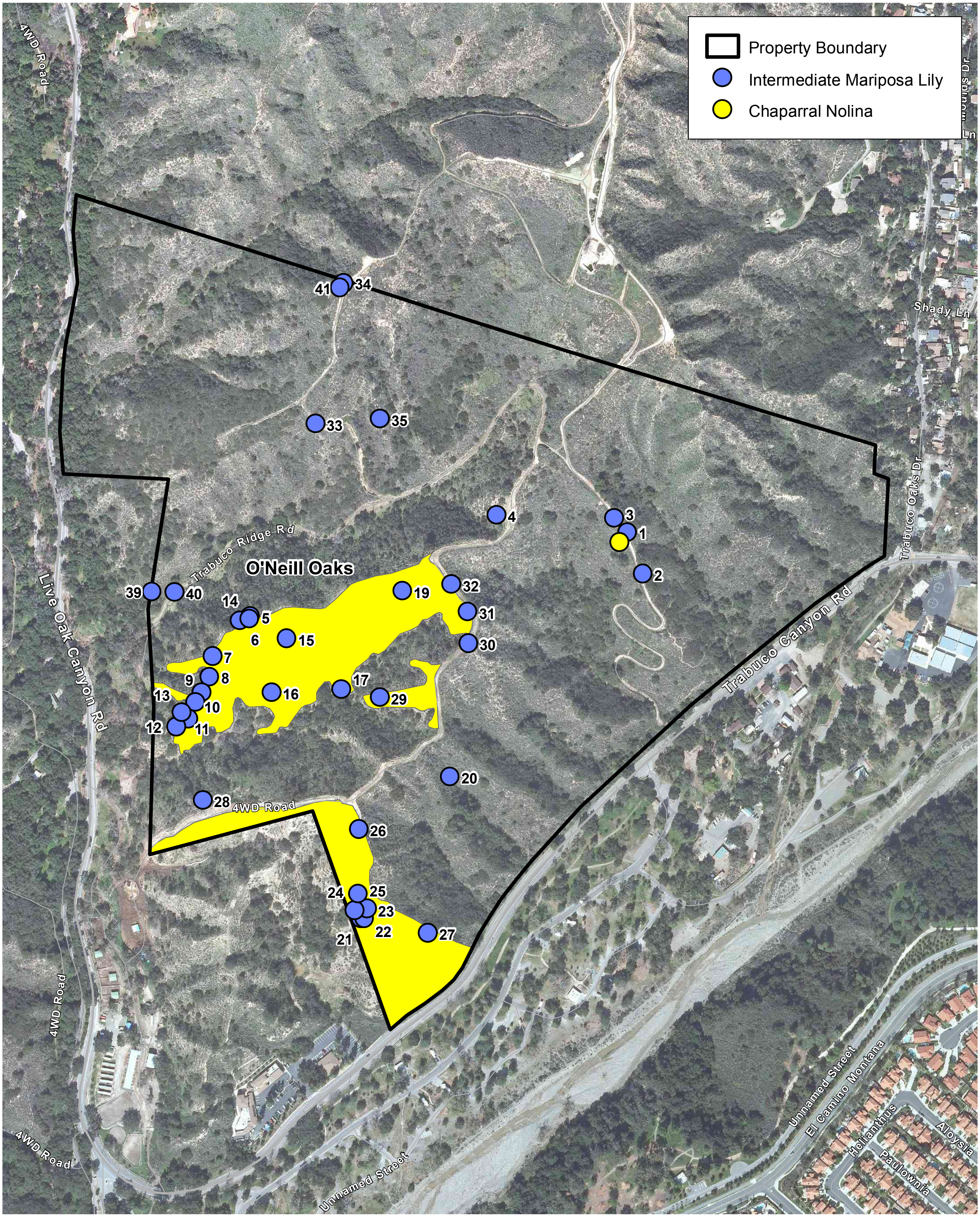
Exhibit 14A

Measure M2 Acquisition Properties/Ferber Ranch Property

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-13 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex14A_SSplant_Ferber.pdf



Special Status Plant Locations

Exhibit 14B

Measure M2 Acquisition Properties/O'Neill Oaks Property

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BonTerra CONSULTING

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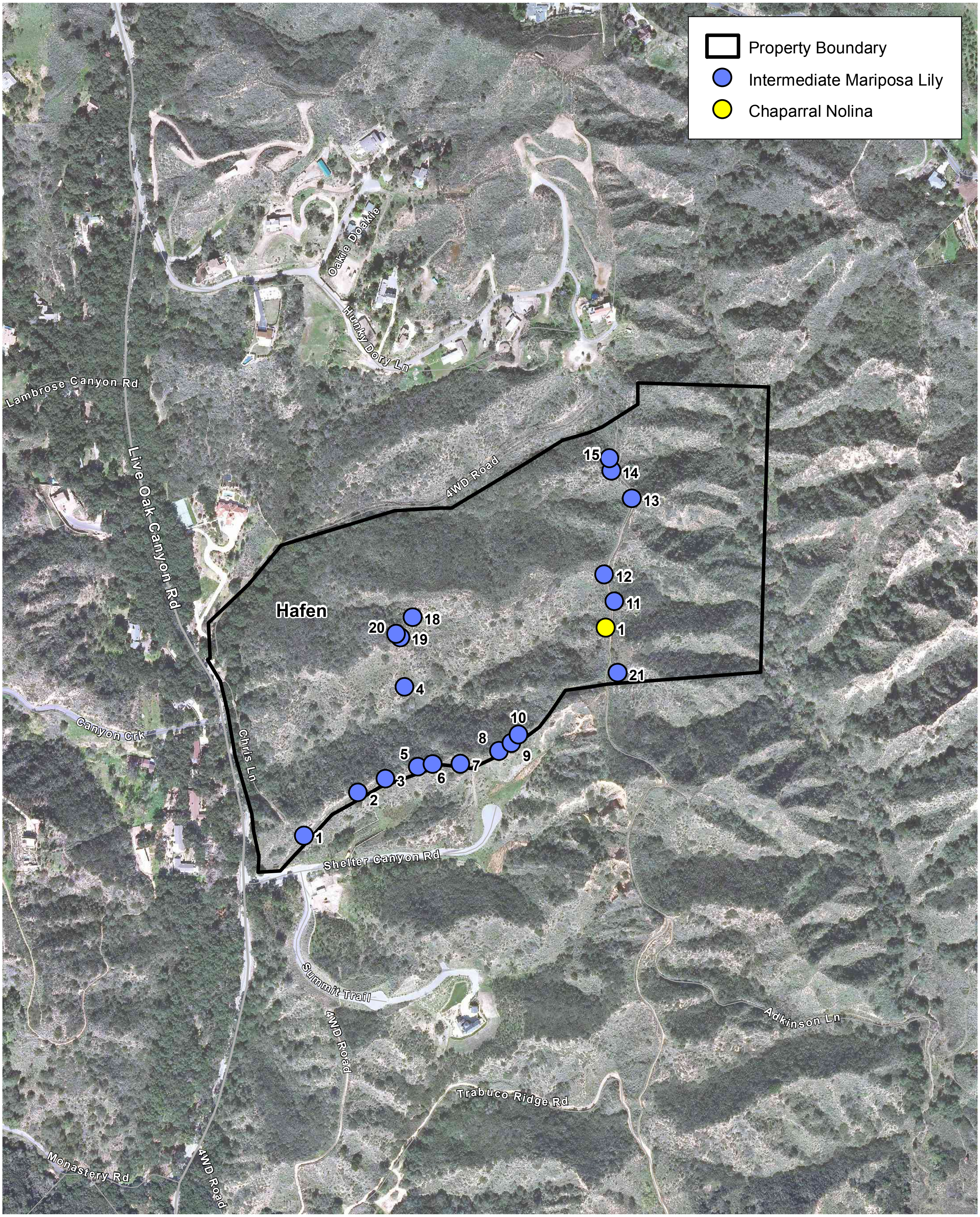

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Special Status Plant Locations

Exhibit 14C

Measure M2 Acquisition Properties/Hafen Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-13 cjs) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex14C_SSplant_Hafen.pdf

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Special Status Plant Locations

Exhibit 14D

Measure M2 Acquisition Properties/Saddle Creek South Property

N W E S

500 250 0 500
Feet

BonTerra CONSULTING

(Rev: 12-24-13 cjs) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex14D_SSplant_SaddleCreek.pdf

TABLE 11
INTERMEDIATE MARIPOSA LILY POPULATIONS OBSERVED ON THE SOUTH COUNTY PROPERTIES

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
F-14	1	Gravelly sandy soil on southeast-facing slope; associated with deerweed, golden-yarrow, narrowly leaved bedstraw (*Galium angustifolium*), black sage, coast prickly-pear, California sagebrush, California buckwheat, and foothill needlegrass.	100%	0	0
F-15	1	Gravelly sandy soil on east-facing slope; associated with black sage, deerweed, California sagebrush, and foothill needlegrass.	100%	0	0
F-16	8	Sandstone-derived cliff face; associated with lance-leaved dudleya (*Dudleya lanceolata*), Bigelow's spike-moss (*Selaginella bigelovii*), narrowly leaved bedstraw, and lichens.	100%	0	0
F-17	1	Rocky gravelly soil; associated with chamise, chaparral yucca, black sage, and sweetbush (*Bebbia juncea* var. *aspera*).	0	100%	0
F-18	1	Rocky gravelly soil; associated with chamise, chaparral yucca, black sage, and sweetbush.	0	100%	0
F-19	3	Sandy soil near top of south-facing slope; associated with chamise, chaparral yucca, and black sage.	0	100%	0
F-20	1	Sandy soils on northeast-facing slope; associated with chaparral rein-orchid (*Piperia cooperi*), chamise, chaparral yucca, and scrub oak.	0	100%	0
O'Neill Oaks					
O-1	1	Sandy soil on ridgeline; associated with California sagebrush, deerweed, California buckwheat, and lance-leaved dudleya.	0	100%	0
O-2	3	Sandy soil on ridgeline; associated with California buckwheat, deerweed, California sagebrush, and lance-leaved dudleya.	0	100%	0
O-3	3	Sandy soil on ridgeline; associated with California buckwheat, deerweed, California sagebrush, and lance-leaved dudleya.	0	100%	0
O-4	9	Sandy soil on northwest-facing slope; associated with American lotus (*Acmispon americanus* var. *americanus*), chalk dudleya (*Dudleya pulverulenta*), white pincushion (*Chaenactis artemisiifolia*), and littleseed muhly (*Muhlenbergia microsperma*).	33%	67%	0
O-5	4	Sandy soil on north-facing slope; associated with California sagebrush and red brome.	75%	25%	0
O-6	5	Sandy loam soil on knoll; associated with California sagebrush, prickly phlox (*Linanthus californicus*), and lemonade berry.	40%	60%	0
O-7	5	Sandy soil on southwest-facing slope; associated with littleseed muhly, California sagebrush, California buckwheat, and chaparral nolina.	20%	80%	0
O-8	5	Sandy soil on southwest-facing slope; associated with chaparral nolina, California sagebrush, and California buckwheat.	0	100%	0

TABLE 11
INTERMEDIATE MARIPOSA LILY POPULATIONS OBSERVED
ON THE SOUTH COUNTY PROPERTIES

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
O-9	4	Sandy and rocky soil on southeast-facing slope; associated with California sagebrush, chaparral nolina, California buckwheat, four-o'clock (*Mirabilis* sp.), and deerweed.	0	100%	0
O-10	4	Sandy and rocky soil on southwest-facing slope; associated with California sagebrush and black sage.	25%	50%	25%
O-11	2	Sandy soil on southwest-facing slope; associated with California sagebrush, California buckwheat, and chaparral yucca.	50%	50%	0
O-12	2	Sandy loam soil on southwest-facing slope; associated with California sagebrush.	100%	0	0
O-13	1	Sandy loam soil on west-facing slope; associated with California sagebrush.	100%	0	0
O-14	2	Loamy sand soil on south/southwest-facing slope; associated with California sagebrush.	100%	0	0
O-15	6	Sandy loam soil on west/southwest-facing slope; associated with chaparral nolina, black sage, and California sagebrush.	33%	67%	0
O-16	19	Sandy soil on west/southwest-facing slope; associated with chaparral nolina, black sage, and California sagebrush.	26%	74%	0
O-17	46	Loamy sand soil in drainage; associated with chaparral nolina, California sagebrush, white sage, chaparral yucca, and splendid mariposa lily (*Calochortus splendens*).	41%	54%	4%
O-19	53	Sandy soil on ridgeline; associated with chaparral nolina.	32%	64%	0
O-20	4	Sandy soil on ridgeline; associated with chaparral nolina, white sage, and California buckwheat.	0	100%	0
O-21	1	Cobbly sand soil on west-facing slope; associated with sessileflower goldenaster (*Heterotheca sessiliflora*).	0	100%	0
O-22	1	Cobbly sand soil on ridgeline; associated with California sagebrush.	0	100%	0
O-23	1	Cobbly sandy soil on south-facing slope; associated with California sagebrush.	0	100%	0
O-24	4	Cobbly sandy soil on ridgeline; associated with California sagebrush and chaparral yucca.	50%	50%	0
O-25	1	Sandy soil on west-facing slope; associated with California sagebrush and California buckwheat.	0	100%	0
O-26	3	Sandy soil on west-facing slope; associated with California sagebrush and chaparral nolina.	0	100%	0
O-27	20	Clay soil on ridgeline.	15%	85%	0
O-28	1	Sandy loam soil on north-facing slope; associated with California sagebrush.	0	100%	0
O-29	36	West-facing slope.	39%	61%	0
O-30	12	Sandy loam soil on west-facing slope; associated with California sagebrush.	92%	8%	0

TABLE 11
INTERMEDIATE MARIPOSA LILY POPULATIONS OBSERVED ON THE SOUTH COUNTY PROPERTIES

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
O-31	4	Ridgeline; associated with white sage, California sagebrush, and chaparral nolina.	0	100%	0
O-32	2	Ridgeline; associated with California sagebrush and chaparral dodder (*Cuscuta californica*).	50%	50%	0
O-33	1	Rocky loam soil on south-facing slope; associated with deerweed.	0	100%	0
O-34	3	Rocky loam soil on south-facing slope; associated with deerweed.	67%	33%	0
O-35	1	Sandy loam soil on south-facing slope; associated with deerweed.	0	100%	0
O-39	5	Silt loam soil on south-facing slope; associated with deerweed.	40%	60%	0
O-40	6	Silty loam soil on east-facing slope; associated with deerweed.	17%	83%	0
O-41	3	Sandy soil on south-facing slope.	0	0	100%
Hafen					
H-1	1	Sandy cobble; associated with chaparral yucca, California sagebrush, crested needlegrass, white sage, and scrub oak.	0	100%	0
H-2	1	Sandy cobble on northwest-facing slope; associated with chaparral yucca.	0	100%	0
H-3	9	Sandy soil; associated with California buckwheat, chaparral yucca, deerweed, and chaparral dodder.	22%	77%	0
H-4	1	Sandy soil on northwest-facing slope; associated with California buckwheat.	0	100%	0
H-5	5	Sandy soil; associated with California sagebrush.	40%	60%	0
H-6	2	Sandy soil on northwest-facing slope; associated with deerweed, California sagebrush, and chaparral yucca.	50%	50%	0
H-7	3	Sandy cobble on west-facing slope; associated with California buckwheat and chaparral yucca.	0	100%	0
H-8	1	Sandy soil; associated with deerweed.	0	0	100%
H-9	1	Sandy soil on southeast-facing slope; associated with deerweed.	0	100%	0
H-10	1	Sandy soil; associated with deerweed.	0	100%	0
H-11	5	Cobbly sandy soil on ridgeline; associated with chaparral yucca, California buckwheat, California sagebrush, black sage, scrub oak, and chaparral dodder.	20%	80%	0
H-12	2	Sandy soil on ridgeline; associated with chaparral yucca, California buckwheat, chaparral dodder, and California sagebrush.	0	100%	0
H-13	1	Sandy soil on ridgeline; associated with California sagebrush, chaparral dodder, and narrowly leaved bedstraw.	100%	0	0
H-14	4	Sandy soil on ridgeline; associated with chaparral nolina, California sagebrush, narrowly leaved bedstraw, and black sage.	25%	75%	0

TABLE 11
INTERMEDIATE MARIPOSA LILY POPULATIONS OBSERVED ON THE SOUTH COUNTY PROPERTIES

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
H-15	23	Sandy soil on ridgeline; associated with chaparral yucca, chaparral nolina, deerweed, California buckwheat, and narrowly leaved bedstraw.	26%	70%	4%
H-18	3	Sandy soil on south-/southwest-facing slope; associated with California buckwheat.	33%	67%	0
H-19	1	Cobbly sand on south-facing slope; associated with chaparral nolina.	0	100%	0
H-20	1	Cobbly sand on west-facing slope; associated with chaparral nolina.	0	100%	0
H-21	9	Sandy soil; associated with crested needlegrass and deerweed.	11%	88%	0
Saddle Creek South					
S-1	2	Red sandy clay soil at base of steep west-/southwest-facing slope; associated with California sagebrush, splendid mariposa lily, California buckwheat, and California fuchsia (*Epilobium canum*).	100%	0	0

Ocelated Humboldt Lily

Ocelated Humboldt lily (*Lilium humboldtii* ssp. *ocellatum*) was observed on the Ferber Ranch property. Two individuals were observed near the southeastern portion of the property. Details on the occurrence are summarized in Table 12 and illustrated on Exhibit 14A.

TABLE 12
OCELATED HUMBOLDT LILY POPULATIONS OBSERVED ON THE FERBER RANCH PROPERTY

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
F-1	2	Gravelly sandy loam soil in shaded riparian habitat; associated with coast live oak, western poison oak, Fish's milkwort, and mugwort.	50%	50%	0

Chaparral Nolina

Chaparral nolina was observed on the Ferber Ranch, O'Neill Oaks, and Hafen properties (Table 13; Exhibits 14A, 14B, and 14C). Relatively small populations were observed at three locations near the eastern side of the Ferber Ranch property. Large populations were observed throughout the O'Neill Oaks and Hafen properties. Over 10,000 individuals were observed throughout south-facing slopes in California sagebrush – California buckwheat scrub in the southern half of the O'Neill Oaks property and along a dirt road on the eastern side of the property. Approximately 5,000 individuals were observed along a ridgeline in California sagebrush – California buckwheat scrub on the Hafen property.

TABLE 13
CHAPARRAL NOLINA POPULATIONS OBSERVED
ON THE SOUTH COUNTY PROPERTIES

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
Ferber Ranch					
F-1	1	Sandy clay on ridgeline; associated with bush monkeyflower, deerweed, chamise, and crested needlegrass.	100%	0	0
F-2	~200	Gravelly sandy soil on south-facing slope in California sagebrush scrub; associated with California sagebrush, lemonadeberry, golden-yarrow, black sage, and slender sunflower.	10%	90%	0
F-3	1	Northeast-facing slope in chamise chaparral; associated with chamise, white sage, and black sage.	0	0	100%
O'Neill Oaks					
Not labeled	~10,000	South-facing slopes throughout property in California sagebrush – California buckwheat scrub.	DNR	DNR	DNR
Hafen					
H-1	~5,000	Along ridgeline in California sagebrush – California buckwheat scrub	DNR	DNR	DNR
DNR: Did not record.					

Chaparral Rein-Orchid

Chaparral rein-orchid (*Piperia cooperi*) was observed on the Ferber Ranch property. Two individuals were observed near the center of the eastern side of the property. Details on the occurrence are summarized in Table 14 and illustrated on Exhibit 14A.

TABLE 14
CHAPARRAL REIN-ORCHID POPULATIONS OBSERVED
ON THE FERBER RANCH PROPERTY

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
F-1	2	Sandy soil on northeast-facing slope in chaparral/sage scrub; associated with intermediate mariposa lily, chamise, chaparral yucca, and scrub oak.	0	50%	50%

Fish's Milkwort

Fish's milkwort (*Polygala cornuta* var. *fishiae*) was observed on the Ferber Ranch property. Thirty-one individuals were observed in an ephemeral drainage in the southeastern region of the property. Details on the occurrences are summarized in Table 15 and illustrated on Exhibit 14A.

TABLE 15
FISH'S MILKWORT POPULATIONS OBSERVED
ON THE FERBER RANCH PROPERTY

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
F-1	11	Loamy soil on east-facing slope in coast live oak woodland; associated with western poison oak and California goldenrod.	100%	0	0
F-2	20	Sandy loam soil on moderate, east-facing slope in coast live oak woodland; associated with western poison oak and western sycamore.	100%	0	0

Coulter's Matilija Poppy

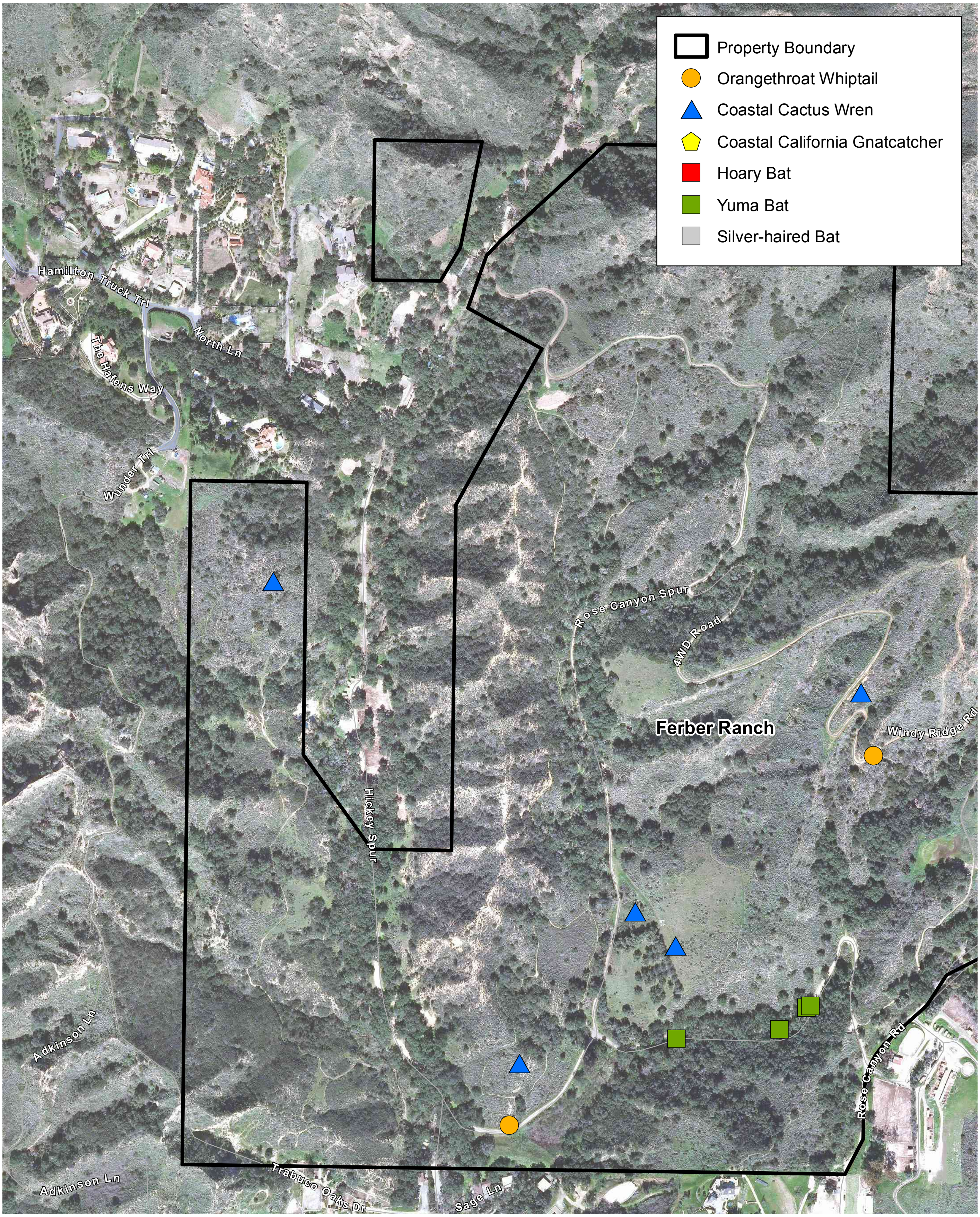
Coulter's matilija poppy (*Romneya coulteri*) was observed on the Ferber Ranch property. Sixty-five individuals were observed in the northern portion of the property. Details on the occurrances are summarized in Table 16 and illustrated on Exhibit 14A.

TABLE 16
COULTER'S MATILIJA POPPY POPULATIONS OBSERVED
ON THE FERBER RANCH PROPERTY

Population	Number of Individuals	Habitat Description	Phenology		
			Percent Vegetative	Percent Flowering	Percent Fruiting
F-1	15	South-facing slope in laurel sumac – lemonade berry chaparral with California sagebrush – California buckwheat scrub.	0	100%	0
F-2	50	South-facing slope in California sagebrush scrub.	0	0	100%

3.3.4 <u>Special Status Wildlife</u>

Based on the results of the literature review and the list of proposed covered wildlife species for the NCCP/HCP, 67 special status wildlife species are known to occur in vicinity of the south county properties. These species and their potential for occurrence (i.e., based on the presence of suitable habitat) are summarized in Table 17. Note that these species are listed taxonomically. Thirteen special status wildlife species were observed on the south county properties (see Exhibits 15A, 15B, 15C, and 15D. Species for which focused surveys were conducted are discussed after the table.



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Special Status Wildlife Locations

Exhibit 15A

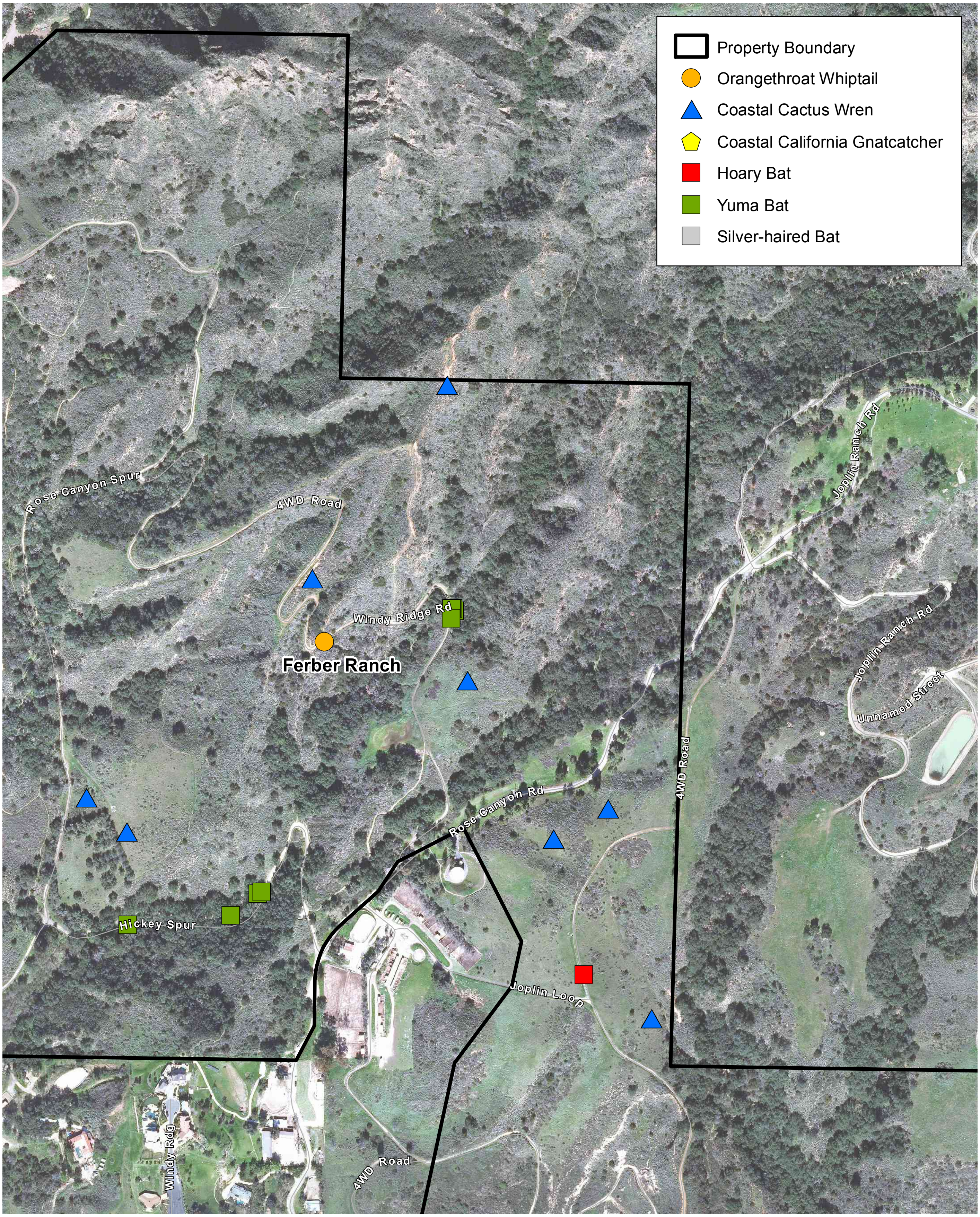
Measure M2 Acquisition Properties/Ferber Ranch Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-13 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex15A_SSAnimals_Ferber.pdf



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Special Status Wildlife Locations

Exhibit 15A

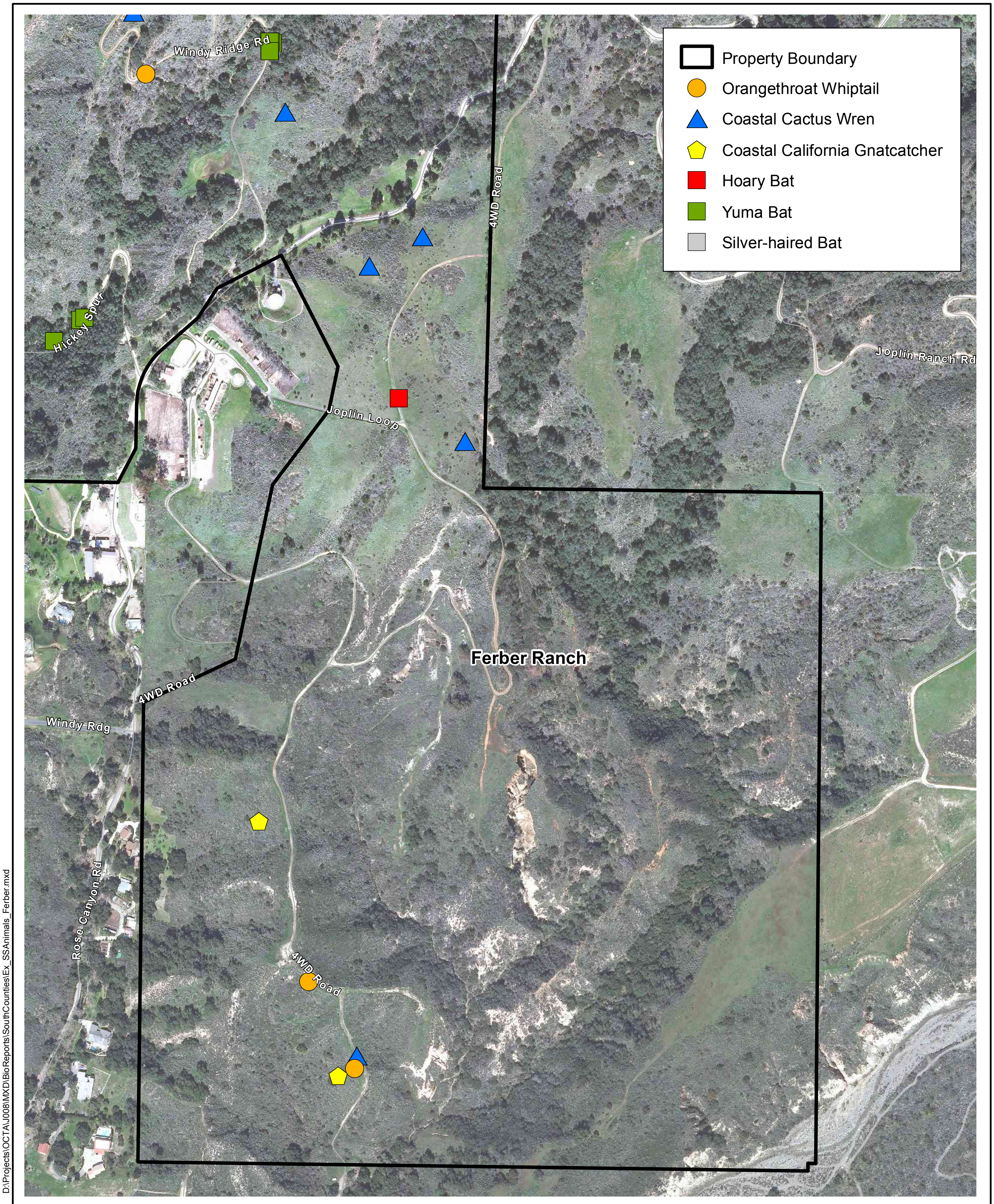
Measure M2 Acquisition Properties/Ferber Ranch Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-13 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex15A_SSAnimals_Ferber.pdf



Special Status Wildlife Locations

Exhibit 15A

Measure M2 Acquisition Properties/Ferber Ranch Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

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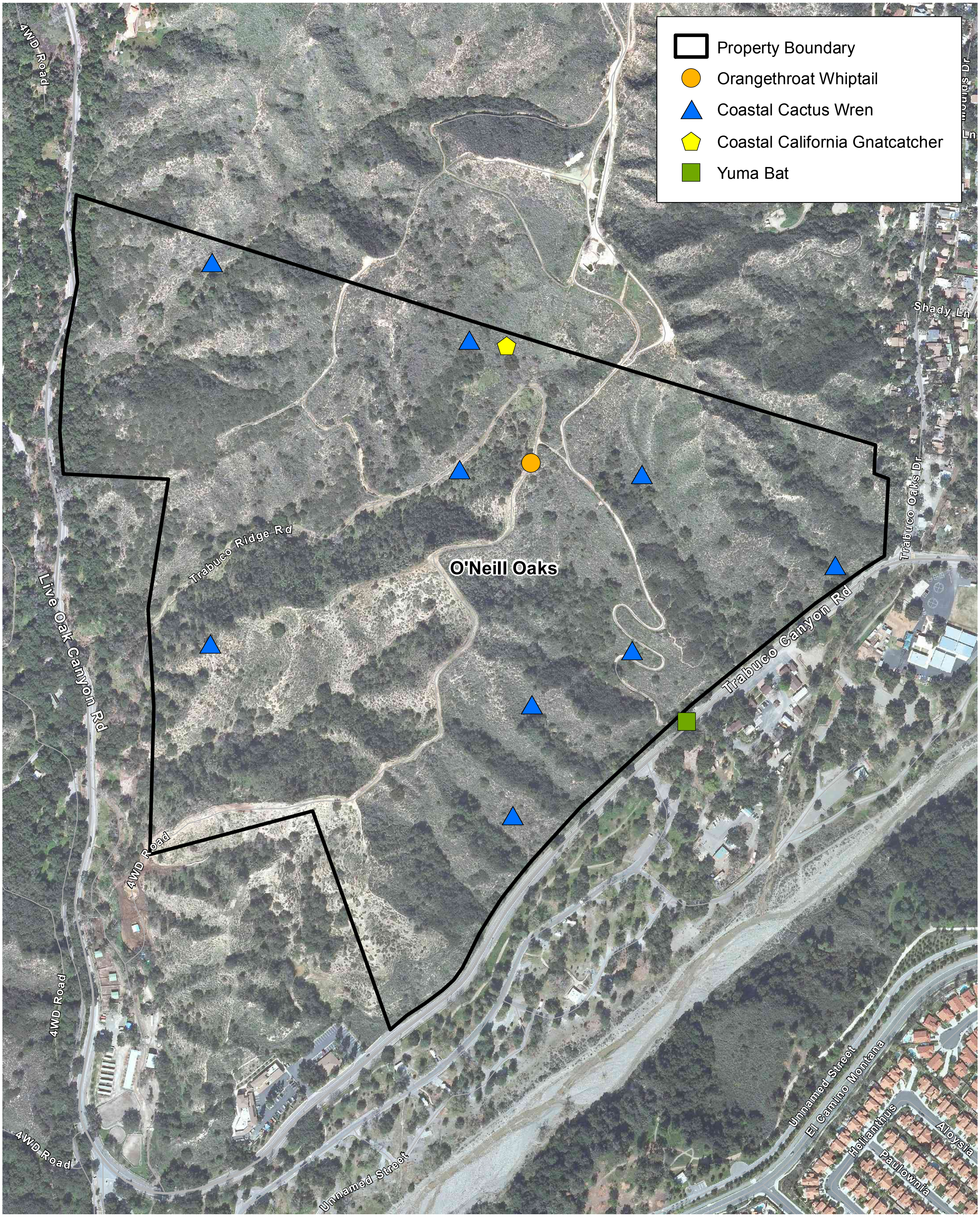

Special Status Wildlife Locations

Exhibit 15B

Measure M2 Acquisition Properties/O'Neill Oaks Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

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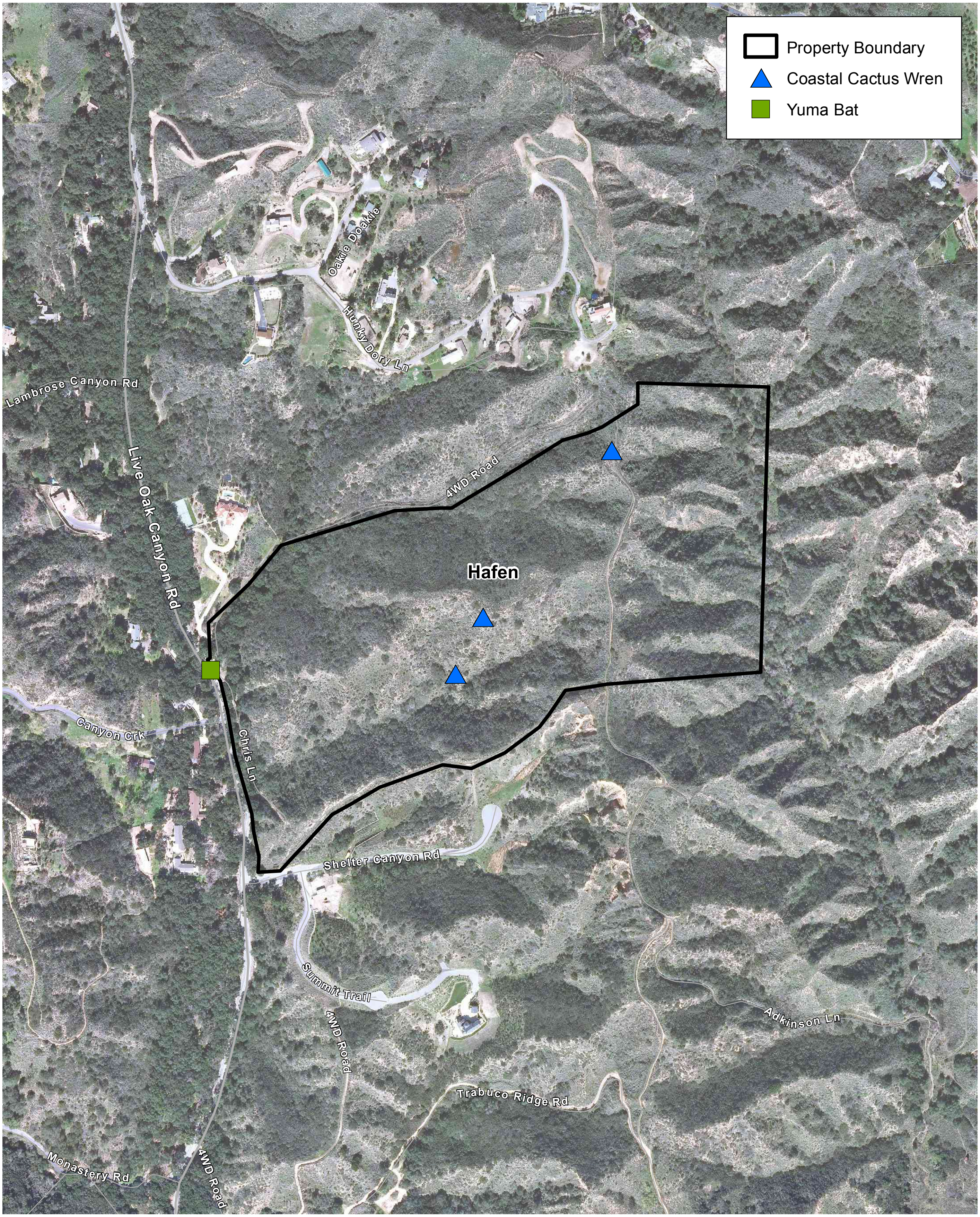

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Special Status Wildlife Locations

Exhibit 15C

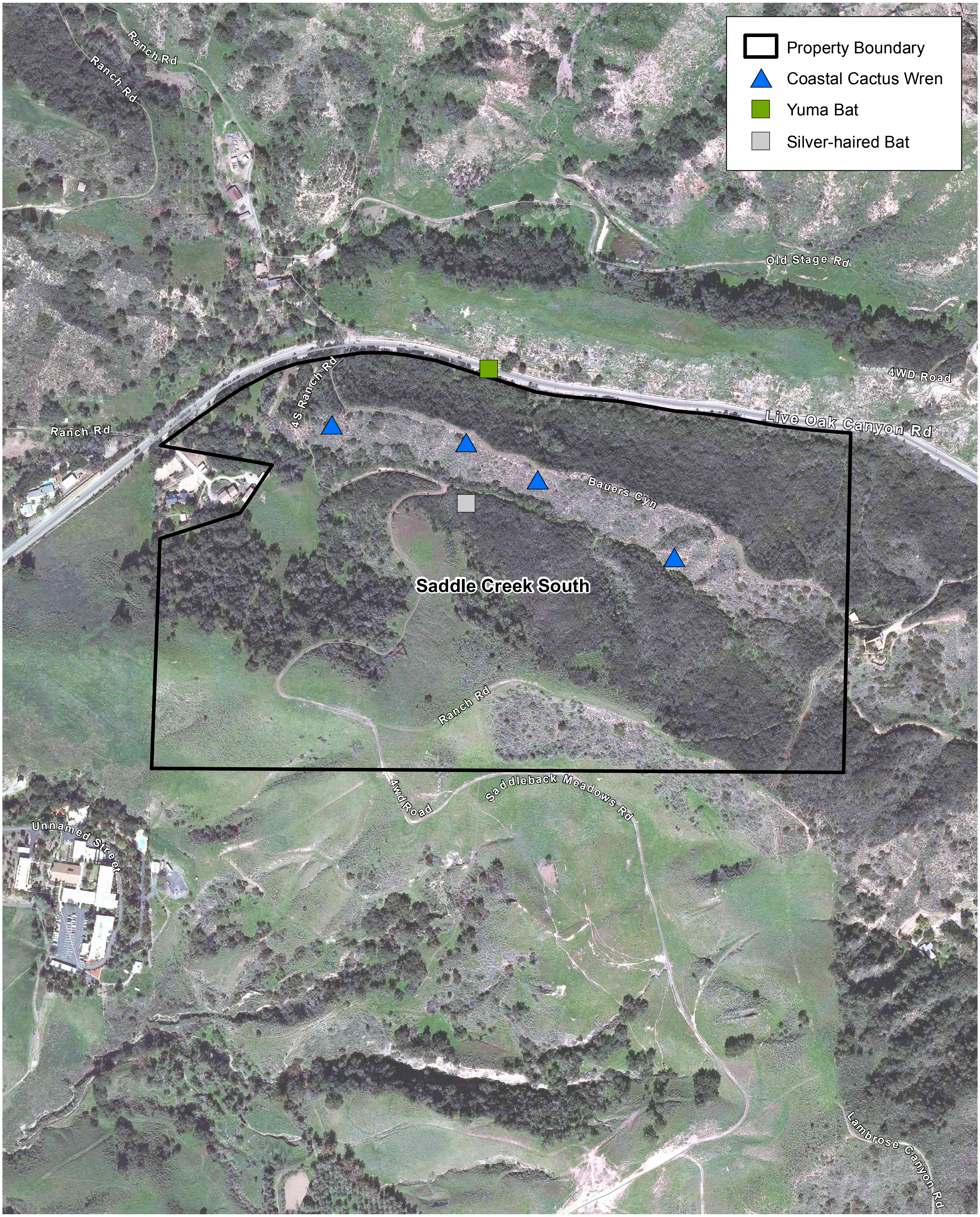
Measure M2 Acquisition Properties/Hafen Property

N W E S

500 250 0 500 Feet

BonTerra CONSULTING

(Rev: 12-24-13 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex15C_SSAnimals_Hafen.pdf



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Special Status Wildlife Locations

Exhibit 15D

Measure M2 Acquisition Properties/Saddle Creek South Property

N W E S

500 250 0 500
Feet

BonTerra CONSULTING

(Rev: 12-24-13 CJS) Projects\OCTA\J008\Graphics\BioReport\SouthCounty\Ex15D_SSAnimals_SaddleCreek.pdf

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Invertebrates								
Branchinecta sandiegonensis San Diego fairy shrimp	FE	–	Vernal pools.	Coastal Orange County and San Diego County.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Streptocephalus woottoni Riverside fairy shrimp	FE	–	Vernal pools and ephemeral ponds.	Coastal Ventura County south to Baja California, Mexico.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Fish								
Catostomus santaanae Santa Ana sucker	FT	SSC	Small to medium-sized perennial streams, preferably with coarse gravel, rubble, or boulder substrate.	Los Angeles, San Gabriel, and Santa Ana River drainages.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Gila orcuttii arroyo chub*	–	SSC	Coastal freshwater streams and rivers with steady current and emergent vegetation.	Currently found at three native locations: Santa Margarita and De Luz Creeks in San Diego County, Trabuco and San Juan Creeks in Orange County; and Malibu Creek in Los Angeles County; introduced elsewhere.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Oncorhynchus mykiss irideus Southern steelhead – Southern California DPS	FE	SSC	Cool water streams; spawns in areas of gravelly substrate in riffles or pool tails.	The Southern California Steelhead DPS occurs from the Santa Maria River to the Tijuana River at the U.S. and	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR
IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
				Mexican border in seasonally accessible rivers and streams.				
Rhinichthys osailolus Santa Ana speckled dace	—	SSC	Small streams, springs, large rivers, deep lakes; prefer clear oxygenated water with movement from current or waves; typically overhanging vegetation cover.	Restricted to the headwaters of the Los Angeles, Santa Ana, and San Gabriel rivers.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Amphibians								
Spea hammondii western spadefoot	–	SSC	Quiet streams, vernal pools, and temporary ponds.	Great Valley and bordering foothills and Coast Ranges from Monterey Bay south to Baja California, Mexico.	Marginally suitable habitat. Limited potential to occur.	Marginally suitable habitat. Limited potential to occur.	Marginally suitable habitat. Limited potential to occur.	Marginally suitable habitat. Limited potential to occur.
Anaxyrus californicus [*Bufo microscaphus californicus*] arroyo toad	FE	SSC	Semi-arid regions near washes or intermittent streams; requires suitable breeding pools.	Southern California and northwestern Baja California, Mexico.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Lithobates [*Rana*] *pipiens* northern leopard frog (native populations)	–	SSC	Variety of habitats such as grasslands, brushlands, woodlands, and forests; requires aquatic habitat for overwintering and breeding.	Broadly distributed; native in California only from Modoc and Lassen Counties.	Outside native range of species; not expected to occur as a native population.	Outside native range of species; not expected to occur as a native population.	Outside native range of species; not expected to occur as a native population.	Outside native range of species; not expected to occur as a native population.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Taricha torosa Coast Range newt	–	SSC	Wet forests, oak forests, chaparral, grasslands. Breeds in streams, rivers, ponds, lakes, and reservoirs.	Coast and coast range mountains from Mendocino County south to San Diego County.	Marginally suitable habitat. Limited potential to occur.	Marginally suitable habitat. Limited potential to occur.	Marginally suitable habitat. Limited potential to occur.	Marginally suitable habitat. Limited potential to occur.
Reptiles								
Actinemys marmorata [*Emys m.*] Pacific [western] pond turtle*	–	SSC	In ponds, lakes, marshes, rivers, streams, and irrigation ditches with a rocky or muddy bottom and aquatic vegetation.	Pacific slope drainages from Washington south to northern Baja California, Mexico.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Phrynosoma blainvillii coast horned lizard*	–	SSC	Scrubland, grassland, coniferous forests, and broadleaf woodland with friable soil for burrowing.	Northern California south to northern Baja California, Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Aspidoscelis hyperytha [*Cnemidophorus hyperythus beldingi*] orangethroat whiptail*	–	SSC	Washes and open areas of sage scrub and chaparral in friable, gravelly soil.	Western Peninsular Ranges from Orange and San Bernardino Counties south to Baja California, Mexico.	Suitable habitat. **Observed on the property.**	Suitable habitat. **Observed on the property.**	Suitable habitat. May occur.	Suitable habitat. May occur.
Aspidoscelis [*Cnemidophorus*] *tigris stejnegeri* coastal whiptail [coastal western whiptail]	–	SA	Hot and dry open areas with sparse foliage such as chaparral, woodland.	Coastal Southern California, mostly west of the Peninsular Ranges and south of the Transverse Ranges, and north into Ventura County.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Anniella pulchra pulchra silvery legless lizard	–	SSC	In loose sandy soil of chaparral, pine-oak woodland, beach, and riparian areas.	Coast, Transverse, and Peninsular Ranges from Contra Costa County south to Baja California, Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Salvadora hexalepis virgultea coast patch-nosed snake	–	SSC	Sandy or rocky grasslands, chaparral, sagebrush plains, piñon-juniper woodlands, and desert scrub.	Coast of California from San Luis Obispo County south to Baja California, Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Thamnophis hammondii two-striped garter snake	–	SSC	Perennial or intermittent freshwater streams with rocky beds bordered by willows or other dense vegetation.	From Monterey County south to El Rosario in Baja California, Mexico.	Limited suitable habitat. Limited potential to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Thamnophis sirtalis ssp. south coast garter snake	–	SSC[a]	Associated with permanent or semi-permanent bodies of water in habitats such as grassland, woodland, scrubland, chaparral, and forest.	Coastal plain from Ventura County to San Diego County.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Lampropeltis zonata pulchra California mountain kingsnake (San Diego population)	–	SSC	Found in diverse habitats including coniferous forests, oak-pine woodlands, riparian woodland, chaparral, manzanita, and coastal sage scrub; wooded areas near a stream with rock outcrops, talus or rotting logs that are exposed to the sun.	Found in three areas in Southern California: in the central San Diego County peninsular ranges - the Laguna, Palomar, Volcan, and Hot Springs Mountains; in the Santa Ana Mountains; and in the Hollywood Hills and the Santa Monica mountains.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Crotalus ruber red-diamond rattlesnake	–	SSC	Open scrub, chaparral, woodland, and grassland.	Orange County and San Bernardino County south to Baja California, Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Birds								
Plegadis chihi white-faced ibis (rookery sites)	–	WL	Nests in extensive marshes with tall marsh plants and feeds in fresh emergent wetland, shallow ponds or lakes, and the muddy ground of wet meadows of irrigated pastures and croplands.	Within Orange County, this species is known to occur at the San Joaquin Marsh and along lower San Diego Creek to Upper Newport Bay and at the Santa Ana River channel.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Accipiter cooperii Cooper's hawk (nesting)	–	WL	Prefers to nest in oak woodlands and riparian woodlands. Forages primarily in forest habitats.	Breeds from southern Canada into northwestern and north-central Mexico. Wintering range extends south.	**Observed on the property.** Expected to occur for foraging and nesting; suitable foraging and nesting habitat.	**Observed on the property.** Expected to occur for foraging and nesting; suitable foraging and nesting habitat.	**Observed on the property.** Expected to occur for foraging and nesting; suitable foraging and nesting habitat.	**Observed on the property.** Expected to occur for foraging and nesting; suitable foraging and nesting habitat.
Accipiter striatus sharp-shinned hawk (nesting)	–	WL	Nests and forages in forest habitats.	Breeds in Alaska and Canada, portions of the U.S., in the West Indies, and south through Mexico, Central America, and South America. Migrant and winter visitor in Orange County.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Aquila chrysaetos golden eagle (nesting and non-breeding/ wintering)	–	FP, WL	Nests in open and semi-open habitats, such as tundra, shrublands, grasslands, woodland-brushlands, coniferous forests, farmland, and riparian habitats. Forages in broad expanses of open country.	Resident throughout Southern California, except in the Colorado Desert and Colorado River, where it is a casual winter visitor.	**Observed foraging on the property.** Limited potential to occur for nesting; marginal nesting habitat.	May occur for foraging; suitable foraging habitat. Limited potential to occur for nesting; marginal nesting habitat.	May occur for foraging; suitable foraging habitat. Limited potential to occur for nesting; marginal nesting habitat.	May occur for foraging; suitable foraging habitat. Limited potential to occur for nesting; marginal nesting habitat.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Buteo regalis ferruginous hawk (non-breeding/ wintering)	–	WL	Open, dry habitats such as grasslands, shrublands, rangelands, and plowed agricultural fields.	Winter resident in California; visitor along the coast of Southern California.	Not expected to occur for foraging or nesting; no suitable foraging habitat and outside the breeding range of the species.	Not expected to occur for foraging or nesting; no suitable foraging habitat and outside the breeding range of the species.	Not expected to occur for foraging or nesting; no suitable foraging habitat and outside the breeding range of the species.	Not expected to occur for foraging or nesting; no suitable foraging habitat and outside the breeding range of the species.
Circus cyaneus northern harrier (nesting)	–	SSC	Breeds on the ground within dense vegetation. Forages in open habitats such as marshes and fields.	Winter migrant throughout Southern California, but a scarce local breeder.	**Observed foraging on the property.** Limited potential to occur for nesting; marginal nesting habitat.	May occur for foraging; suitable foraging habitat. Limited potential to occur for nesting; marginal nesting habitat.	May occur for foraging; suitable foraging habitat. Limited potential to occur for nesting; marginal nesting habitat.	May occur for foraging; suitable foraging habitat. Limited potential to occur for nesting; marginal nesting habitat.
Elanus leucurus white-tailed kite (nesting)	–	FP	Low elevation grassland, agricultural areas, wetlands, oak woodlands, savannahs, and riparian habitat adjacent to open areas.	Resident in coastal Southern California and a visitor and local breeder on the western edge of the deserts.	**Observed on the property.** May occur for nesting. Suitable foraging and nesting habitat.	May occur for foraging and nesting. Suitable foraging and nesting habitat	May occur for foraging and nesting. Suitable foraging and nesting habitat	May occur for foraging and nesting. Suitable foraging and nesting habitat

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Falco columbarius merlin (non-breeding/ wintering)	–	WL	Breeds in forests and prairies. Occures along the coast in open grasslands, savannahs; in inland and montane valleys; and in the desert.	Breeds in northern North America, Europe, and Asia. Fall transient and rare winter visitor in California.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.
Falco mexicanus prairie falcon (nesting)	–	WL	Nests on cliffs. Forages in grassland and scrub vegetation.	Year-round resident of interior Southern California. Winter resident and rare summer resident along the Southern California coast.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.	Suitable foraging habitat; may occur for foraging as a fall or winter visitor. Outside the breeding range of the species; not expected to occur for nesting.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Charadrius alexandrinus nivosus western snowy plover (nesting)	FT[b]	SSC[c]	Nests primarily on dune-backed beaches, barrier beaches, and salt-evaporation ponds; on the coast, it forages on beaches, tide flats, salt flats, and salt ponds.	The Pacific coast populations of the western snowy plover breed from southern Washington south through Baja California, Mexico. In Orange County, breeding is currently limited to Bolsa Chica and the mouth of the Santa Ana River. Migrants have been observed in the County from late summer through winter.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Coccyzus americanus occidentalis western yellow-billed cuckoo (nesting)	FC	SE	Broad areas of old-growth riparian habitats dominated by willows with dense understory.	Breeds primarily along the Sacramento River and south fork of the Kern River; from the Santa Ana River in the region.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Asio otus long-eared owl (nesting)	–	SSC	Nests in dense trees such as oaks and willows. Forages over grasslands and other open habitats.	Breeds in Canada south to northern Baja California, Mexico. Winters throughout breeding range to the interior of Mexico.	May occur for foraging and nesting. Suitable foraging and nesting habitat.	May occur for foraging and nesting. Suitable foraging and nesting habitat.	May occur for foraging and nesting. Suitable foraging and nesting habitat.	May occur for foraging and nesting. Suitable foraging and nesting habitat.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Athene cunicularia burrowing owl (burrow sites; wintering in northern counties)	–	SSC	Sparse vegetation in arid and semi-arid habitats such as grasslands, steppes, deserts, prairies, and agricultural areas. Nests in mammal burrows or man-made cavities.	In California from the Central Valley and Southern California.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Empidonax traillii extimus southwestern willow flycatcher* (nesting)	FE	SE	Riparian habitats with dense growths of willows; often with a scattered overstory of cottonwood.	Breeds in coastal Southern California.	Marginally suitable habitat. Not seen during surveys/not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Lanius ludovicianus loggerhead shrike (nesting)	–	SSC	Grasslands and other dry, open habitats.	Throughout North America; a year-round resident in Southern California.	Suitable habitat. May occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	Suitable habitat. May occur.
Vireo bellii pusillus least Bell's vireo* (nesting)	FE	SE	Riparian habitat dominated by willows with dense understory vegetation.	Breeds throughout the Central Valley and other low-elevation river systems in California and Baja California, Mexico.	Marginally suitable habitat. Not seen during surveys/not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Eremophila alpestris actia California horned lark	–	WL	Open habitats with bare ground or short vegetation, such as shortgrass prairie, deserts, brushy flats, alpine, shrubsteppe, and agricultural areas.	From Alaska and Canadian arctic south to Mexico. Common migrant and winter resident that remains to breed along the Southern California coast.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Progne subis purple martin (nesting)	–	SSC	Breeds in cavities of conifer or western sycamore. Forages over riparian areas, forests, and woodlands.	Throughout much of eastern North American and locally in the Rocky Mountains, Sonoran Desert, Central Mexico, and Pacific coast states. Summer resident and migrant in California.	No suitable habitat due to presence of European starlings. Not expected to occur.	No suitable habitat due to European starlings. Not expected to occur.	No suitable habitat due to European starlings. Not expected to occur.	No suitable habitat due to European starlings. Not expected to occur.
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren* (San Diego and Orange Counties)	–	SSC	Coastal sage scrub and alluvial sage scrub with prickly pear cactus and/or cholla.	Southern Orange County and San Diego County to northwestern Baja California, Mexico.	Suitable habitat. **Observed on the property.**	Suitable habitat. **Observed on the property.**	Suitable habitat. **Observed on the property.**	Suitable habitat. **Observed on the property.**
Polioptila californica californica coastal California gnatcatcher*	FT	SSC	Coastal sage scrub vegetation.	Los Angeles, Orange, Riverside, and San Diego Counties south to Baja California, Mexico.	Suitable habitat**.** **Observed on the property.**	Suitable habitat. **Observed on the property.**	Suitable habitat. Not observed during focused surveys.	Suitable habitat. Not observed during focused surveys.
Dendroica petechia brewsteri yellow warbler (nesting)	–	SSC	Riparian vegetation, often with willows and cottonwoods.	Breeds in Southern California.	Marginally suitable habitat. Not seen during surveys/not expected to occur (except as migrant).	No suitable habitat. Not expected to occur (except as migrant).	No suitable habitat. Not expected to occur (except as migrant).	No suitable habitat. Not expected to occur (except as migrant).

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Icteria virens yellow-breasted chat (nesting)	–	SSC	The border of streams, creeks, sloughs, and rivers in dense thickets and tangles of blackberry, wild grape, and willow.	Summer resident in Southern California along the coast and in the deserts.	Marginally suitable habitat. Not seen during surveys/not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Aimophila ruficeps canescens Southern California rufous-crowned sparrow	–	WL	Steep, dry, rocky, south- or west-facing slopes in scrub vegetation interspersed with grasses and forbs or rock outcrops.	Year-round in Southern California.	Suitable habitat. **Observed on the property.**	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Ammodramus savannarum grasshopper sparrow (nesting)	–	SSC	Dense, dry or well-drained grassland.	Across North America from southern Canada south to Ecuador. Summer resident along the coastal slope of Southern California.	Suitable habitat. May occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	Suitable habitat. May occur.
Amphispiza belli belli Bell's sage sparrow	–	WL	Low, dense chamise chaparral and dry scrub vegetation, often with stands of cactus.	Resident in interior foothills or coastal Southern California.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Agelaius tricolor tricolored blackbird (nesting colony)	–	SSC	Colonially nests in marsh vegetation of bulrushes and cattails. In winter, forages in grasslands, agricultural fields, dairies, and feedlots.	Primarily in California with local nesting colonies in Oregon, Washington, Nevada, and coastal Baja California, Mexico.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Mammals								
Antrozous pallidus pallid bat	–	SSC	Low elevation grasslands, shrublands, woodlands, and forests. Roosts in caves, crevices, mines, bridges, and occasionally in hollow trees.	Throughout California except the high Sierra Nevada from Shasta County to Kern County and in the northwestern portion of the State.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Corynorhinus townsendii Townsend's big-eared bat	–	SSC	Wide variety of habitats except subalpine and alpine. Roosts in caves, mines, tunnels, buildings, or other human-made structures.	Throughout most of California.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Euderma maculatum spotted bat	–	SSC	Foothills, mountains, arid deserts, grasslands, and mixed conifer forests. Roosts in rock crevices, occasionally in caves and buildings.	Western North America from southern British Columbia to Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Lasionycteris noctivagans silver-haired bat	–	SA	Coastal and montane forests, valley foothill woodlands, pinyon-juniper woodlands, and valley foothill and montane riparian habitats. Primarily a forest dweller.	North America, from southern British Columbia to northern Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. **Observed during focused bat surveys.**

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Lasiurus cinereus hoary bat	–	SA	Prefers open habitats or habitat mosaics, with access to trees and open areas or habitat edges.	Widest range of any New World bat, living from Argentina and Chile northward through Canada.	Suitable habitat. **Observed during focused bat surveys.**	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Lasiurus blossevillii western red bat	–	SSC	Prefers riparian areas dominated by walnuts, oaks, willows, cottonwoods, and sycamores where they roost in these broad-leafed trees.	Found in western Canada, the western U.S., western Mexico and Central America.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Lasiurus xanthinus western yellow bat	–	SSC	Valley foothill riparian, desert riparian, desert wash, and palm oasis. Roosts in trees.	Mexican Plateau, coastal western Mexico, and deserts of the southwestern U.S.	Suitable habitat. May occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Myotis ciliolabrum western small-footed myotis	–	SA	Arid uplands, primarily in arid wooded and brushy uplands near water. Roosts in caves, buildings, mines, crevices, and occasionally under bridges and under bark.	Southern British Columbia, Alberta, and Saskatchewan, Canada to the southwestern U.S.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Myotis evotis long-eared myotis	–	SA	Nearly all brush, woodland, and forest habitats, but appears to prefer coniferous woodlands and forests. Roosts in buildings, crevices, spaces under bark, and snags.	Western Canada; western U.S.; and Baja California, Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Myotis yumanensis Yuma myotis	–	SA	Open forests and woodlands, closely associated with water bodies. Roosts in buildings, mines, caves, crevices, swallow nests, and under bridges.	Southwestern British Columbia through the western U.S., and into central Mexico.	Suitable habitat. **Observed during focused bat surveys.**	Suitable habitat. **Observed during focused bat surveys.**	Suitable habitat. **Observed during focused bat surveys.**	Suitable habitat. **Observed during focused bat surveys.**
Eumops perotis californicus western mastiff bat	–	SSC	Open, semi-arid to arid habitats including conifer and deciduous woodland, coastal scrub, grasslands, palm oases, chaparral, desert scrub, and urban. Roosts in crevices in cliffs, high buildings, trees, and tunnels.	Southeastern San Joaquin Valley and Coastal Ranges from Monterey County south through Southern California, and from the coast eastward to the Colorado Desert.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Nyctinomops femorosaccus pocketed free-tailed bat	–	SSC	Pinyon-juniper woodland, desert scrub, desert succulent scrub, desert riparian, desert. Roosts in crevices in cliffs, caverns, or buildings.	Southwestern U.S. to south-central Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status		Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys			
	USFWS	CDFW			Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Nyctinomops macrotis big free-tailed bat	–	SSC	Forages over water in rugged, rocky terrain. Roosts in crevices in high cliffs or rocky outcrops.	Western U.S. to northern South America and the Caribbean Islands.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Lepus californicus bennettii San Diego black-tailed jackrabbit	–	SSC	Herbaceous and desert-shrub areas and open, early stages of forest and chaparral.	Pacific slope from Santa Barbara County south to northwestern Baja California, Mexico.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.	No suitable habitat. Not expected to occur.
Chaetodipus fallax fallax northwestern San Diego pocket mouse	–	SSC	Chaparral, coastal sage scrub, and grassland.	Southwest San Bernardino County south to northern Baja California, Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Neotoma lepida intermedia San Diego desert woodrat	–	SSC	Joshua tree woodland, pinyon-juniper, mixed and chamise-redshank chaparral, sagebrush, and desert habitats.	Pacific slope from San Luis Obispo south to northwestern Baja California, Mexico.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Onychomys torridus ramona southern grasshopper mouse	–	SSC	Desert areas, especially in scrub habitats with friable soil. Also in coastal scrub, mixed chaparral, sagebrush, low sage, and bitterbrush habitats.	Along the coast of Southern California from Los Angeles County south through San Diego County.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Bassariscus astutus ringtail[d]	–	–	Woodlands, riparian areas, and arid scrubland.	The southwestern third of the U.S. into Baja California and other portions of Mexico.	Limited suitable habitat. Limited potential to occur.	Limited suitable habitat. Limited potential to occur.	Limited suitable habitat. Limited potential to occur.	Limited suitable habitat. Limited potential to occur.

TABLE 17
SPECIAL STATUS WILDLIFE SPECIES KNOWN TO OCCUR IN THE VICINITY OF THE SOUTH COUNTY PROPERTIES

Species	Status: USFWS	Status: CDFW	Habitat	Range	Potential to Occur on Each Property/Results of Focused Surveys: Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Taxidea taxus American badger	–	SSC	Drier, open stages of shrub, forest, and herbaceous habitats with friable soil.	Throughout California except the extreme northwest.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.
Puma [*Felis*] *concolor* mountain lion[e*]	–	–	Broad variety of habitats in range except shrubless deserts and agricultural areas.	Latitudinal range of 110 degrees in North and South America.	Suitable habitat. May occur.	Suitable habitat. **Observed on the property[e].**	Suitable habitat. May occur.	Suitable habitat. May occur.
Lynx rufus bobcat[*]	–	–	Broad variety of habitats.	Throughout contiguous U.S. and Mexico south to Rio Mescale, and Canada.	Suitable habitat. **Observed on the property.**	Suitable habitat. May occur.	Suitable habitat. May occur.	Suitable habitat. May occur.

USFWS: U.S. Fish and Wildlife Service; CDFW: California Department of Fish and Wildlife; DPS: Distinct Population Segment; msl: mean sea level.

LEGEND

Federal (USFWS)		State (CDFW)	
FE	Endangered	SE	Endangered
FT	Threatened	SSC	Species of Special Concern
FC	Candidate Species	WL	Watch List
		FP	Fully Protected
		SA	Special Animal

* Proposed Covered Species in the NCCP/HCP.
a Individuals on the coastal plain from Ventura County to San Diego County, from sea level to approximately 2,790 feet above msl, are protected.
b Federal listing applies only to the Pacific coastal population.
c SSC designation refers to both the coastal and interior populations.
d A species of local concern.
e Incidentally observed by a Park Ranger in May 2012.

Coastal Cactus Wren

Coastal cactus wren was observed on all four south county properties (Exhibits 15A, 15B, 15C, and 15D). Multiple territories were observed on each property, including one territory on the Ferber Ranch property adjacent to willow riparian habitat that fledged young cactus wrens.

Coastal California Gnatcatcher

Coastal California gnatcatchers were observed in the southwest corner of the Ferber Ranch property and the northern edge of the O'Neill Oaks property during focused surveys. One breeding pair and one individual (detected through vocalization) were observed on the Ferber Ranch property; one breeding pair was detected on the O'Neill Oaks property. Breeding behavior was confirmed either through observation of males displaying territorial behavior, or observations of adults carrying nesting material and/or food for nesting.

Silver-Haired Bat

Silver-haired bat was observed during the focused bat surveys. It was documented once on the Saddle Creek South location in Bauers Canyon, which runs west-east through the center of the property (Exhibit 15D).

Hoary Bat

Hoary bat was observed during the focused bat surveys. It was documented once on the Ferber Ranch property over open fields along the northern spur road off Joplin Loop Road in the central portion of the property (Exhibit 15A).

Yuma Myotis

Yuma myotis was observed during the focused bat surveys (Exhibits 15A, 15B, 15C, and 15D). It was documented 15 times on the Ferber Ranch property and once on each of the other threeproperties. On the Ferber Ranch property, it was primarily recorded from two locations: along Hickey Canyon Road and Windy Ridge Road in the northern section of the property. On the O'Neill Oaks property it was recorded at the western boundary of the property; it is likely that three high frequency species detected along the Trabuco Ridge trail and at the entrance to the property were also Yuma myotis. On the Hafen property, it was recorded along Live Oak Canyon Road on the western border of the property; a high frequency species detected at the entrance is possibly a Yuma myotis. On the Saddle Creek South property, it was recorded on the northern boundary of the property along Live Oak Canyon Road.

3.3.5 Critical Habitat

The USFWS defines critical habitat as follows:

> the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the [Endangered Species] Act, on which are found those physical or biological features (1) essential to the conservation of the species and (2) that may require special management considerations or protection; and specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

On February 9, 2011, the USFWS published a Final Rule designating critical habitat for arroyo toad. This Final Rule designates 98,366 acres in Santa Barbara, Ventura, Los Angeles, San

Bernardino, Riverside, Orange, and San Diego Counties as critical habitat. The southern end of the Ferber Ranch property and the southeastern edge of the O'Neill Oaks property are within Unit 10b of the designated critical habitat for arroyo toad.

On December 19, 2007, the USFWS published a final rule revising critical habitat for the coastal California gnatcatcher. The revised critical habitat designates 197,303 acres of land in Ventura, Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties, California. All four properties are within Unit 6 of the designated critical habitat for coastal California gnatcatcher.

On December 4, 2012, the USFWS published a Final Rule revising critical habitat for the Riverside fairy shrimp (*Streptocephalus woottoni*). The revised critical habitat designates 1,724 acres of land in Ventura, Orange, and San Diego Counties, California. The southern half of the Saddle Creek South property overlaps Subunit 2dA of the designated critical habitat for Riverside fairy shrimp.

3.4 COVERED SPECIES SUMMARY

The baseline surveys described in this document were focused towards establishing baseline knowledge of the set of species covered by the OCTA M2 NCCP/HCP. The OCTA M2 NCCP/HCP includes requirements to understand and document the status of Covered Species and their habitats within the Preserves. Table 18 provides a summary of the OCTA M2 NCCP/HCP Covered Species; whether they were observed during the baseline surveys; other information documenting the potential for the Covered Species to occur on site; and a description of the threats and opportunities for management of the Preserve to benefit Covered Species.

TABLE 18
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys				Potential to Occur on the Property				Opportunities, Threats, and Management
	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	
Plants									
Calochortus weedii var. *intermedius* intermediate mariposa lily	**OBS**	**OBS**	**OBS**	**OBS**	POT	POT	POT	POT	Potential threats include off-road vehicles, equestrian use, and grazing. Opportunities occur to establish the species in areas with suitable conditions (e.g., soils) that are currently degraded. A resource management plan may incorporate restricting unauthorized vehicles on site and transplantation

TABLE 18 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys				Potential to Occur on the Property				Opportunities, Threats, and Management
	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	
									and/or seeding of this variety in suitable areas on site.
Centromadia parryi ssp. *australis* southern tarplant	NO	NO	NO	NO	NE	NE	NE	NE	No opportunities available because properties are outside range of the species.
Dudleya multicaulis many-stemmed dudleya	NO	NO	NO	NO	POT	MAR	MAR	MAR	Potential threats include off-road vehicles, equestrian use, and grazing. Opportunities occur to establish the species in areas with suitable conditions (e.g., soils) that are currently degraded. A resource management plan may incorporate restrictions to unauthorized vehicles on site and transplantation and/or seeding of this species in suitable areas on site.
Fish									
Gila orcuttii arroyo chub	NO	NO	NO	NO	NE	NE	NE	NE	No opportunities available because suitable habitat does not occur on the properties.
Reptiles									
Actinemys marmorata [*Emys m.*] Pacific [western] pond turtle	NO	NO	NO	NO	NE	NE	NE	NE	No opportunities available because suitable habitat does not occur on the properties.

TABLE 18 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys				Potential to Occur on the Property				Opportunities, Threats, and Management
	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	
Phrynosoma blainvillii coast horned lizard	NO	NO	NO	NO	POT	POT	POT	POT	Potential threats include mortality and habitat destruction due to off-road vehicles/ equestrian use and spread of non-native ant species. Habitat restoration opportunities for coastal sage scrub and other suitable habitat exists. A resource management plan may incorporate restricting unauthorized vehicles and ensuring any plant/soil material brought on site is free of non-native ant species.
Aspidoscelis hyperytha [*Cnemidophorus hyperythus beldingi*] orangethroat whiptail	**OBS**	**OBS**	NO	NO	POT	POT	POT	POT	The major threat to this species is loss of habitat by development. The preservation of suitable habitats on site is the best conservation opportunity for this species. A resource management plan may incorporate restoration opportunities for coastal sage scrub and other native habitats utilized by this species.

TABLE 18 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys				Potential to Occur on the Property				Opportunities, Threats, and Management
	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	
Birds									
Empidonax traillii extimus southwestern willow flycatcher (nesting)	NO	NO	NO	NO	MAR	NE	NE	NE	The loss and degradation of riparian habitats and brood parasitism by the brown-headed cowbird (*Molothrus ater*) are this subspecies' greatest threats. The southwestern willow flycatcher population has not shown the same recovery that the least Bell's vireo has shown in response to riparian habitat restoration and cowbird control, as described below. Therefore, no additional opportunities or management activities have been identified.
Vireo bellii pusillus least Bell's vireo (nesting)	NO	NO	NO	NO	MAR	NE	NE	NE	The loss and degradation of riparian habitats and brood parasitism by the brown-headed cowbird are this subspsecies' greatest threats. Possible opportunities available on the Ferber Ranch property for riparian habitat restoration and enhancement. A resource management plan may include a cowbird-control program and an

TABLE 18 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys				Potential to Occur on the Property				Opportunities, Threats, and Management
	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	
									exotic plant removal effort to support riparian restoration efforts on the Ferber Ranch property.
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren (San Diego and Orange Counties)	**OBS**	**OBS**	**OBS**	**OBS**	POT	POT	POT	POT	Habitat loss, degradation, and fragmentation are the most critical threats facing this subspecies. Protection of cactus scrub habitat is crucial for the preservation of this subspecies. A resource management plan may incorporate restoration opportunities for coastal sage scrub with cactus species utilized by this subspecies.
Polioptila californica californica coastal California gnatcatcher	**OBS**	**OBS**	NO	NO	POT	POT	POT	POT	Habitat loss, degradation, and fragmentation are the most critical threats facing this subspecies. Protection of coastal sage scrub habitat is crucial for the preservation of this subspecies. A resource management plan may incorporate restoration opportunities for coastal sage scrub utilized by this subspecies.

TABLE 18 (Continued)
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys				Potential to Occur on the Property				Opportunities, Threats, and Management
	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South	
Mammals									
Puma [*Felis*] *concolor* mountain lion	NO	**OBS**	NO	NO	POT	POT	POT	POT	Potential threats include illegal hunting and habitat loss. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintainence of movement opportunities,
Lynx rufus bobcat	**OBS**	NO	NO	NO	POT	POT	POT	POT	Potential threats include illegal hunting and habitat loss. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintainence of movement opportunities.

NO: Not observed on site; OBS: Observed on site; NE: No suitable habitat and/or outside known range; not expected to occur; MAR: Marginally suitable habitat; not observed during surveys and not expected to occur;
POT: Suitable habitat; may occur; PF/NR: Suitable foraging, but no suitable roosting habitat; may occur for foraging but is not expected to roost on site; PF/PR: Suitable foraging and roosting habitat; may occur for foraging and roosting.

4.0 REFERENCES

Abrams, L. 1951. *Illustrated Flora of the Pacific States.* Vol. III: Geraniums to Figworts (*Geraniaceae* to *Scrophulariaceae*). Stanford, CA: Stanford University Press.

———. *Illustrated Flora of the Pacific States.* Vol. II: Buckwheats to Kramerias (*Polygonaceae* to *Krameriaceae*). Stanford, CA: Stanford University Press.

———. 1923. *Illustrated Flora of the Pacific States.* Vol. I: Ferns to Birthworts (*Ophioglossaceae* to *Aristolochiaceae*). Stanford, CA: Stanford University Press.

Abrams, L. and R. Ferris. 1960. *Illustrated Flora of the Pacific States.* Vol. IV: Bignonias to Sunflowers (*Bignoniaceae* to *Compositae*). Stanford, CA: Stanford University Press.

Allen, E.B, S.A. Eliason, V.J. Marquez, G.P. Schultz, N.K. Storms, C.D. Stylinski, T.A. Zink, and M.F. Allen. 2000. What are the Limits to Restoration of Coastal Sage Scrub in Southern California (pp. 253-262). *2nd Interface Between Ecology and Land Development in California* (J.E. Keeley, M. Baer-Keeley, and C.J. Fotheringham, Eds.). Sacramento, CA: U.S. Geological Survey.

American Ornithologists' Union (AOU). 2011 (August). *Check-list of North American Birds* (7th ed., as revised through 52nd Supplement). Washington, D.C.: AOU. http://www.aou.org/checklist/north/index.php.

Baker, R.J., L.C. Bradley, R.D. Bradley, J.W. Dragoo, M.D. Engstrom, R.S. Hoffmann, C.A. Jones, F. Reid, D.W. Rice, and C. Jones. 2003 (December). Revised Checklist of North American Mammals North of Mexico, 2003. *Occasional Papers (No. 229).* Waco, TX: Museum of Texas Tech University.

Baldwin, B.G., D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken (Eds.). 2012. *The Jepson Manual: Vascular Plants of California* (Second ed.). Berkeley, CA: University of California Press.

Barry, W.J. 1972. *California Prairie Ecosystems*. *Vol. 1: The Central Valley Prairie.* Sacramento, CA: State of California Resources Agency, Department of Parks and Recreation.

Bell, G. 1997. Ecology and Management of *Arundo donax* and Approaches to Riparian Habitat Restoration in Southern California (pp. 103–113). *Plant Invasions: Studies from North America and Europe* (J.H. Brock, M. Wade, P. Pysek, and D. Green, Eds.). Leiden, The Netherlands: Blackhuys Publishers.

Bennett, A.F. 1990. Habitat Corridors and the Conservation of Small Mammals in the Fragmented Forest Environment. *Landscape Ecology* 4(2–3):109–122. New York, NY: International Association for Landscape Ecology.

BioResource Consultants, Inc. (BRC). 2012 (August). *Orange County Transportation Authority Southern Properties Bat Survey Report.* Ojai, CA: BRC.

BonTerra Consulting. 2013a (February). *Jurisdictional Delineation Report [for the] Measure M2 Freeway Environmental Mitigation Program Acquisition Properties, Orange County, California.* Irvine, CA: BonTerra Consulting.

———. 2013b (January). *Results of 2012 Special Status Plant Surveys on the Measure M2 Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California.* Irvine, CA: BonTerra Consulting.

———. 2012a (August). *Results of Focused Presence/Absence Coastal California Gnatcatcher Surveys on the Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California.* Irvine, CA: BonTerra Consulting.

———. 2012b (September). *Results of Focused Presence/Absence Southwestern Willow Flycatcher and Least Bell's Vireo Surveys for the Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California.* Irvine, CA: BonTerra Consulting.

California Department of Forestry and Fire Protection (CAL FIRE). 2011. Fire Perimeter Data. Sacramento, CA: CAL FIRE, U.S. Department of Agriculture Forest Service Region 5 Remote Sensing Lab, Bureau of Land Management, National Park Service. http://frap.cdf.ca.gov/projects/fire_data/fire_perimeters/.

California Department of Fish and Game (CDFG). 2012a. California Natural Diversity Database. Records of Occurrence for the USGS Black Star Canyon, Cañada Gobernadora, El Toro, and Santiago Peak 7.5-minute quadrangles. Sacramento, CA: CDFG, Natural Heritage Division.

———. 2012b (October). *Special Vascular Plants, Bryophytes, and Lichens List.* Sacramento, CA: CDFG, Natural Heritage Division.

———. 2011 (January). *Special Animals.* Sacramento, CA: CDFG, Natural Heritage Division.

———. 2009 (November 24). *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. Sacramento, CA: CDFG.

California Department of Fish and Game, Biogeographic Data Branch (CDFG BDB). 2012. Wildlife Habitats — California Wildlife Habitat Relationships System. Sacramento, CA: CDFG BDB. http://www.dfg.ca.gov/bdb/html/wildlife_habitats.html.

California Department of Water Resources (CDWR). 2012. California Data Exchange Center (CDEC): Bell Canyon Incremental Precipitation Sensor (CDEC Station BEC). Sacramento, CA: CDWR, CDEC. http://cdec.water.ca.gov/cgi-progs/selectQuery?station_id=BEC&dur_code=H&sensor _num=2&start_date=01/01/2000+00:00.

California Native Plant Society (CNPS). 2012. Electronic Inventory of Rare and Endangered Vascular Plants of California. Records of Occurrence for the USGS Black Star Canyon, Cañada Gobernadora, El Toro, and Santiago Peak 7.5-minute quadrangles. Sacramento, CA: CNPS. http://www.cnps.org/inventory.

———. 2011. *The CNPS Ranking System*. Sacramento, CA: CNPS. http://www.cnps.org/cnps/rareplants/ranking.php.

———. 2001. *CNPS Botanical Survey Guidelines.* Sacramento, CA: CNPS. http://www.cnps.org/cnps/rareplants/pdf/cnps_survey_guidelines.pdf.

California Wetlands Monitoring Workgroup (CWMW). 2012 (March). *California Rapid Assessment Method (CRAM) for Wetlands and Riparian Areas* (Version 6.0).

Collins, J.N, E. Stein, M. Sutula, R. Clark, A.E. Fetscher, L. Grenier, C. Grosso, and A. Wiskind. 2008 (September). *California Rapid Assessment Method (CRAM) for Wetlands* (Version 5.0.2).

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States* (Version 04DEC1998). Washington, D.C.: U.S. Fish and Wildlife Service. http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm.

Crother, B.I. (Ed.). 2008 (May 2011, last update). Scientific and Standard English Names of Amphibians and Reptiles of North American North of Mexico, with Comments Regarding Confidence in our Understanding (Edition 6.1). Shoreview, MN: Society for the Study of Amphibians and Reptiles. http://www.ssarherps.org/pages/comm_names/Index.php.

Elvin, M.A. and A.C. Sanders. 2009. Nomenclatural changes for *Monardella* (Lamiaceae) in California. *Novon* 19: 315–343. St. Louis, MO: Missouri Botanical Garden Press.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual* (Technical Report Y-87-1). Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Faber, P., E. Keller, A. Sands, B. Massey. 1989. *The Ecology of Riparian Habitats of the Southern California Coastal Region: A Community Profile* (Biological Report 85 [7.27]). Washington, D.C: U.S. Fish and Wildlife Service, Research and Development, National Wetlands Research Center.

Faber-Langendoen, D., L. Master, J. Nichols, K. Snow, A. Tomaino, R. Bittman, G. Hammerson, B. Heidel, L. Ramsay, and B. Young. 2009. *NatureServe Conservation Status Assessments: Methodology for Assigning Ranks.* Arlington, VA: NatureServe. http://www.natureserve.org/publications/ConsStatusAssess_RankMethodology.pdf.

Fahrig, L. and G. Merriam. 1985. Habitat Patch Connectivity and Population Survival. *Ecology* 66(6): 1762–1768. Tempe, AZ: Ecological Society of America.

Halsey, R.W. 2007. Chaparral: Pure California. Fremontia 35(4): 2–7. Sacramento, CA: CNPS.

———. 2005. *Fire, Chaparral, and Survival in Southern California*. San Diego, CA: Sunbelt Publications, Inc.

Harris, L.D. and P.B. Gallagher. 1989. New Initiatives for Wildlife Conservation: The Need for Movement Corridors (pp. 11–34). *Preserving Communities and Corridors* (G. Mackintosh, Ed.). Washington, D.C.: Defenders of Wildlife.

Hickman, J.C., Ed. 1993. *The Jepson Manual of Higher Plants of California*. Berkeley, CA: University of California Press.

Howard, J.L. 1992. Malomsa laurina. In: Fire Effects Information System, [Online]. Golden, CO: U.S., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

Keeley, J.E. 1986. Resilience of Mediterranean Shrub Communities to Fires (pp. 95–112). *Resilience in Mediterranean-type Ecosystems* (B. Dell, A.J.M. Hopkins, and B.B. Lamont, Eds.). Dordrecht, Netherlands: Dr. W. Junk Publishers.

Los Angeles, County of, Santa Monica Mountains Conservancy, City of Brea, City of La Habra Heights, City of Whittier, and City of Diamond Bar (Los Angeles County et al.). 2003 (October 14, adopted). Wildlife Corridor Conservation Authority Joint Exercise of Powers Agreement (an agreement "to provide for the proper planning, conservation, environmental protection, and maintenance of the habitat and wildlife corridor between the Whittier-Puente Hills and the Cleveland National Forest in the Santa Monica Mountains.").

MacArthur, R.H. and E.O. Wilson. 1967. *The Theory of Island Biogeography*. Princeton, NJ: Princeton University Press.

McCreary, D.D. 2004. *Fire in California's Oak Woodlands*. University of California Integrated Hardwood Range Management Program. Davis, CA: University of California, Agricultural Issues Center, Integrated Hardwood Range Management Program. http://ucanr.org/faqs/filegroups/faqs14-sep-09-1109/16808.pdf.

Minnich, R.A. and R.J. Dezzani. 1998. Historic Decline of Coastal Sage Scrub in the Riverside – Perris Plain, California. *Western Birds.* 29(4): 366–391. San Diego, CA: Western Field Ornithologists.

Munz, P.A. 1974. *A Flora of Southern California*. Berkeley, CA: University of California Press.

Noss, R.F. 1983. A Regional Landscape Approach to Maintain Diversity. *BioScience.* 33(11): 700–706. Washington, D.C.: American Institute of Biological Sciences.

Noss, R.F. and R.L. Peters. 1995. *Endangered Ecosystems: a Status Report on America's Vanishing Habitat and Wildlife.* Washington, D.C.: Defenders of Wildlife.

O'Leary, J. 1995. Coastal Sage Scrub: Threats and Current Status. *Fremontia.* 23(4): 27–31. Sacramento, CA: California Native Plant Society.

Orange, County of. 1991 (as amended). *Foothill/Trabuco Specific Plan*. Santa Ana, CA: County of Orange Environmental Management Agency.

Orange County Fire Authority (OCFA). 2008 (November 15). *After Action Report: Freeway Complex Fire*. Irvine, CA: OCFA.

———. 2007 (October). *After Action Report: Santiago Fire*. Irvine, CA: OCFA.

Orange County Transportation Authority (OCTA). 2010 (December 3). Notice of Preparation to Prepare an Environmental Impact Report. Orange, CA: OCTA.

Ritter, M.E. 2006. The Physical Environment: Mediterranean or Dry Summer Subtropical Climate. Stevens Point, WI: University of Wisconsin. http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/climate_systems/mediterranean.html.

Ruben, J.A. and W.J. Hillenius. 2005 (May). Cold Blooded. *Natural History*. New York, NY: American Museum of Natural History.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation* (2nd ed.). Sacramento, CA: CNPS.

Schoenherr, A.A. 1992. *A Natural History of California.* Berkeley, CA: University of California Press.

Simberloff, D. and J. Cox. 1987. Consequences and Costs of Conservation Corridors. *Conservation Biology* 1(1): 63–71. Boston, MA: Blackwell Scientific Publications.

Sogge, M.K., D. Ahlers, and S.J. Sferra. 2010. A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher: U.S. Geological Survey Techniques and Methods (prepared in cooperation with the Bureau of Reclamation and the U.S. Fish and Wildlife Service). Menlo Park, CA: USGS, Western Region.

Soule, M.E. 1987. *Viable Populations for Conservation*. New York, NY: Cambridge University Press.

Steinberg, P.D. 2002. Quercus agrifolia. In: Fire Effects Information System, [Online]. Golden, CO: USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region, Version 2.0* (J.S. Wakeley, R.W. Lichvar, and C.V. Noble, Eds.). Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Bureau of Labor Statistics, Federal Bureau of Investigation, National Oceanic and Atmospheric Administration, U.S. Census Bureau, U.S. Department of Housing and Urban Development. 2009 (July 10, last revised). Mapstats: Mission Viejo (city), California. Washington, D.C.: U.S. Bureau of Labor Statistics et al. http://www.fedstats.gov/qf/ states/06000.html.

U.S. Fish and Wildlife Service (USFWS). 2012 (December 4) Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Riverside Fairy Shrimp; Final Rule. *Federal Register* 77(233): 72069–72140. Washington, D.C.: USFWS.

———. 2011 (February 9). Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Arroyo Toad; Final Rule. *Federal Register* 76(27): 7245–7467. Washington, D.C.: USFWS.

———. 2007 (December 19). Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Coastal California Gnatcatcher (*Polioptila californica californica*); Final Rule. *Federal Register* 72(243): 72009–72213. Washington, D.C.: USFWS.

———. 2001 (January 19). *Least Bell's Vireo Survey Guidelines*. Carlsbad, CA: USFWS.

———. 1997 (February 28). *Coastal California Gnatcatcher (Polioptila californica californica). Presence/Absence Survey Guidelines.* Washington, D.C.: USFWS.

U.S. Forest Service (USFS). 2013 (March, access date). Cleveland National Forest: History| Heritage. San Diego, CA: Cleveland National Forest.

———. 2009 (March 30). Vegetation Descriptions, South Coast and Montane Ecological Province Calveg Zone 7. San Diego, CA: Cleveland National Forest.

Western Regional Climate Center (WRCC). 2012 (October 31). General Climate Summary Tables for San Juan Canyon, California (Station 047836). Reno, NV: WRCC. http://www.wrcc.dri.edu.

Attachment A

Plant and Wildlife Compendia

PLANT COMPENDIUM FOR THE SADDLE CREEK SOUTH SURVEY AREA

SPECIES	
***PTERIDOPHYTES* - FERNS AND ALLIES**	
***PTERIDACEAE* - BRAKE FAMILY**	
Pellaea andromedifolia	coffee fern
Pentagramma triangularis ssp. *triangularis*	goldenback fern
***ANGIOSPERMAE* - FLOWERING PLANTS**	
EUDICOTS	
***ADOXACEAE* - MUSKROOT FAMILY**	
Sambucus nigra ssp. *caerulea* [*S. mexicana*]	blue elderberry
***ANACARDIACEAE* - SUMAC FAMILY**	
Rhus aromatica [*R. trilobata*]	skunk bush
Rhus integrifolia	lemonadeberry
Toxicodendron diversilobum	western poison oak
***APIACEAE* - CARROT FAMILY**	
Daucus pusillus	rattlesnake weed
Lomatium lucidum	shiny lomatium
Sanicula crassicaulis	Pacific sanicle
*Torilis nodosa**	short sock-destroyer
***APOCYNACEAE* - DOGBANE FAMILY**	
Asclepias fascicularis	narrow-leaf milkweed
***ASTERACEAE* - SUNFLOWER FAMILY**	
Achillea millefolium	common yarrow
*Anthemis cotula**	mayweed
Artemisia californica	California sagebrush
Artemisia douglasiana	mugwort
Baccharis salicifolia ssp. *salicifolia* [*B. salicifolia*]	mule fat
Carduus pycnocephalus ssp. *pycnocephalus**	Italian thistle
*Centaurea melitensis**	tocalote, Malta star-thistle
Cirsium occidentale var. *occidentale*	cobwebby thistle
*Cirsium vulgare**	bull thistle
Corethrogyne filaginifolia	California-aster
*Cynara cardunculus**	cardoon, globe artichoke
Deinandra fasciculata [*Hemizonia f.*]	fascicled tarweed
Eriophyllum confertiflorum	golden-yarrow
Grindelia camporum	white-stem gumplant
Hazardia squarrosa	saw-toothed goldenbush
*Hedypnois cretica**	Crete weed
*Hypochaeris glabra**	smooth cat's-ear
Isocoma menziesii var. *vernonioides*	coastal goldenbush
Logfia filaginoides [*Filago californica*]	California cottonrose
Pseudognaphalium biolettii [*Gnaphalium bicolor*]	bicolored everlasting, Bioletti's cudweed
Pseudognaphalium californicum [*Gnaphalium c*.]	California everlasting
Solidago velutina ssp. *californica* [*Solidago c*.]	California goldenrod
*Sonchus oleraceus**	common sow thistle
Uropappus lindleyi [*Microseris l*.]	silver puffs

PLANT COMPENDIUM FOR THE SADDLE CREEK SOUTH SURVEY AREA

SPECIES	
BORAGINACEAE **- BORAGE FAMILY**	
Phacelia cicutaria	caterpillar phacelia
BRASSICACEAE **- MUSTARD FAMILY**	
*Hirschfeldia incana**	shortpod mustard
*Sisymbrium officinale**	hedge mustard
CACTACEAE **- CACTUS FAMILY**	
Opuntia littoralis	coastal prickly-pear
CAPRIFOLIACEAE **- HONEYSUCKLE FAMILY**	
Lonicera subspicata var. *denudata*	southern honeysuckle
Symphoricarpos mollis	creeping snowberry
CARYOPHYLLACEAE **- PINK FAMILY**	
*Silene gallica**	small-flower catchfly
Silene laciniata ssp. *lanciniata* [*S.l.* ssp. *major*]	Mexican pink
CHENOPODIACEAE **- GOOSEFOOT FAMILY**	
*Chenopodium album**	lamb's quarters
CONVOLVULACEAE **- MORNING-GLORY FAMILY**	
Calystegia macrostegia	large-bracted morning-glory
Cuscuta californica	chaparral dodder
CRASSULACEAE **- STONECROP FAMILY**	
Dudleya lanceolata	lance-leaved dudleya / lanceleaf/ coastal dudleya / coastal live-forever
Dudleya pulverulenta	chalk dudleya / chalky live-forever
CUCURBITACEAE **- GOURD FAMILY**	
Marah macrocarpus	wild cucumber / chilicothe
EUPHORBIACEAE **- SPURGE FAMILY**	
Croton setigerus [*Eremocarpus s*.]	doveweed / turkey mullein
FABACEAE **- LEGUME FAMILY**	
Acmispon americanus [*Lotus purshianus*]	American lotus
Acmispon glaber var. *glaber* [*Lotus scoparius* var. *scoparius*]	coastal deerweed
Lathyrus vestitus ssp. *vestitus*	chaparral sweet pea
*Spartium junceum**	Spanish broom
*Trifolium hirtum**	rose clover
Trifolium willdenovii	tomcat clover
FAGACEAE **- OAK / BEECH FAMILY**	
Quercus agrifolia	coast live oak
Quercus berberidifolia	scrub oak / California scrub oak
GERANIACEAE **- GERANIUM FAMILY**	
*Erodium botrys**	long-beaked filaree
LAMIACEAE **- MINT FAMILY**	
*Marrubium vulgare**	common horehound
Salvia apiana	white sage
Salvia mellifera	black sage
Stachys rigida ssp. *quercetorum*	hillside hedge-nettle

PLANT COMPENDIUM FOR THE SADDLE CREEK SOUTH SURVEY AREA

SPECIES	
MALVACEAE **- MALLOW FAMILY**	
*Malva parviflora**	cheeseweed
MYRSINACEAE - MYRSINE FAMILY	
*Anagallis arvensis**	scarlet pimpernel
NYCTAGINACEAE **- FOUR-O'CLOCK FAMILY**	
Mirabilis laevis var. *crassifolia* [*M. californica*]	wishbone bush / California wishbone bush
OLEACEAE **- OLIVE FAMILY**	
*Olea europaea**	olive
ONAGRACEAE **- EVENING PRIMROSE FAMILY**	
Epilobium canum	California fuchsia
OROBANCHACEAE **- BROOMRAPE FAMILY**	
Castilleja affinis ssp. *affinis*	coastal paintbrush
OXALIDACEAE **- WOOD-SORREL FAMILY**	
Oxalis californica [*O. albicans* ssp. *c*.]	California wood-sorrel
PHRYMACEAE **- LOPSEED FAMILY**	
Mimulus aurantiacus var. *puniceus*	orange bush monkeyflower
PLANTAGINACEAE **- PLANTAIN FAMILY**	
Keckiella cordifolia	heart-leaved bush-penstemon
POLYGONACEAE - **BUCKWHEAT FAMILY**	
Eriogonum fasciculatum	California buckwheat
Pterostegia drymarioides	woodland threadstem
RANUNCULACEAE **- CROWFOOT FAMILY**	
Delphinium parryi ssp. *parryi*	Parry's larkspur
Thalictrum fendleri var. *polycarpum*	common meadow-rue
RHAMNACEAE **- BUCKTHORN FAMILY**	
Rhamnus ilicifolia	hollyleaf redberry
ROSACEAE **- ROSE FAMILY**	
Adenostoma fasciculatum var. *fasciculatum*	common chamise
Heteromeles arbutifolia	toyon / Christmas berry
Drymocallis glandulosa ssp. *glandulosa* [*Potentilla g.* ssp. *g*.]	sticky cinquefoil
RUBIACEAE **- MADDER FAMILY**	
Galium angustifolium	narrowly leaved bedstraw
*Galium parisiense**	Parisian bedstraw
MONOCOTYLEDONES **- MONOCOTS**	
AGAVACEAE **- CENTURY PLANT FAMILY**	
Chlorogalum pomeridianum	wavy-leaved soap plant
Hesperoyucca whipplei [*Yucca w*.]	chaparral yucca
IRIDACEAE **- IRIS FAMILY**	
Sisyrinchium bellum	western blue-eyed grass
LILIACEAE **- LILY FAMILY**	
Calochortus splendens	splendid mariposa lily
Calochortus weedii var. *intermedius*	intermediate mariposa lily

PLANT COMPENDIUM FOR THE SADDLE CREEK SOUTH SURVEY AREA

SPECIES	
POACEAE **- GRASS FAMILY**	
*Avena barbata**	slender wild oat
*Brachypodium distachyon**	purple false brome
*Bromus diandrus**	ripgut grass
*Bromus hordeaceus**	soft chess
Elymus condensatus [*Leymus c*.]	giant wild rye
Hordeum murinum var. *leporinum**	hare barley
Melica imperfect	little California melic grass
Stipa coronata [*Achnatherum coronatum*]	crested needlegrass
Stipa pulchra [*Nassella p*.]	purple needlegrass
THEMIDACEAE **- BRODIAEA FAMILY**	
Bloomeria crocea	common goldenstar
Dichelostemma capitatum	blue dicks
* non-native to the region it was found cf. appears similar to	

PLANT COMPENDIUM FOR THE HAFEN SURVEY AREA

SPECIES	
***PTERIDOPHYTES* - FERNS AND ALLIES**	
***DRYOPTERIDACEAE* - WOOD FERN FAMILY**	
Dryopteris arguta	coastal wood fern
***PTERIDACEAE* - BRAKE FAMILY**	
Pellaea andromedifolia	coffee fern
***SELAGINELLACEAE* - SPIKE-MOSS FAMILY**	
Selaginella bigelovii	Bigelow's or bushy spike-moss
***ANGIOSPERMAE* - FLOWERING PLANTS**	
EUDICOTS	
***ANACARDIACEAE* - SUMAC FAMILY**	
Rhus integrifolia	lemonadeberry
Toxicodendron diversilobum	western poison oak
***APIACEAE* - CARROT FAMILY**	
Daucus pusillus	rattlesnake weed
*Foeniculum vulgare**	sweet fennel
*Torilis arvensis**	tall sock-destroyer
***ASTERACEAE* - SUNFLOWER FAMILY**	
Acourtia microcephala	sacapellote
Artemisia californica	California sagebrush
Baccharis pilularis ssp. *consanguinea* [*B. pilularis*]	coyote brush
Baccharis salicifolia ssp. *salicifolia* [*B. salicifolia*]	mule fat
Brickellia californica	California brickellbush
Carduus pycnocephalus ssp. *pycnocephalus**	Italian thistle
*Centaurea melitensis**	tocalote, Malta star-thistle
Chaenactis artemisiifolia	white pincushion
Chaenactis glabriuscula	yellow pincushion
Corethrogyne filaginifolia	California-aster
Encelia californica	California brittlebush
Encelia farinosa	desert brittlebush
Encelia californica x Encelia farinosa	hybrid California/desert brittlebush
Erigeron foliosus	leafy fleabane
Eriophyllum confertiflorum	golden-yarrow
Hazardia squarrosa	saw-toothed goldenbush
Heterotheca grandiflora	telegraph weed
Logfia filaginoides [Filago californica]	California cottonrose
Porophyllum gracile	odora
Pseudognaphalium biolettii [Gnaphalium bicolor]	bicolored everlasting, Bioletti's cudweed
Pseudognaphalium californicum [Gnaphalium c.]	California everlasting
Stephanomeria diegensis	San Diego wreath plant
Uropappus lindleyi [Microseris l.]	silver puffs
***BORAGINACEAE* - BORAGE FAMILY**	
Eucrypta chrysanthemifolia	common eucrypta
***BRASSICACEAE* - MUSTARD FAMILY**	
*Hirschfeldia incana**	shortpod mustard

PLANT COMPENDIUM FOR THE HAFEN SURVEY AREA

SPECIES	
CACTACEAE **- CACTUS FAMILY**	
Opuntia littoralis	coastal prickly-pear
CAPRIFOLIACEAE **- HONEYSUCKLE FAMILY**	
Lonicera subspicata var. *denudata*	southern honeysuckle
Symphoricarpos mollis	creeping snowberry
CONVOLVULACEAE **- MORNING-GLORY FAMILY**	
Calystegia macrostegia	large-bracted morning-glory
Cuscuta californica	chaparral dodder
CRASSULACEAE **- STONECROP FAMILY**	
Dudleya lanceolata	lance-leaved dudleya / lanceleaf/ coastal dudleya / coastal live-forever
Dudleya pulverulenta	chalk dudleya / chalky live-forever
CUCURBITACEAE **- GOURD FAMILY**	
Marah macrocarpus	wild cucumber / chilicothe
FABACEAE **- LEGUME FAMILY**	
Acmispon americanus [*Lotus purshianus*]	American lotus
Acmispon glaber var. *glaber* [*Lotus scoparius* var. *scoparius*]	coastal deerweed
Lathyrus vestitus ssp. *vestitus*	chaparral sweet pea
Lupinus sparsiflorus	Coulter's lupine
Lupinus truncatus	truncate lupine / collar lupine
FAGACEAE **- OAK / BEECH FAMILY**	
Quercus agrifolia	coast live oak
Quercus berberidifolia	scrub oak / California scrub oak
LAMIACEAE **- MINT FAMILY**	
Salvia apiana	white sage
Salvia columbariae	chia
Salvia mellifera	black sage
NYCTAGINACEAE **- FOUR-O'CLOCK FAMILY**	
Mirabilis laevis var. *crassifolia [M. californica]*	wishbone bush / California wishbone bush
ONAGRACEAE **- EVENING PRIMROSE FAMILY**	
Clarkia purpurea	winecup clarkia
OROBANCHACEAE **- BROOMRAPE FAMILY**	
Castilleja foliolosa	felt paintbrush
Cordylanthus rigidus ssp. *setigerus*	pellaea
PHRYMACEAE **- LOPSEED FAMILY**	
Mimulus aurantiacus var. *puniceus*	orange bush monkeyflower
PLANTAGINACEAE **- PLANTAIN FAMILY**	
Keckiella cordifolia	heart-leaved bush-penstemon
PLATANACEAE **- SYCAMORE FAMILY**	
Platanus racemosa	western sycamore
POLEMONIACEAE **- PHLOX FAMILY**	
Eriastrum sapphirinum	sapphire woollystar
Linanthus californicum [*Leptodactylon c*.]	prickly phlox

PLANT COMPENDIUM FOR THE HAFEN SURVEY AREA

SPECIES	
***POLYGONACEAE* - BUCKWHEAT FAMILY**	
Chorizanthe staticoides	Turkish rugging
Eriogonum fasciculatum	California buckwheat
Pterostegia drymarioides	woodland threadstem
***RHAMNACEAE* - BUCKTHORN FAMILY**	
Ceanothus crassifolius	hoaryleaf ceanothus
Rhamnus ilicifolia	hollyleaf redberry
***ROSACEAE* - ROSE FAMILY**	
Adenostoma fasciculatum var. *fasciculatum*	common chamise
Heteromeles arbutifolia	toyon / Christmas berry
Drymocallis glandulosa ssp. *glandulosa* [*Potentilla g.* ssp. *g.*]	sticky cinquefoil
***RUBIACEAE* - MADDER FAMILY**	
Galium angustifolium	narrowly leaved bedstraw
Galium porrigens var. *porrigens*	climbing bedstraw
***SOLANACEAE* - NIGHTSHADE FAMILY**	
*Nicotiana glauca**	tree tobacco
***MONOCOTYLEDONES* - MONOCOTS**	
***AGAVACEAE* - CENTURY PLANT FAMILY**	
Chlorogalum pomeridianum	wavy-leaved soap plant
Hesperoyucca whipplei [*Yucca w.*]	chaparral yucca
***LILIACEAE* - LILY FAMILY**	
Calochortus splendens	splendid mariposa lily
Calochortus weedii var. *intermedius*	intermediate mariposa lily
***POACEAE* - GRASS FAMILY**	
*Avena barbata**	slender wild oat
Bothriochloa barbinodis	cane bluestem
Bromus madritensis ssp. *rubens**	red brome
*Cynodon dactylon**	Bermuda grass
Elymus condensatus [*Leymus c.*]	giant wild rye
Festuca sp. [*Vulpia* sp.]	fescue
Muhlenbergia microsperma	littleseed muhly
Stipa coronata [*Achnatherum coronatum*]	crested needlegrass
Stipa miliacea [*Piptatherum miliacea*]*	smilo grass
***RUSCACEAE* - BUTCHER'S-BROOM FAMILY**	
Nolina cismontana	chaparral nolina, chaparral beargrass
***THEMIDACEAE* - BRODIAEA FAMILY**	
Dichelostemma capitatum	blue dicks
* non-native to the region it was found cf. appears similar to	

PLANT COMPENDIUM FOR THE O'NEILL OAKS SURVEY AREA

SPECIES	
***PTERIDOPHYTES* - FERNS AND ALLIES**	
***SELAGINELLACEAE* - SPIKE-MOSS FAMILY**	
Selaginella bigelovii	Bigelow's or bushy spike-moss
***ANGIOSPERMAE* - FLOWERING PLANTS**	
EUDICOTS	
***ADOXACEAE* - MUSKROOT FAMILY**	
Sambucus nigra ssp. *caerulea* [*S. mexicana*]	blue elderberry
***ANACARDIACEAE* - SUMAC FAMILY**	
Malosma laurina	laurel sumac
Rhus integrifolia	lemonadeberry
Toxicodendron diversilobum	western poison oak
***ASTERACEAE* - SUNFLOWER FAMILY**	
Artemisia californica	California sagebrush
Artemisia dracunculus	tarragon
Baccharis salicifolia ssp. *salicifolia* [*B. salicifolia*]	mule fat
Bebbia juncea var. *aspera*	sweetbush
Brickellia californica	California brickellbush
*Centaurea melitensis**	tocalote, Malta star-thistle
Chaenactis artemisiifolia	white pincushion
Cirsium occidentale var. *occidentale*	cobwebby thistle
Corethrogyne filaginifolia	California-aster
*Cynara cardunculus**	cardoon, globe artichoke
Deinandra fasciculata [*Hemizonia f.*]	fascicled tarweed
Encelia californica	California brittlebush
Encelia farinosa	desert brittlebush
Eriophyllum confertiflorum	golden-yarrow
Hazardia squarrosa	saw-toothed goldenbush
Heterotheca grandiflora	telegraph weed
Heterotheca sessiliflora	sessileflower goldenaster
*Hypochaeris glabra**	smooth cat's-ear
Logfia filaginoides [*Filago californica*]	California cottonrose
Osmadenia tenella	osmadenia
Porophyllum gracile	odora
Pseudognaphalium biolettii [*Gnaphalium bicolor*]	bicolored everlasting, Bioletti's cudweed
Pseudognaphalium californicum [*Gnaphalium c.*]	California everlasting
Rafinesquia californica	California chicory
*Senecio vulgaris**	common groundsel
***BORAGINACEAE* - BORAGE FAMILY**	
Phacelia ramosissima	branching phacelia
***BRASSICACEAE* - MUSTARD FAMILY**	
*Capsella bursa-pastoris**	shepherd's purse
*Hirschfeldia incana**	shortpod mustard
Lepidium nitidum	peppergrass / shining peppergrass
*Sisymbrium officinale**	hedge mustard

PLANT COMPENDIUM FOR THE O'NEILL OAKS SURVEY AREA

SPECIES	
***CACTACEAE* - CACTUS FAMILY**	
Opuntia littoralis	coastal prickly-pear
Opuntia x occidentalis	western prickly-pear
***CAPRIFOLIACEAE* - HONEYSUCKLE FAMILY**	
Lonicera subspicata var. *denudata*	southern honeysuckle
***CARYOPHYLLACEAE* - PINK FAMILY**	
Silene laciniata ssp. *lanciniata* [*S.l.* ssp. *major*]	Mexican pink
***CHENOPODIACEAE* - GOOSEFOOT FAMILY**	
*Chenopodium album**	lamb's quarters
*Salsola tragus**	Russian thistle
***CISTACEAE* - ROCK-ROSE FAMILY**	
Helianthemum scoparium	peak rush-rose
***CONVOLVULACEAE* - MORNING-GLORY FAMILY**	
Calystegia macrostegia	large-bracted morning-glory
Cuscuta californica	chaparral dodder
Cuscuta subinclusa	canyon dodder
***CRASSULACEAE* - STONECROP FAMILY**	
Dudleya lanceolata	lance-leaved dudleya / lanceleaf/ coastal dudleya / coastal live-forever
Dudleya pulverulenta	chalk dudleya / chalky live-forever
***CUCURBITACEAE* - GOURD FAMILY**	
Marah macrocarpus	wild cucumber / chilicothe
***FABACEAE* - LEGUME FAMILY**	
Acmispon americanus [*Lotus purshianus*]	American lotus
Acmispon glaber var. glaber [*Lotus scoparius* var. *scoparius*]	coastal deerweed
Acmispon strigosus [*Lotus s.*]	strigose lotus
***FAGACEAE* - OAK / BEECH FAMILY**	
Quercus agrifolia	coast live oak
Quercus berberidifolia	scrub oak / California scrub oak
***GERANIACEAE* - GERANIUM FAMILY**	
*Erodium cicutarium**	red-stemmed filaree
***LAMIACEAE* - MINT FAMILY**	
Salvia apiana	white sage
Salvia mellifera	black sage
***MALVACEAE* - MALLOW FAMILY**	
*Malva parviflora**	cheeseweed
***NYCTAGINACEAE* - FOUR-O'CLOCK FAMILY**	
Mirabilis laevis var. *crassifolia* [*M. californica*]	wishbone bush / California wishbone bush
***OXALIDACEAE* - WOOD-SORREL FAMILY**	
Oxalis californica [*O. albicans* ssp. *c.*]	California wood-sorrel
***PAEONIACEAE* - PEONY FAMILY**	
Paeonia californica	California peony

PLANT COMPENDIUM FOR THE O'NEILL OAKS SURVEY AREA

SPECIES	
***PHRYMACEAE* - LOPSEED FAMILY**	
Mimulus aurantiacus var. puniceus	orange bush monkeyflower
***PLANTAGINACEAE* - PLANTAIN FAMILY**	
Keckiella cordifolia	heart-leaved bush-penstemon
Plantago erecta	dwarf plantain / California plantain
***POLEMONIACEAE* - PHLOX FAMILY**	
Eriastrum sapphirinum	sapphire woollystar
Linanthus californicum [*Leptodactylon c*.]	prickly phlox
***POLYGONACEAE* - BUCKWHEAT FAMILY**	
Chorizanthe staticoides	Turkish rugging
Eriogonum fasciculatum	California buckwheat
Polygonum aviculare ssp. *depressum* [*Polygonum arenastrum*]*	common knotweed
***RHAMNACEAE* - BUCKTHORN FAMILY**	
Rhamnus ilicifolia	hollyleaf redberry
***ROSACEAE* - ROSE FAMILY**	
Adenostoma fasciculatum var. *fasciculatum*	common chamise
Cercocarpus betuloides var. *betuloides*	birch-leaf mountain-mahogany
Heteromeles arbutifolia	toyon / Christmas berry
***RUBIACEAE* - MADDER FAMILY**	
Galium angustifolium	narrowly leaved bedstraw
***SCROPHULARIACEAE* - FIGWORT FAMILY**	
Scrophularia californica	California figwort
***SOLANACEAE* - NIGHTSHADE FAMILY**	
Datura wrightii	jimson weed
*Nicotiana glauca**	tree tobacco
Solanum douglasii	Douglas' nightshade
***MONOCOTYLEDONES* - MONOCOTS**	
***AGAVACEAE* - CENTURY PLANT FAMILY**	
Chlorogalum pomeridianum	wavy-leaved soap plant
Hesperoyucca whipplei [*Yucca w*.]	chaparral yucca
***LILIACEAE* - LILY FAMILY**	
Calochortus weedii var. *intermedius*	intermediate mariposa lily
***POACEAE* - GRASS FAMILY**	
*Bromus diandrus**	ripgut grass
Bromus madritensis ssp. *rubens**	red brome
*Cynodon dactylon**	Bermuda grass
Elymus condensatus [*Leymus c*.]	giant wild rye
Melica imperfect	little California melic grass
Muhlenbergia microsperma	littleseed muhly
Stipa coronata [*Achnatherum coronatum*]	crested needlegrass
Stipa lepida [*Nassella l*.]	foothill needlegrass
Stipa miliacea [*Piptatherum miliacea*]*	smilo grass

PLANT COMPENDIUM FOR THE O'NEILL OAKS SURVEY AREA

SPECIES	
RUSCACEAE **- BUTCHER'S-BROOM FAMILY**	
Nolina cismontana	chaparral nolina, chaparral beargrass
THEMIDACEAE **- BRODIAEA FAMILY**	
Bloomeria crocea	common goldenstar
* non-native to the region it was found cf. appears similar to	

PLANT COMPENDIUM FOR THE FERBER RANCH SURVEY AREA

SPECIES	
PTERIDOPHYTES **- FERNS AND ALLIES**	
DRYOPTERIDACEAE **- WOOD FERN FAMILY**	
Dryopteris arguta	coastal wood fern
POLYPODIACEAE **- POLYPODY FAMILY**	
Polypodium californicum	California polypody
PTERIDACEAE **- BRAKE FAMILY**	
Adiantum jordanii	California maidenhair
Pellaea andromedifolia	coffee fern
Pellaea mucronata	bird's-foot fern
Pentagramma triangularis ssp. *triangularis*	goldenback fern
SELAGINELLACEAE **- SPIKE-MOSS FAMILY**	
Selaginella bigelovii	Bigelow's or bushy spike-moss
GYMNOSPERMS	
PINACEAE **- PINE FAMILY**	
*Pinus halepensis**	Aleppo pine
ANGIOSPERMAE **- FLOWERING PLANTS**	
EUDICOTS	
ADOXACEAE **- MUSKROOT FAMILY**	
Sambucus nigra ssp. *caerulea* [*S. mexicana*]	blue elderberry
ANACARDIACEAE **- SUMAC FAMILY**	
Malosma laurina	laurel sumac
Rhus integrifolia	lemonadeberry
Rhus integrifolia x Rhus ovata	hybrid lemonadeberry-sugarbush
Toxicodendron diversilobum	western poison oak
APIACEAE **- CARROT FAMILY**	
Daucus pusillus	rattlesnake weed
*Foeniculum vulgare**	sweet fennel
Lomatium lucidum	shiny lomatium
Osmorhiza brachypoda	California sweet cicely
Sanicula crassicaulis	Pacific sanicle
*Torilis arvensis**	tall sock-destroyer
Yabea microcarpa	California hedge parsley
APOCYNACEAE **- DOGBANE FAMILY**	
Asclepias eriocarpa	kotolo, Indian milkweed
Asclepias fascicularis	narrow-leaf milkweed
*Vinca major**	greater periwinkle
ASTERACEAE **- SUNFLOWER FAMILY**	
Acourtia microcephala	sacapellote
Ambrosia psilostachya	western ragweed
Artemisia californica	California sagebrush
Artemisia douglasiana	mugwort
Artemisia dracunculus	tarragon
Baccharis pilularis ssp. *consanguinea* [*B. pilularis*]	coyote brush
Baccharis salicifolia ssp. *salicifolia* [*B. salicifolia*]	mule fat
Baccharis sarothroides	broom baccharis

PLANT COMPENDIUM FOR THE FERBER RANCH SURVEY AREA

SPECIES	
Bebbia juncea var. *aspera*	sweetbush
Brickellia californica	California brickellbush
Carduus pycnocephalus ssp. *pycnocephalus**	Italian thistle
*Centaurea melitensis**	tocalote, Malta star-thistle
Chaenactis artemisiifolia	white pincushion
Cirsium occidentale	cobweb thistle
*Cirsium vulgare**	bull thistle
Corethrogyne filaginifolia	California-aster
*Cynara cardunculus**	cardoon, globe artichoke
Deinandra fasciculata [*Hemizonia f.*]	fascicled tarweed
Encelia californica	bush sunflower
Erigeron canadensis [*Conyza c.*]	common horseweed
Erigeron foliosus	leafy fleabane
Eriophyllum confertiflorum	golden-yarrow
*Gazania linearis**	gazania
Glebionis coronaria [*Chrysanthemum coronarium*]*	garland daisy
Gutierrezia californica	California matchweed
Hazardia squarrosa	saw-toothed goldenbush
*Hedypnois cretica**	Crete weed
Helianthus gracilentus	slender sunflower
Helminthotheca echioides [*Picris e.*]*	bristly ox-tongue
Heterotheca grandiflora	telegraph weed
*Hypochaeris glabra**	smooth cat's-ear
Isocoma menziesii var. *vernonioides*	coastal goldenbush
*Lactuca serriola**	prickly lettuce
Lepidospartum squamatum	scale-broom
Logfia filaginoides [*Filago californica*]	California cottonrose
Logfia gallica [*Filago g.*]*	daggerleaf cottonrose
Madia gracilis	gumweed
Osmadenia tenella	osmadenia
Porophyllum gracile	odora
Pseudognaphalium biolettii [*Gnaphalium bicolor*]	bicolored everlasting, Bioletti's cudweed
Pseudognaphalium californicum [*Gnaphalium c.*]	California everlasting
Pseudognaphalium canescens iGnaphalium c.]	everlasting
Pseudognaphalium luteoalbum [*Gnaphalium l.*]*	weedy cudweed
Pseudognaphalium microcephalum [*Gnaphalium canescens* ssp. *m.*]	white everlasting
Rafinesquia californica	California chicory
Solidago velutina ssp. *californica* [*Solidago c.*]	California goldenrod
Sonchus asper ssp. *asper**	prickly sow thistle
*Sonchus oleraceus**	common sow thistle
Stebbinsoseris heterocarpa [*Microseris h.*]	grassland silverpuffs/brownpuffs
Stephanomeria diegensis	San Diego wreath plant

PLANT COMPENDIUM FOR THE FERBER RANCH SURVEY AREA

SPECIES	
***BETULACEAE* - BIRCH FAMILY**	
Alnus rhombifolia	white alder
***BORAGINACEAE* - BORAGE FAMILY**	
Cryptantha intermedia	common cryptantha
Eucrypta chrysanthemifolia	common eucrypta
Phacelia cicutaria	caterpillar phacelia
Phacelia minor	wild canterbury-bell
***BRASSICACEAE* - MUSTARD FAMILY**	
*Hirschfeldia incana**	shortpod mustard
Lepidium nitidum	peppergrass / shining peppergrass
*Sisymbrium officinale**	hedge mustard
***CACTACEAE* - CACTUS FAMILY**	
*Opuntia ficus-indica**	mission prickly-pear
Opuntia littoralis	coastal prickly-pear
Opuntia x occidentalis	western prickly-pear
Opuntia x vaseyi	mesa prickly-pear
***CAPRIFOLIACEAE* - HONEYSUCKLE FAMILY**	
Lonicera subspicata var. *denudata*	southern honeysuckle
Symphoricarpos mollis	creeping snowberry
***CARYOPHYLLACEAE* - PINK FAMILY**	
Polycarpon depressum	California polycarp
*Silene gallica**	small-flower catchfly
Silene laciniata ssp. *lanciniata* [*Silene l. ssp. major*]	Mexican pink
***CHENOPODIACEAE* - GOOSEFOOT FAMILY**	
*Atriplex semibaccata**	Australian saltbush
*Chenopodium album**	lamb's quarters
Chenopodium californicum	California goosefoot
*Chenopodium murale**	nettle-leaved goosefoot
***CISTACEAE* - ROCK-ROSE FAMILY**	
Helianthemum scoparium	peak rush-rose
***CONVOLVULACEAE* - MORNING-GLORY FAMILY**	
Calystegia macrostegia	large-bracted morning-glory
*Convolvulus arvensis**	bindweed
Cuscuta californica	chaparral dodder
Cuscuta subinclusa	canyon dodder
***CRASSULACEAE* - STONECROP FAMILY**	
Dudleya lanceolata	lance-leaved dudleya / lanceleaf/ coastal dudleya / coastal live-forever
Dudleya pulverulenta	chalk dudleya / chalky live-forever
***CUCURBITACEAE* - GOURD FAMILY**	
Marah macrocarpus	wild cucumber / chilicothe
***EUPHORBIACEAE* - SPURGE FAMILY**	
Chamaesyce polycarpa [*Euphorbia p.*]	golondrina / small-seed sandmat
Croton setigerus [*Eremocarpus s.*]	doveweed / turkey mullein
*Euphorbia peplus**	petty spurge

PLANT COMPENDIUM FOR THE FERBER RANCH SURVEY AREA

SPECIES	
*Ricinus communis**	castor bean
FABACEAE **- LEGUME FAMILY**	
Acmispon americanus [*Lotus purshianus*]	American lotus
Acmispon glaber var. glaber [*Lotus scoparius* var. *scoparius*]	coastal deerweed
Acmispon hamatus [*Lotus h*.]	grab lotus / San Diego lotus
Acmispon heermannii var*. heermannii* [*Lotus h.* var*. h*.]	southern woolly lotus
Acmispon maritimus var. *maritimus* [*Lotus salsuginosus* ssp. s*alsuginosus*]	alkali lotus
Acmispon strigosus [*Lotus s*.]	strigose lotus
Astragalus trichopodus var. *lonchus*	ocean locoweed
Lathyrus vestitus ssp. *vestitus*	chaparral sweet pea
Lupinus bicolor	miniature lupine
Lupinus microcarpus var. *densiflorus*	dense-flowered chick lupine
*Medicago polymorpha**	California burclover
*Melilotus alba**	white sweetclover
*Melilotus indica**	sourclover
Trifolium willdenovii	tomcat clover
Vicia cf. *benghalensis**	purple vetch
Vicia sativa ssp. *sativa**	spring vetch
FAGACEAE **- OAK / BEECH FAMILY**	
Quercus agrifolia	coast live oak
Quercus berberidifolia	scrub oak / California scrub oak
GERANIACEAE **- GERANIUM FAMILY**	
*Erodium botrys**	long-beaked filaree
*Erodium cicutarium**	red-stemmed filaree
GROSSULARIACEAE **- GOOSEBERRY FAMILY**	
Ribes indecorum	white-flowered currant
LAMIACEAE **- MINT FAMILY**	
*Marrubium vulgare**	common horehound
Monardella hypoleuca ssp. *intermedia*	intermediate thick-leaved monardella
Salvia apiana	white sage
Salvia mellifera	black sage
Salvia apiana x Salvia mellifera	hybrid white sage-black sage
Stachys rigida ssp. *rigida*	rigid hedge-nettle
MALVACEAE **- MALLOW FAMILY**	
*Malva parviflora**	cheeseweed
MYRSINACEAE - MYRSINE FAMILY	
*Anagallis arvensis**	scarlet pimpernel
NYCTAGINACEAE **- FOUR-O'CLOCK FAMILY**	
Mirabilis laevis var. *crassifolia* [*M. californica*]	wishbone bush / California wishbone bush
OLEACEAE **- OLIVE FAMILY**	
Fraxinus dipetala	California ash
*Olea europaea**	olive

PLANT COMPENDIUM FOR THE FERBER RANCH SURVEY AREA

SPECIES	
***ONAGRACEAE* - EVENING PRIMROSE FAMILY**	
Camissoniopsis bistorta [*Camissonia b.*]	California sun cup
Clarkia purpurea	winecup clarkia
Epilobium canum	California fuchsia
Eulobus californicus [*Camissonia californica*]	mustard-like evening primrose
***OROBANCHACEAE* - BROOMRAPE FAMILY**	
Castilleja affinis ssp. *affinis*	coastal paintbrush
Castilleja exserta	purple owl's clover
Castilleja foliolosa	felt paintbrush
Cordylanthus rigidus ssp. *setigerus*	dark-tipped bird's beak
***OXALIDACEAE* - WOOD-SORREL FAMILY**	
Oxalis californica [*O. albicans* ssp. *c*.]	California wood-sorrel
*Oxalis pes-caprae**	Bermuda buttercup / sour grass
***PAEONIACEAE* - PEONY FAMILY**	
Paeonia californica	California peony
***PAPAVERACEAE* - POPPY FAMILY**	
Romneya coulteri	Coulter's matilija poppy
***PHRYMACEAE* - LOPSEED FAMILY**	
Mimulus aurantiacus var. *puniceus*	orange bush monkeyflower
Mimulus cardinalis	scarlet monkeyflower
***PLANTAGINACEAE* - PLANTAIN FAMILY**	
Antirrhinum kelloggii	Kellogg's / climbing snapdragon
Antirrhinum nuttallianum ssp. *nuttallianum*	Nuttall's snapdragon
Keckiella cordifolia	heart-leaved bush-penstemon
***PLATANACEAE* - SYCAMORE FAMILY**	
Platanus racemosa	western sycamore
***POLEMONIACEAE* - PHLOX FAMILY**	
Allophyllum glutinosum	blue false-gilia
Eriastrum sapphirinum	sapphire woollystar
Linanthus californicum [*Leptodactylon c*.]	prickly phlox
Linanthus dianthiflorus	ground pink
***POLYGALACEAE* - MILKWORT FAMILY**	
Polygala cornuta ssp. *fishiae*	horned polygala / fish's milkwort
***POLYGONACEAE* - BUCKWHEAT FAMILY**	
Chorizanthe staticoides	Turkish rugging
Eriogonum elongatum var. *elongatum*	long-stemmed wild buckwheat
Eriogonum fasciculatum	California buckwheat
Polygonum aviculare ssp. *depressum* [*Polygonum arenastrum*]*	common knotweed
Pterostegia drymarioides	woodland threadstem
*Rumex conglomeratus**	whorled dock
*Rumex crispus**	curly dock
Rumex salicifolius	willow dock
***RANUNCULACEAE* - CROWFOOT FAMILY**	
Clematis sp.	clematis

PLANT COMPENDIUM FOR THE FERBER RANCH SURVEY AREA

SPECIES	
Thalictrum fendleri var. *polycarpum*	common meadow-rue
***RHAMNACEAE* - BUCKTHORN FAMILY**	
Frangula californica [*Rhamnus californica*]	California coffee berry
Rhamnus ilicifolia	hollyleaf redberry
***ROSACEAE* - ROSE FAMILY**	
Adenostoma fasciculatum var. *fasciculatum*	common chamise
Cercocarpus betuloides var. *betuloides*	birch-leaf mountain-mahogany
Heteromeles arbutifolia	toyon / christmas berry
Rosa californica	California rose
***RUBIACEAE* - MADDER FAMILY**	
Galium angustifolium	narrowly leaved bedstraw
Galium aparine	goose grass
*Galium parisiense**	Parisian bedstraw
Galium porrigens var. *porrigens*	climbing bedstraw
***SALICACEAE* - WILLOW FAMILY**	
Populus fremontii ssp. *fremontii*	Fremont cottonwood
Salix exigua	narrow-leaved willow
Salix gooddingii	Goodding's black willow
Salix laevigata	red willow
Salix lasiolepis	arroyo willow
***SCROPHULARIACEAE* - FIGWORT FAMILY**	
Scrophularia californica	California figwort
***SOLANACEAE* - NIGHTSHADE FAMILY**	
Datura wrightii	jimson weed
*Nicotiana glauca**	tree tobacco
Solanum douglasii	Douglas' nightshade
***TAMARICACEAE* - TAMARISK FAMILY**	
*Tamarix ramosissima**	Mediterranean tamarix
***VERBENACEAE* - VERVAIN FAMILY**	
Verbena lasiostachys var. *lasiostachys*	western verbena
***MONOCOTYLEDONES* - MONOCOTS**	
***AGAVACEAE* - CENTURY PLANT FAMILY**	
Chlorogalum pomeridianum	wavy-leaved soap plant
Hesperoyucca whipplei [*Yucca w*.]	chaparral yucca
***CYPERACEAE* - SEDGE FAMILY**	
Carex triquetra	trigonous sedge
Cyperus esculentus	yellow umbrella-sedge / nutgrass
Scirpus microcarpus	small-fruited bulrush
***IRIDACEAE* - IRIS FAMILY**	
Sisyrinchium bellum	western blue-eyed grass
***JUNCACEAE* - RUSH FAMILY**	
Juncus dubius	mariposa rush
***LILIACEAE* - LILY FAMILY**	
Calochortus splendens	splendid mariposa lily
Calochortus weedii var. *intermedius*	intermediate mariposa lily

PLANT COMPENDIUM FOR THE FERBER RANCH SURVEY AREA

SPECIES	
Lilium humboldtii ssp. *ocellatum*	ocellated Humboldt lily
***ORCHIDACEAE* - ORCHID FAMILY**	
Piperia cooperi	chaparral rein orchid
***POACEAE* - GRASS FAMILY**	
Agrostis pallens	San Diego bentgrass
Aristida divaricata	poverty three-awn
Aristida purpurea	purple three-awn
*Avena barbata**	slender wild oat
*Avena fatua**	wild oat
Bothriochloa barbinodis	cane bluestem
*Brachypodium distachyon**	purple false brome
Bromus carinatus var. *marginatus*	mountain brome
*Bromus diandrus**	ripgut grass
*Bromus hordeaceus**	soft chess
Bromus madritensis ssp. *rubens**	red brome
*Bromus sterilis**	poverty brome
*Cynodon dactylon**	Bermuda grass
Distichlis spicata	salt grass
*Ehrharta calycina**	perennial veldt grass
Elymus condensatus [*Leymus c*.]	giant wild rye
Elymus triticoides [*Leymus t*.]	beardless wild rye
Festuca myuros [*Vulpia m*.]*	foxtail fescue
Festuca perennis [*Lolium perenne, L. multiflorum*]*	perennial ryegrass
Gastridium phleoides [*Gastridium ventricosum*]*	nit grass
Hordeum murinum var. *leporinum**	hare barley
*Lamarckia aurea**	goldentop
Melica imperfecta	little California melic grass
Muhlenbergia microsperma	littleseed muhly
Muhlenbergia rigens	deergrass
*Phalaris minor**	little-seed canary grass
*Phalaris paradoxa**	paradox canary grass
*Polypogon monspeliensis**	annual beard grass
Polypogon viridis [*Agrostis viridis*]*	water bentgrass
Stipa coronata [*Achnatherum coronatum*]	crested needlegrass
Stipa lepida [*Nassella l*.]	foothill needlegrass
Stipa miliacea [*Piptatherum miliacea*]*	smilo grass
Stipa pulchra [*Nassella p*.]	purple needlegrass
***RUSCACEAE* - BUTCHER'S-BROOM FAMILY**	
Nolina cismontana	chaparral nolina, chaparral beargrass
***THEMIDACEAE* - BRODIAEA FAMILY**	
Bloomeria crocea	common goldenstar
Dichelostemma capitatum	blue dicks
* non-native to the region it was found cf. appears similar to	

WILDLIFE COMPENDIUM FOR THE SOUTH COUNTY PROPERTIES

Species		Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
AMPHIBIANS					
***AMPHIBIA* - AMPHIBIANS**					
BUFONIDAE - TRUE TOADS					
Anaxyrus boreas [Bufo boreas]	western toad	X			
HYLIDAE - TREEFROGS					
Pseudacris [Hyla] cadaverina	California treefrog	X			
REPTILES					
***LEPIDOSAURIA* - LIZARDS & SNAKES**					
PHRYNOSOMATIDAE - ZEBRA-TAILED, FRINGE-TOED, SPINY, TREE, SIDE-BLOTCHED, & HORNED LIZARDS					
Sceloporus occidentalis	western fence lizard	X	X	X	X
Uta stansburiana	side-blotched lizard	X	X	X	X
TEIIDAE - WHIPTAIL LIZARDS					
Aspidoscelis [Cnemidophorus] hyperythra	orangethroat whiptail	X	X		
COLUBRIDAE - COLUBRID SNAKES					
Pituophis catenifer	gopher snake	X			X
BIRDS					
***AVES* - BIRDS**					
ODONTOPHORIDAE - QUAILS					
Callipepla californica	California quail	X	X	X	X
CATHARTIDAE - NEW WORLD VULTURES					
Cathartes aura	turkey vulture	X	X	X	X
ACCIPITRIDAE - HAWKS, KITES, EAGLES, & ALLIES					
Elanus leucurus	white-tailed kite	X			
Circus cyaneus	northern harrier	X			
Accipiter cooperii	Cooper's hawk	X	X	X	X
Buteo lineatus	red-shouldered hawk	X	X	X	X
Buteo jamaicensis	red-tailed hawk	X	X	X	
Aquila chrysaetos	golden eagle	X			

WILDLIFE COMPENDIUM FOR THE SOUTH COUNTY PROPERTIES

Species		Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
FALCONIDAE - FALCONS					
Falco sparverius	American kestrel	X			
COLUMBIDAE - PIGEONS & DOVES					
Columba livia *	rock pigeon	X	X	X	X
Columba fasciata	band-tailed pigeon	X	X	X	
Streptopelia decaocto *	Eurasian collared-dove	X			
Zenaida macroura	mourning dove	X	X	X	X
CUCULIDAE - CUCKOOS & ROADRUNNERS					
Geococcyx californianus	greater roadrunner	X			
TYTONIDAE - BARN OWLS					
Tyto alba	barn owl	X			
STRIGIDAE - TRUE OWLS					
Bubo virginianus	great horned owl	X	X	X	
CAPRIMULGIDAE - GOATSUCKERS					
Phalaenoptilus nuttallii	common poorwill				X
APODIDAE - SWIFTS					
Aeronautes saxatalis	white-throated swift	X			
TROCHILIDAE - HUMMINGBIRDS					
Archilochus alexandri	black-chinned hummingbird	X			
Calypte anna	Anna's hummingbird	X	X	X	X
Calypte costae	Costa's hummingbird	X			X
Selasphorus sasin	Allen's hummingbird	X			
PICIDAE - WOODPECKERS					
Melanerpes formicivorus	acorn woodpecker	X	X	X	X
Picoides nuttallii	Nuttall's woodpecker	X	X	X	X
Picoides pubescens	downy woodpecker	X			
Colaptes auratus	northern flicker	X	X		X
TYRANNIDAE - TYRANT FLYCATCHERS					
Contopus sordidulus	western wood-pewee			X	X
Empidonax traillii	willow flycatcher	X			
Empidonax difficilis	Pacific-slope flycatcher	X			
Sayornis nigricans	black phoebe	X	X	X	X

WILDLIFE COMPENDIUM FOR THE SOUTH COUNTY PROPERTIES

Species		Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
Sayornis saya	Say's phoebe	X			
Myiarchus cinerascens	ash-throated flycatcher	X	X	X	X
Tyrannus verticalis	western kingbird	X			
VIREONIDAE - VIREOS					
Vireo huttoni	Hutton's vireo	X			
CORVIDAE - CROWS & JAYS					
Aphelocoma californica	western scrub-jay	X	X	X	X
Corvus brachyrhynchos	American crow	X	X	X	X
Corvus corax	common raven	X	X	X	X
HIRUNDINIDAE - SWALLOWS					
Tachycineta thalassina	violet-green swallow	X			
Stelgidopteryx serripennis	northern rough-winged swallow	X			
Petrochelidon pyrrhonota	cliff swallow	X		X	X
Hirundo rustica	barn swallow	X			
PARIDAE - TITMICE					
Baeolophus inornatus	oak titmouse	X	X		X
AEGITHALIDAE - BUSHTITS					
Psaltriparus minimus	bushtit	X	X	X	X
SITTIDAE - NUTHATCHES					
Sitta carolinensis	white-breasted nuthatch	X			
TROGLODYTIDAE - WRENS					
Campylorhynchus brunneicapillus sandiegensis	coastal cactus wren	X	X	X	X
Thryomanes bewickii	Bewick's wren	X	X	X	X
Troglodytes aedon	house wren	X	X	X	X
POLIOPTILIDAE - GNATCATCHERS & GNATWRENS					
Polioptila caerulea	blue-gray gnatcatcher	X			X
Polioptila californica californica	coastal California gnatcatcher	X	X		
SYLVIIDAE - SYLVIID WARBLERS					
Chamaea fasciata	wrentit	X	X	X	X
TURDIDAE - THRUSHES & ROBINS					
Turdus migratorius	American robin	X			

WILDLIFE COMPENDIUM FOR THE SOUTH COUNTY PROPERTIES

Species		Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
MIMIDAE - THRASHERS					
Mimus polyglottos	northern mockingbird	X	X	X	X
Toxostoma redivivum	California thrasher	X	X	X	
STURNIDAE - STARLINGS					
Sturnus vulgaris *	European starling	X	X		X
PTILOGONATIDAE - SILKY-FLYCATCHERS					
Phainopepla nitens	phainopepla	X	X	X	
PARULIDAE - WARBLERS					
Oreothlypis [*Vermivora*] *celata*	orange-crowned warbler	X			
Geothlypis trichas	common yellowthroat	X			
Cardellina pusilla [*Wilsonia pusilla*]	Wilson's warbler	X			
EMBERIZIDAE - SPARROWS & JUNCOS					
Pipilo maculatus	spotted towhee	X	X	X	X
Melozone [*Pipilo*] *crissalis*	California towhee	X	X	X	X
Aimophila ruficeps canescens	southern California rufous-crowned sparrow	X			
Spizella atrogularis	black-chinned sparrow	X			
Chondestes grammacus	lark sparrow	X			
Passerella iliaca	fox sparrow		X	X	X
Melospiza melodia	song sparrow	X	X	X	X
Junco hyemalis	dark-eyed junco	X			
ICTERIDAE - BLACKBIRDS					
Euphagus cyanocephalus	Brewer's blackbird	X	X		
Molothrus ater	brown-headed cowbird	X			
Icterus cucullatus	hooded oriole	X			
Icterus bullockii	Bullock's oriole	X		X	
FRINGILLIDAE - FINCHES					
Carpodacus purpureus	purple finch	X			
Carpodacus mexicanus	house finch	X	X	X	X
Spinus [Carduelis] psaltria	lesser goldfinch	X	X	X	X
Spinus [Carduelis] tristis	American goldfinch	X		X	

WILDLIFE COMPENDIUM FOR THE SOUTH COUNTY PROPERTIES

Species		Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
PASSERIDAE - OLD WORLD SPARROWS					
Passer domesticus *	house sparrow	X			
MAMMALS					
***MAMMALIA* - MAMMALS**					
VESPERTILIONIDAE - VESPER BATS					
Myotis yumanensis	Yuma bat	X	X	X	X
Lasiurus cinereus	hoary bat	X			
Lasionycteris noctivagans	silver-haired bat				X
Parastrellus [*Pipistrellus*] *hesperus*	canyon bat	X			
Eptesicus fuscus	big brown bat	X			X
MOLOSSIDAE - FREE-TAILED BATS					
Tadarida brasiliensis	Brazilian free-tailed bat	X	X	X	X
LEPORIDAE - HARES & RABBITS					
Sylvilagus audubonii	desert cottontail	X	X	X	X
SCIURIDAE - SQUIRRELS					
Spermophilus beecheyi	California ground squirrel	X	X		X
Sciurus griseus	western gray squirrel	X	X		
GEOMYIDAE - POCKET GOPHERS					
Thomomys bottae	Botta's pocket gopher	X	X	X	X
MURIDAE - MICE, RATS, & VOLES					
Neotoma fuscipes	dusky-footed woodrat		X		
Neotoma lepida	desert woodrat				X
Neotoma sp.	woodrat			X	
CANIDAE - WOLVES & FOXES					
Canis latrans	coyote	X			X
Urocyon cinereoargenteus	common gray fox	X			
MEPHITIDAE - SKUNKS					
Mephitis mephitis	striped skunk	X			
FELIDAE - CATS					
Lynx rufus	bobcat	X			
EQUIDAE - HORSES & ASSES					
Equus caballus	domestic horse	X			

WILDLIFE COMPENDIUM FOR THE SOUTH COUNTY PROPERTIES

Species		Ferber Ranch	O'Neill Oaks	Hafen	Saddle Creek South
CERVIDAE - DEER					
Odocoileus hemionus	mule deer	X	X		X
BOVIDAE - CATTLE, ANTELOPE, SHEEP, & GOATS					
Bos taurus *	domestic cattle		X		X
INVERTEBRATES					
***INSECTA* - INSECTS**					
PAPILIONIDAE - SWALLOWTAIL BUTTERFLIES					
Papilio zelicaon	anise swallowtail	X			
Papilio rutulus	western tiger swallowtail	X			
PIERIDAE - WHITES, SULFURS, & ORANGETIPS					
Anthocharis sara	Sara orangetip	X			
Pieris rapae *	mustard white	X			
Pontia protodice	common (checkered) white	X			
Colias harfordi	Harford's sulfur	X			
SATYRIDAE - WOOD NYMPHS					
Coenonympha californica	California ringlet	X			
NYMPHALIDAE - BRUSH-FOOTED BUTTERFLIES					
Agraulis vanillae	gulf fritillary	X			
Vanessa cardui	painted lady	X			
Vanessa annabella	west coast lady	X			
Junonia coenia	common buckeye	X			
Adelpha bredowii californica	California sister	X			
Basilarchia lorquini	Lorquin's admiral	X			
LYCAENIDAE - BLUES, HAIRSTREAKS, & COPPERS					
Leptotes marina	marine blue	X			
Icaricia acmon	acmon blue	X			
HETERONEMIIDAE - COMMON WALKINGSTICKS					
Parabacillus hesperus	western short-horned walking stick	X			
* introduced species					

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Baseline Biological Surveys Technical Report for the MacPherson Property

Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California

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TABLE OF CONTENTS

Section		**Page**
1.0	**Introduction**	**1**
	1.1 Background	1
	1.2 Project Location and Physical Environmental Setting	2
2.0	**Survey Methods**	**6**
	2.1 Literature Review	6
	2.2 Vegetation Mapping and General Surveys	6
	2.3 Focused Biological Surveys	7
3.0	**Existing Biological Resources**	**9**
	3.1 Vegetation Types and Other Areas	9
	3.2 Wildlife Populations and Movement Patterns	11
	3.3 Special Status Biological Resources	16
	3.4 Covered Species Summary	39
4.0	**References**	**43**

TABLES

Table		**Page**
1	Summary of Survey Data and Conditions for Gnatcatcher Surveys	8
2	Vegetation Types and Other Areas on the MacPherson Property	9
3	Special Status Plant Species Reported from the Property Vicinity	22
4	Intermediate Mariposa Lily Populations Observed on the Property	28
5	Chaparral Nolina Populations Observed on the Property	29
6	Special Status WILDLIFE SPecies Reported from the Property Vicinity	30
7	Summary of Covered Species	40

EXHIBITS

<u>**Exhibit**</u>		<u>**Follows Page**</u>
1	Project Location	1
2	USGS 7.5-Minute Quadrangle	2
3	Soil Types	2
4	Regional Environmental Setting	2
5	Fire History	4
6	Anthropogenic Features and Invasive Species	5
7	Vegetation Types and Other Areas	9
8	Special Status Species	28

ATTACHMENTS

A Plant and Wildlife Compendia
B Site Photographs

1.0 INTRODUCTION

This Biological Technical Report has been prepared to support California Environmental Quality Act (CEQA) documentation and resource management planning for the Measure M2 Freeway Environmental Mitigation Program (EMP) Acquisition Properties Evaluation Project. The EMP project originally included five separate Orange County Transportation Authority (OCTA) acquisition properties (Hayashi, Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South). An additional acquisition was made of the MacPherson property, also located in unincorporated Orange County, California (Exhibit 1). This report is limited to the MacPherson property; separate reports were previously prepared for the other properties.

This information has been reported in accordance with accepted scientific and technical standards that are consistent with the requirements of the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW).

1.1 BACKGROUND

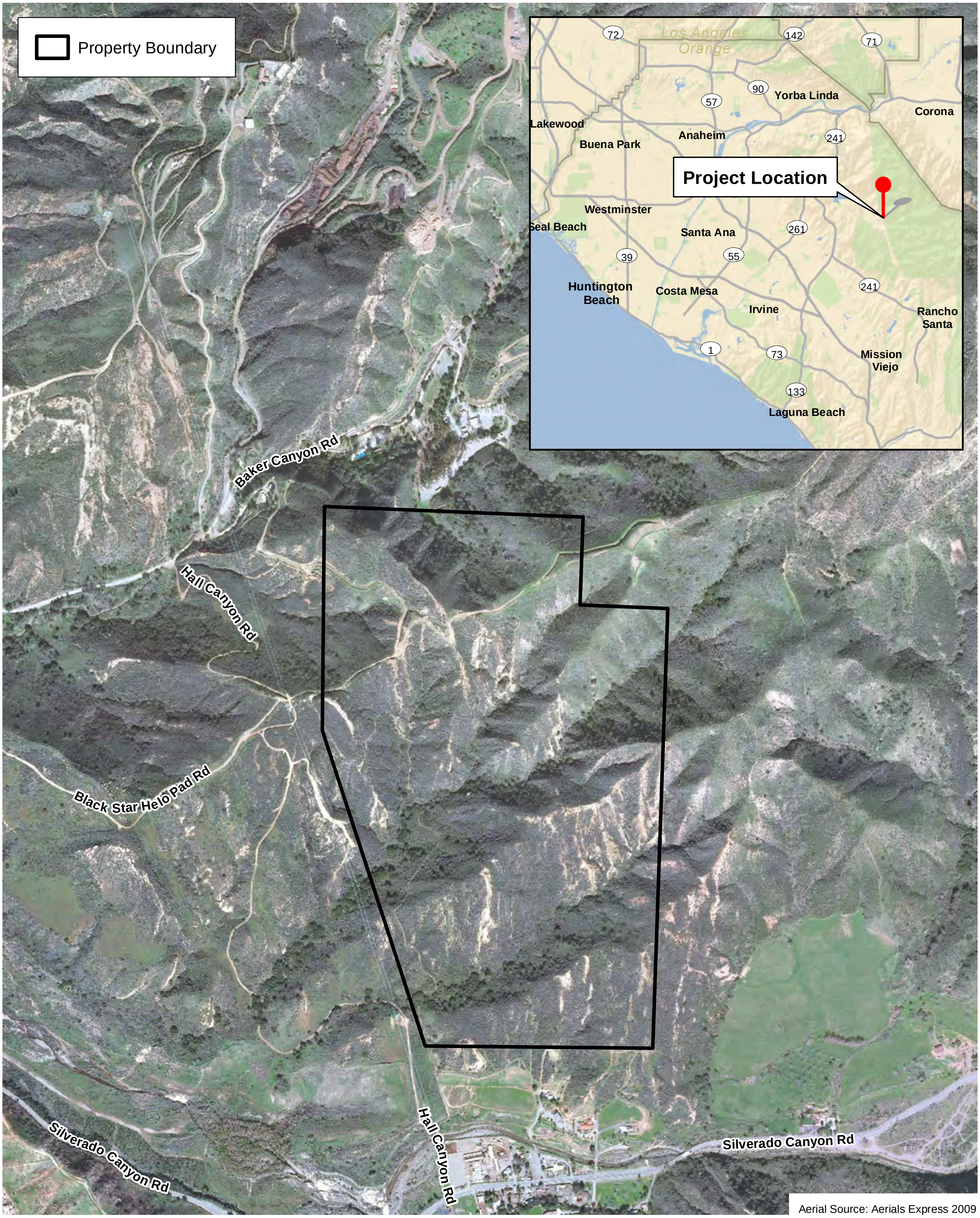
1.1.1 Project Description

In 2006, Orange County voters approved the renewal of Measure M, effectively extending the half-cent sales tax in the County from April 2011 to March 2041. Renewed Measure M (or Measure M2) will continue to provide funding for transportation projects and programs in the County, including select freeway and roadway improvements, transit programs, and two environmental programs.

OCTA's M2 Freeway EMP provides comprehensive mitigation to offset the environmental impacts of the 13 Measure M2-funded freeway projects. The EMP is spearheaded by the Environmental Oversight Committee (EOC), which is made up of OCTA Board members and representatives from the California Department of Transportation (Caltrans), resource agencies, environmental groups, and the public.

Instead of mitigating the natural resource impacts of Measure M2 freeway projects on a project-by-project basis, the EMP presents a comprehensive mitigation approach that not only replaces habitat, but also provides the opportunity to improve the overall functions and values of sensitive biological resources throughout Orange County. Working collaboratively with the resource and regulatory agencies, OCTA ultimately decided that creation of a Natural Community Conservation Plan (NCCP)/Habitat Conservation Plan (HCP) and programmatic wetland permitting program would best serve as the EMP's main implementation tools.

As one of the key components of the conservation strategy for the NCCP/HCP and wetlands permitting, OCTA has undertaken a systematic approach to identifying and acquiring habitat preserves to meet the goals and objectives of the NCCP/HCP and wetland mitigation programs. A formal conservation assessment was completed by Conservation Biology Institute (CBI) for Orange County, which resulted in the identification of Priority Conservation Areas (PCA); these included candidate parcels and properties that could be considered for habitat and wildlife conservation purposes. OCTA solicited willing sellers and evaluated each property using standardized criteria and a prioritization process to rank properties for purchase. Properties for acquisition were selected based on conservation values, policy considerations, mitigation credits, mitigation plan review, and adoption and real estate value/economics.



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Project Location

Exhibit 1

Measure M2 Acquisition Properties Evaluation – MacPherson Property

N W E S

1,000 500 0 1,000 Feet

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The MacPherson property was selected and acquired on December 24, 2013. Baseline biological surveys were completed in 2014 with the following purposes:

- A general biological assessment was completed to establish the baseline biological value of the property and to identify any biological threats that have the potential to reduce the long-term biological value. In addition, information on the overall condition of the property will guide the development of a site-specific Resource Management Plan (RMP).
- Comprehensive surveys of vegetation types were completed to provide detailed knowledge of the natural habitat and a quantification of habitat type credits on the property.
- Focused surveys for OCTA M2 NCCP/HCP Covered Species and their habitats were completed to establish a baseline of the property status and conditions. Results of future biological monitoring will be compared to the baseline results to evaluate habitat and Covered Species trends.

1.2 PROJECT LOCATION AND PHYSICAL ENVIRONMENTAL SETTING

1.2.1 Property Location and Physical Condition

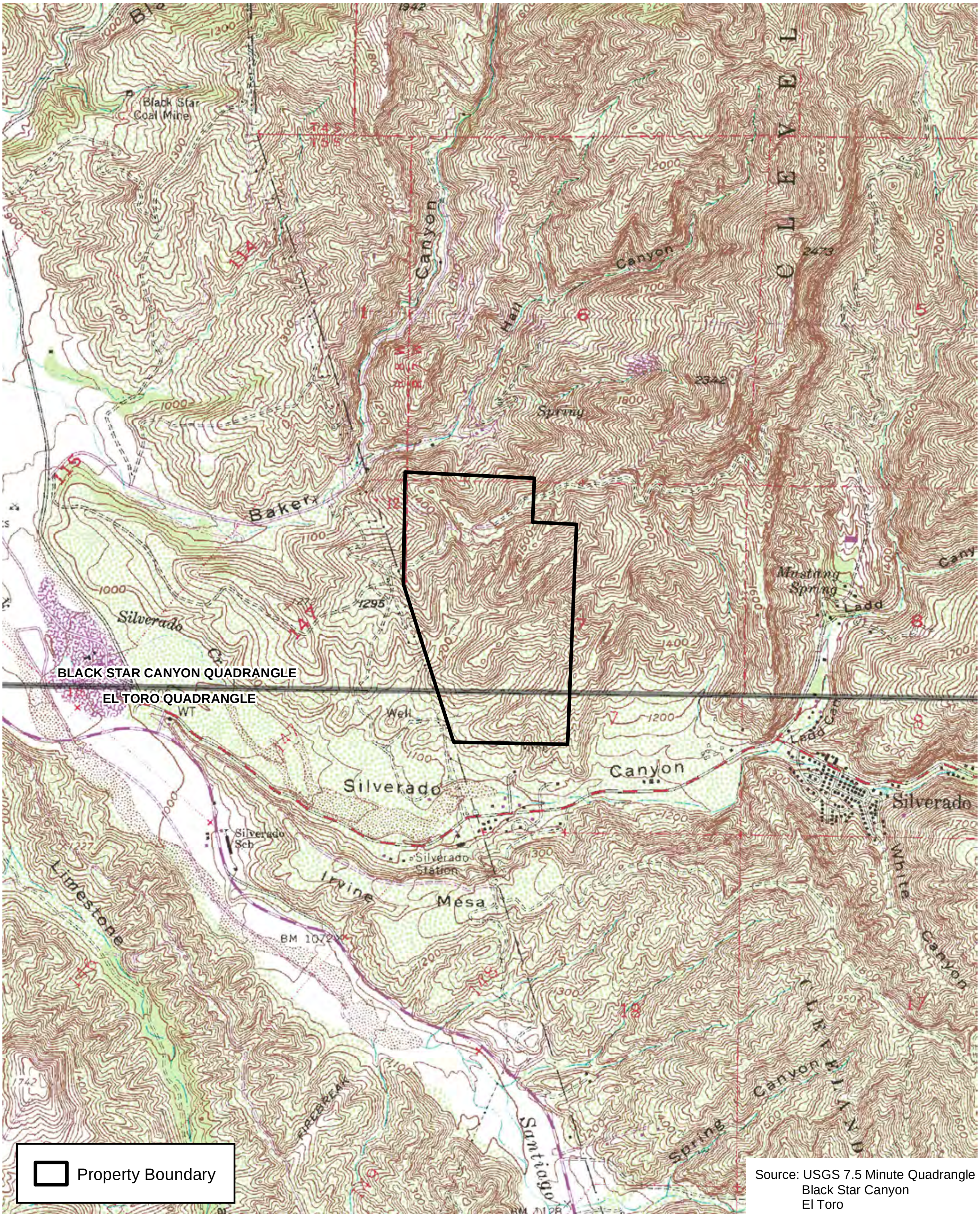
The approximate 204-acre MacPherson property is located in unincorporated Orange County, east of the cities of Orange and Irvine (Exhibit 1). Baker Canyon Road is to the north, Ladd Canyon Road is to the east, Silverado Canyon Road is to the south, and Black Star Canyon Road is to the west. The property is located on the U.S. Geological Survey's (USGS') Black Star Canyon and El Toro 7.5-minute topographic quadrangle maps in Sections 6 and 7 of Township 5 South, Range 7 West (Exhibit 2).

The majority of the property is within the Cleveland National Forest; the western edge of the property is within Irvine Ranch Open Space. The property is within a "Non-Reserve Open Space" area of the Orange County NCCP/HCP for the Central-Coastal Subregion. The property is also located within the Silverado-Modjeska Specific Plan area. The purpose of this plan is to "ensure the preservation of the rural environment and lifestyle of the area while providing for reasonable development" (Orange County 1977).

Topography on the property is hilly, with the main ridgelines oriented in a northeast to southwest direction. Elevations range from approximately 1,135 to 1,678 feet above mean sea level (msl). No blueline streams occur on the property, but multiple drainage features are present in the canyon bottoms. Soil types mapped on the property consist of Anaheim clay loam (30 to 50 percent slopes), Cieneba sandy loam (30 to 75 percent slopes, eroded), Myford sandy loam (2 to 9 percent slopes), and Soper loam (30 to 50 percent slopes) (Exhibit 3).

1.2.2 Regional Environmental Setting

The MacPherson property is located in the cismontane foothills of the Santa Ana Mountains (Exhibit 4). This area is part of a 31-mile swath of continuous wildlife habitat that spans from the Cleveland National Forest in the south to the west end of the Puente Hills (i.e., above Whittier Narrows) in the north. This represents the "last major natural open space resource connecting Los Angeles, Orange, San Bernardino, and Riverside Counties" (Los Angeles County et al. 2003). Specifically, the property occurs between Baker and Hall Canyons to the north, Ladd Canyon to the east, Silverado Canyon to the south, and Santiago Canyon to the west. These canyons are part of the Santiago Hydrologic Subarea of the 1,680-square-mile Santa Ana Watershed. The two main drainages on the property are mapped by the National Wetlands Inventory as freshwater forested/shrub wetland, with the various tributaries mapped as riverine



Source: USGS 7.5 Minute Quadrangle
Black Star Canyon
El Toro

USGS 7.5-Minute Quadrangle

Exhibit 2

Measure M2 Acquisition Properties Evaluation – MacPherson Property

N W E S

2,000 1,000 0 2,000 Feet

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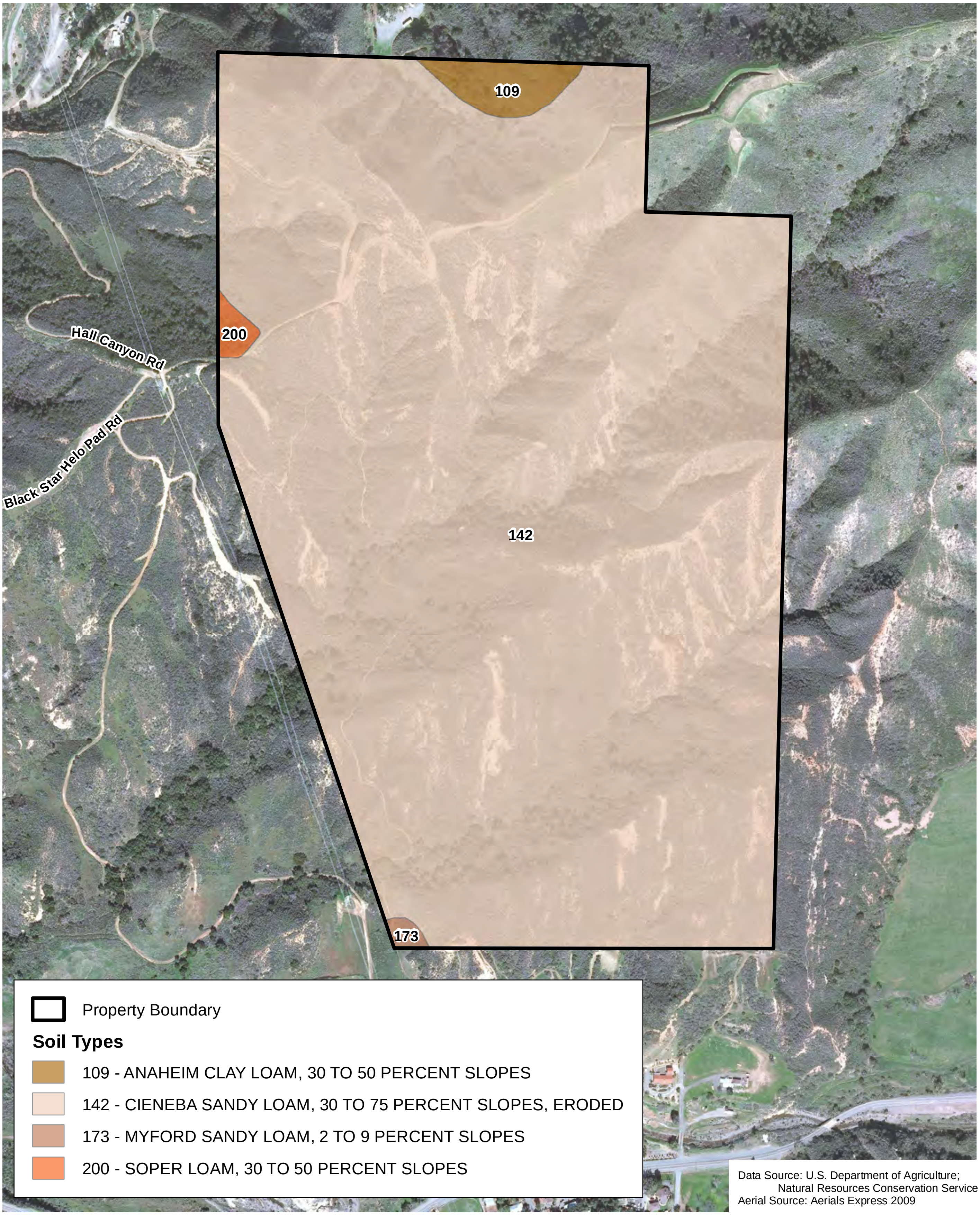

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Soil Types

Exhibit 3

Measure M2 Acquisition Properties Evaluation – MacPherson Property

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600 300 0 600 Feet

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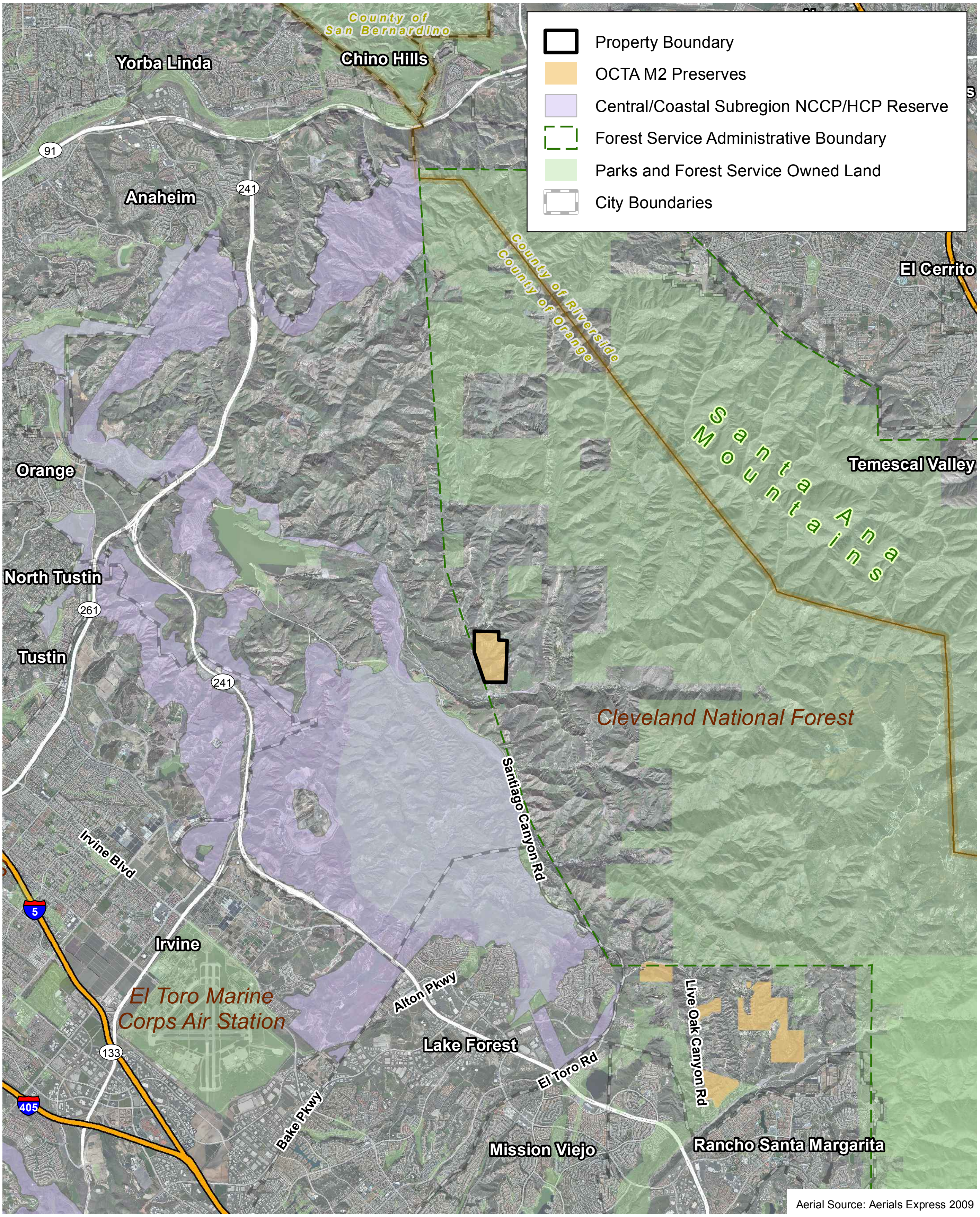

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Regional Environmental Setting

Exhibit 4

Measure M2 Acquisition Properties Evaluation – MacPherson Property

N W E S

2 1 0 2 Miles

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(USFWS 2006). These drainages flow into Santiago Creek, which is a tributary to the Santa Ana River.

1.2.3 Fire History

There are various hypotheses regarding the fire history of Southern California; what constitutes a "natural" fire regime; and the role of fire for chaparral plant species. Traditionally, the fire season in Southern California is from May through September (OCFA 2007). In the past, fires were started by lightning and typically moved down slopes due to falling brands and coals. According to one school of thought, fires only occasionally formed the hot runs on steep slopes that are typical of today's fires and large, intense fires were uncommon (Howard 1992). This fire regime resulted in a mosaic of numerous small burns. New fires were limited by recently burned regions with very little fuel; dead wood and other fuels could not accumulate for long. However, an opposing hypothesis is that large, high-intensity chaparral fires were regular occurrences in the 19th century, often driven by severe weather that involved high temperatures, low humidity, and high winds (Keeley and Zedler 2009).

Mediterranean shrub communities, including those types found on the property, are resilient to infrequent wildfires and historically burned at a frequency of every 30 to 150 years (Halsey 2005). Many plant species associated with chaparral and scrub communities' exhibit characteristics that constitute adaptations to fire. A new fire will then typically burn hot and high into the canopy, killing much of the aboveground biomass. These canopy fires facilitate seed establishment by removing shrub cover and eliminating competitors. In the first few years after a fire, herbs and herbaceous shrubs—such as deerweed (*Acmispon glaber* [*Lotus scoparius*]), lupines (*Lupinus* spp.), paintbrushes (*Castilleja* spp.), and phacelias (*Phacelia* spp.)—are abundant. Because chaparral fires burn nitrogenous compounds in plant tissues and detritus, there is a large loss of nitrogen from the ecosystem. This allows species equipped with nitrogen-fixing bacteria to grow quickly after a fire.

While herbaceous species are establishing, the previously dominant chaparral species are also returning. Many chaparral species rely on fire to release and germinate seeds. Others resprout from roots or buds at the base of the stem. As the shrub canopy closes, whether due to resprouting of individuals burned by the fire or due to seedling growth, these herbaceous species decrease in abundance.

Fire is also a natural element of oak ecosystems and a decreasing fire frequency tends to favor development of oak woodland over scrub or chaparral. Coast live oak is especially fire resistant; trees can survive and resprout even after severe burning due to food reserves stored in the extensive root system. Adaptations to fire include evergreen leaves, thick bark, and the ability to resprout. Trees resprout from the main trunk and upper crown, but also from the root crown; resprouting may result in a multi-trunk tree. While acorns on the soil are killed, animal-buried acorns usually survive moderately severe fire which allows for high rates of post-fire establishment. Post-fire establishment may also be facilitated by western scrub-jays (*Aphelocoma californica*), which prefer burned areas for caching sites (Steinberg 2002). The frequent, low-intensity burning by Native Americans likely resulted in cohorts of large oak trees growing in open, savannah-like stands (McCreary 2004).

Although fires are a natural part of chaparral, scrub, and oak communities, both unnatural increases and decreases in fire frequency can have a negative impact. Now, nearly all wildfires are started by humans, either through arson or accidents (Schoenherr 1992). While the fire season traditionally occurred from May through September, in the past 15 years, Orange County has experienced its most devastating wildfires from October through April (OCFA 2008). Drought conditions contribute to an increase in dead fuels; drier and more explosive fuels; and more intense fire behavior. In addition, sustained Santa Ana Winds increase the speed of fire and magnify the effects on the available fuel bed. Santa Ana Winds are strong, warm, and dry winds that flow down into the valleys when stable; during these conditions, high pressure air is forced across and then down the lee-side slopes of a mountain range. The descending air is warmed and dried, which produces critical fire weather conditions.

Anthropogenic increases in fire frequency can change the natural resilience of native communities. With a high frequency of fires, plants may not store enough energy between fires to resprout from roots or buds. In general, when an area burns too often for the community to mature, native plants may not be able to maintain dominance, often resulting in a habitat type conversion. Ruderal species, including annual grasses and invasive forbs, often thrive in post-fire conditions. As a result, fires often promote the spread of non-native species into native habitats. In turn, this high degree of non-native grass and forb cover can lead to more frequent fire return intervals (e.g., intervals of less than eight years have been reported) (Minnich and Dezzani 1998).

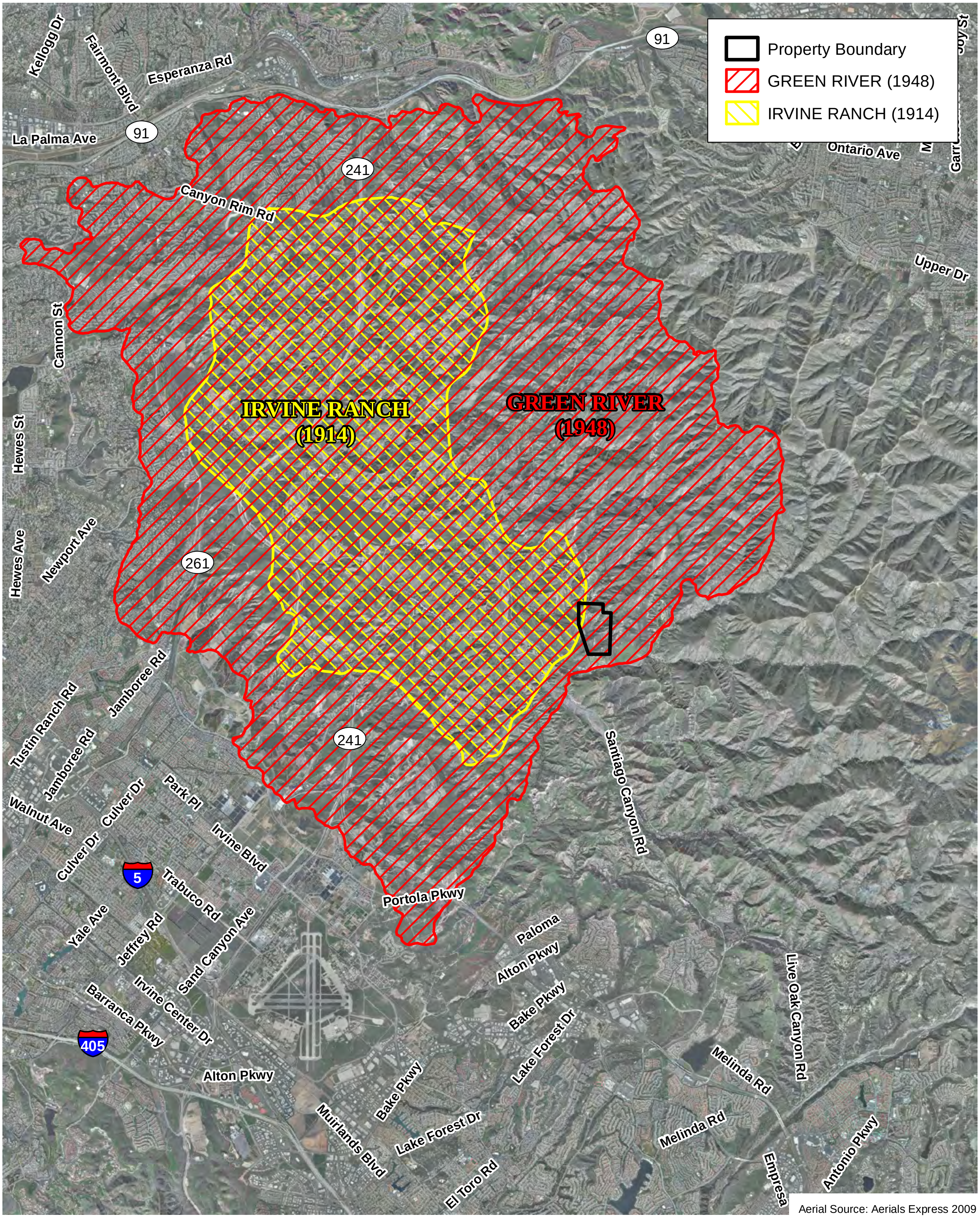
A decrease in fire frequency may also hinder reproduction of fire-adapted species. In the past, government agencies tried to prevent and stop the spread of wildfires through a policy of fire suppression. These efforts were found to be unsuccessful, and they occasionally resulted in larger and more catastrophic fires. While they are less frequent, unnaturally large fires may burn so hot and intense that the canopy, roots, and even the seeds of fire-adapted plants are destroyed. Habitat type conversion may occur in scrub and chaparral communities where fire suppression allows oaks to increase in density (McCreary 2004). When fire is not allowed to regenerate the understory of oak savannahs, the shrub component increases and more severe, crown-consuming fires may result.

Over the past 60 years, Orange County has experienced a number of major (i.e., burned greater than 2,000 acres, burned for an extended period or time, and/or resulted in extraordinary property loss) wildland fires, including 20 that burned over 2,000 acres (OCFA 2008). Most recently, the Silverado Fire burned a total of 968 acres approximately 2.75 miles east of the property in September 2014. The California Department of Forestry and Fire Protection (CAL FIRE) has tracked significant fire events on the MacPherson property. Exhibit 5 shows the fire history of the property. The Irvine Ranch Fire (1914) burned approximately 17.43 acres on the property and the Green River Fire (1948) burned the entire property (CAL FIRE 2014).

1.2.4 Climate

Southern California experiences a Mediterranean climate characterized by mild, rainy winters and hot, dry summers. There can also be dramatic differences in rainfall from year to year. Consequently, the vegetation types in the Southern California area consist of drought-tolerant, woody shrubs and trees and annual, fall/winter-sprouting grasses.

The temperature in Southern California is moderated by the coastal influence of the Pacific Ocean, which creates mild conditions throughout most of the year. The stable atmosphere creates cloudless conditions, producing dry summers and a subtropical climate with many days of sunshine (Ritter 2006). The most distinguishing characteristic of a Mediterranean climate is its seasonal precipitation. In Southern California, precipitation is characterized by brief, intense storms generally between November and March. It is not unusual for a majority of the annual precipitation to fall during a few storms over a close span of time. Rainfall patterns are subject to extreme variations from year to year and longer-term wet and dry cycles.



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Fire History

Exhibit 5

Measure M2 Acquisition Properties Evaluation – MacPherson Property

N W E S

2 1 0 2

Miles

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In the region, the average daily temperature in the summer[1] is approximately 71 degrees Fahrenheit (°F). The average daily temperature in the winter is approximately 56°F. The region receives an average of 12.4 inches of rain a year; the majority of this rain falls in the winter months, which receive an average of 6.7 inches; summer rain is approximately 0.10 inch (NWS 2014).

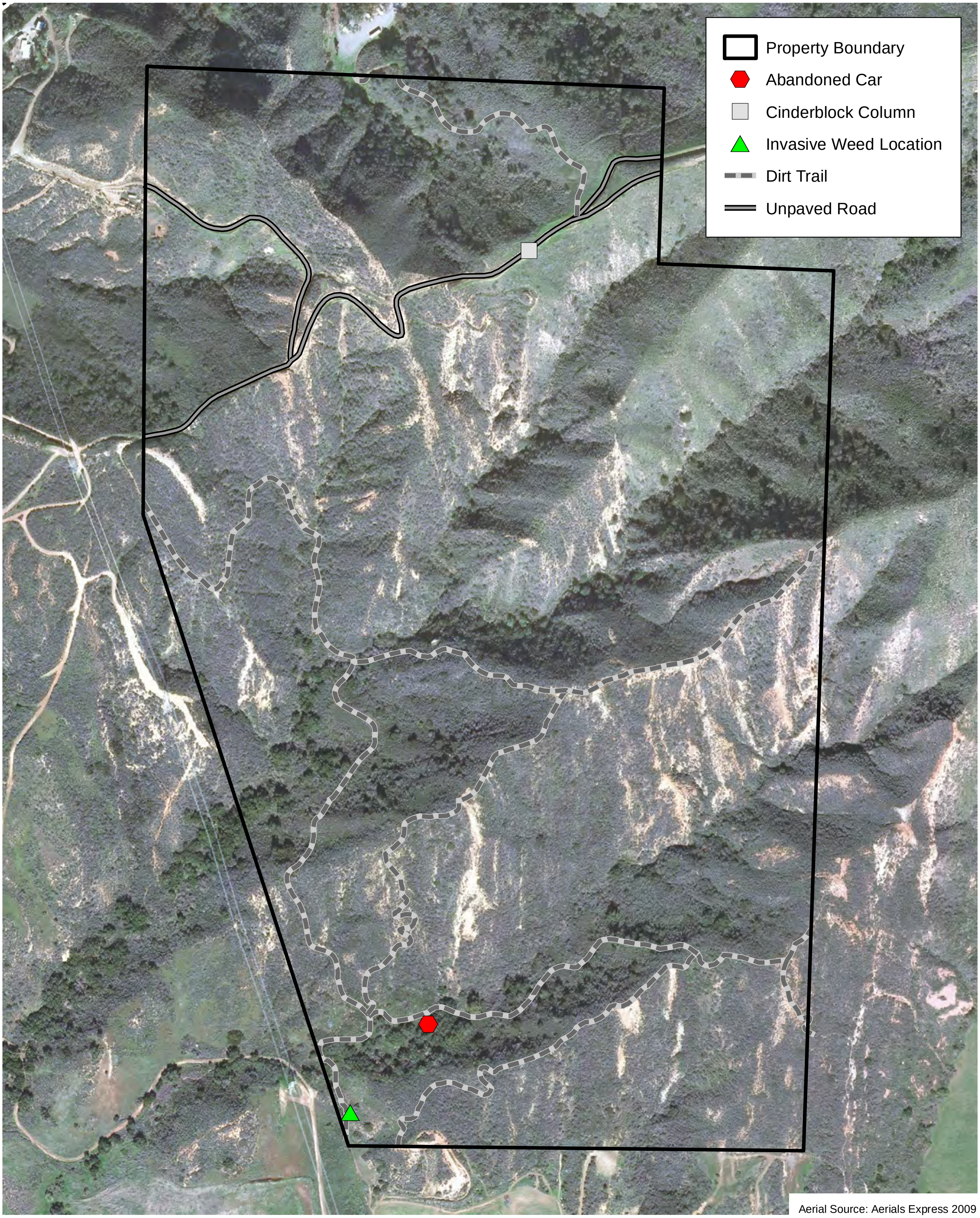
1.2.5 Anthropogenic Uses of the Property

According to the U.S. Forest Service (USFS), the area was inhabited by the Kumeyaay, Luiseño, Cahuilla, and Cupeño Native Americans, who would burn the brushlands along the coast and in the mountains (USFS 2013). Juan Rodriguez Cabrillo arrived in 1542, but the land did not undergo significant change until the establishment of the California missions by Junipero Serra and a ranching culture. The Silverado-Modjeska Canyon area was named "Canyon de la Madera" (or "Canyon of Timber") in 1769 during a Spanish expedition led by Gaspar de Portolá (CLCF 2011). The Spanish had received land grants in the canyons for logging timber as well as for cattle and horse grazing. In 1877, silver was found in Silverado Canyon and coal was found near the canyon's entrance the following year. By 1883, both the coal mine and silver mines were closed. In the early 1900s, the sulphur springs in the canyon attracted residents, and mining resumed at the Blue Light Mine. Suburban development continues to encroach into the area.

A review of historic aerial photographs of the property shows that, in general, vegetation communities have not significantly altered since 1946. Low density development along Silverado Canyon Road is present in aerial photographs as early as 1946, though development along Baker Canyon Road has occurred since 1952. Buildings or otherwise significant structures are not identified in the historic aerials on the property.

Anthropogenic features on the property are shown in Exhibit 6. The property is currently used by hikers and mountain bikers; multiple informal trails cross the property. There is some evidence that target practice occurs on the property (see photograph on left). An old car (see photograph on right) was abandoned in the canyon bottom in the southern portion of the property. A short rebar and cinderblock column was observed along the access road at the northeast corner of the property. Relatively little trash was observed during the surveys and included old barbed wire, portions of cans, and a brush. Evidence of grazing is not present on this property.

[1] Seasons are climatological; winter is considered to be December, January, and February and summer is considered to be June, July, and August.



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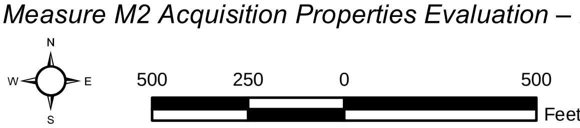
Anthropogenic Features and Invasive Species

Exhibit 6

Measure M2 Acquisition Properties Evaluation – MacPherson Property



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2.0 SURVEY METHODS

This section describes the methods used to conduct the literature review; perform general biological surveys, vegetation mapping, and focused biological surveys; and assess the property's potential to support special status species. A cumulative list of all plant and wildlife species observed on the property is included as Attachments A-1 and A-2, respectively. Photographs of the property are included as Attachment B.

2.1 LITERATURE REVIEW

BonTerra Psomas conducted a literature search to identify special status plants, wildlife, and habitats reported to occur in the vicinity of the MacPherson property. This search included a review of the USGS' Black Star Canyon and El Toro 7.5-minute quadrangles in the California Native Plant Society's (CNPS') Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2014b) and the CDFW's California Natural Diversity Database (CNDDB) (CDFW 2014a). In addition, a species list was obtained from the USFWS' Information, Planning, and Conservation System (IPaC) for the property.

2.2 VEGETATION MAPPING AND GENERAL SURVEYS

BonTerra Psomas Senior Biologists Ann Johnston and Allison Rudalevige conducted a general survey to describe and map the vegetation types on the property on April 7, 2014. Vegetation mapping was refined concurrently with the special status plant survey conducted on July 1, 2014. Nomenclature for vegetation types follows *A Manual of California Vegetation* (Sawyer et al. 2009) for recognized Alliances or Associations.[2] Vegetation was mapped in the field on an aerial photograph at a scale of 1 inch equals 150 feet (1″=150′).

The general surveys included an evaluation of the property's potential to support special status plant and wildlife species, with special focus on M2 NCCP/HCP Covered Species. Covered Species include intermediate mariposa lily (*Calochortus weedii* var. *intermedius*), southern tarplant (*Centromadia parryi* ssp. *australis* [*Hemizonia p.* ssp. *a.*]), many-stemmed dudleya (*Dudleya multicaulis*), arroyo chub (*Gila orcutti*), Blainville's [coast] horned lizard (*Phrynosoma blainvillii*), orange-throated whiptail (*Aspidoscelis hyperythra* [*Cnemidophorus h.*]), Pacific [western] pond turtle (*Actinemys marmorata* [*Emys m.*]), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), coastal cactus wren (*Campylorhynchus brunneicapillus sandiegensis*), coastal California gnatcatcher (*Polioptila californica californica*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor* [*Felis c.*]). Suitable habitat and/or observed individuals were documented in field notes and with global positioning system (GPS) units, and a CNDDB form was filled out for each occurrence.

During field surveys, natural or physical resources and opportunities were identified (mapped and included in field notes) that "preserve, restore and enhance aquatic, riparian and terrestrial natural communities and ecosystems that support Covered Species" (OCTA 2010). The following resources were mapped and documented in field notes: resources that provide valuable enhancement, restoration, or preservation opportunities (e.g., significant stands of non-native species requiring eradication/control; presence of rock outcroppings that provide niche areas for unusual plants, bats, ringtails [*Bassariscus astutus*], or other species; nesting cavities; large mammal burrows; avian rookeries/roosts; and dens). This may include significant stands of invasive plant species based on the California Invasive Plant Council (Cal-IPC) Inventory.

[2] Alliance is "a classification unit of vegetation, containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover". Association is "a vegetation classification unit defined by a diagnostic species, a characteristic range of species composition, physiognomy, and distinctive habitat conditions" (Sawyer et al. 2009).

Anthropogenic influences/structures on the property (e.g., paved and unpaved roads, trails, cell towers, water towers, abandoned vehicles and/or "dumped" trash or debris) were also documented. GPS devices were utilized for recording all point locations.

Plant species were identified in the field or collected for subsequent identification using keys in Baldwin et al. (2012), Hickman (1993), and Munz (1974). Taxonomy follows Baldwin et al. (2012), Hickman (1993), and current scientific data (e.g., scientific journals) for scientific and common names. Active searches for reptiles and amphibians included lifting, overturning, and carefully replacing rocks and debris. Birds were identified by visual and auditory recognition. Surveys for mammals were conducted during the day and included searching for and identifying diagnostic sign, including scat, footprints, burrows, and trails. Taxonomy and nomenclature for wildlife generally follows Crother (2008) for amphibians and reptiles, American Ornithologists' Union (AOU 2013) for birds, and Smithsonian National Museum of Natural History (SNMNH 2011) for mammals. All species observed were recorded in field notes and are included in Attachments A-1 and A-2.

2.3 FOCUSED BIOLOGICAL SURVEYS

Focused biological surveys were conducted in 2014 for special status plant species and coastal California gnatcatcher. Surveys were conducted in suitable habitat, based on the Senior Biologists' best professional judgment.

2.3.1 Special Status Plant Species

Special status plant surveys were floristic in nature and were conducted following the *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFG 2009). Target species included the following Covered Species: intermediate mariposa lily and many-stemmed dudleya.

Rainfall received in the winter and spring determines the germination of many annual and perennial herb species. The region received approximately 5.92 inches of precipitation between June 30, 2013 and July 31, 2014 (data taken from Irvine – South Coast Valleys Station No. 75) (CIMIS 2014). The average annual precipitation for this area is between 10 and 13 inches. In years of low or unusual rainfall patterns, monitoring of reference populations is important in order to ensure that the surveys were comprehensive. Prior to conducting the field surveys, accessible reference populations of target species known from the Orange County area were monitored to ensure that the scheduled surveys were comprehensive and conducted during the appropriate blooming period for these species. A population of many-stemmed dudleya was confirmed blooming at the University of California, Irvine Ecological Reserve on May 7, 2014, and the initial survey visit was scheduled after that date. Reference populations were not monitored for intermediate mariposa lily because it was observed on site during the initial plant survey. Reference populations were not monitored for large perennials (e.g., Tecate cypress [*Hesperocyparis forbesii*] and chaparral nolina [*Nolina cismontana*]), which would be identifiable throughout the year. Rainfall throughout the region was below average for the year. Although reference populations and regional rainfall amounts were monitored to ensure the scientific adequacy of these focused surveys, there is always a minimal potential for false negative survey results as species could possibly be present on a site but may not be detectable at the time of the surveys.

The survey area for special status plant species consisted of the entire property. Surveys were conducted on May 20, 2014, by Ms. Rudalevige, BonTerra Psomas Senior Biologists Jennifer Pareti and Lindsay Messett, and Biologist Jason Mintzer and on July 1, 2014, by Ms. Rudalevige, Ms. Pareti, Mr. Mintzer, and Consulting Botanist David Bramlet. Systematic walking surveys were conducted in all areas of suitable special status plant habitat (i.e., coastal sage scrub, chaparral) and transects were walked at regularly spaced intervals to achieve 100 percent visual coverage of the ground surface (i.e., ridgelines, trails, canyon bottoms) and all potential habitat within the survey area. The habitat preferences of target species (see Table 3, below) were compared to the resources on site (e.g., community associations, soil, slope, shade) to determine which portions of the property represented suitable habitat. All plant species observed were recorded in field notes. Plant species were identified in the field or collected for later identification. Plants were identified to the taxonomic level necessary to determine whether or not they are a special status species using taxonomic keys, descriptions, and illustrations in Baldwin et al. (2012), Hickman (1993), and Munz (1974). Any voucher specimens collected would be deposited with the herbarium at Rancho Santa Ana Botanic Gardens in Claremont, California.

2.3.2 Coastal California Gnatcatcher

Surveys for the coastal California gnatcatcher were conducted in accordance with the guidelines issued by the USFWS for areas participating in an NCCP/HCP (USFWS 1997). These guidelines stipulate that three surveys must be conducted in suitable habitats with at least one week between site visits; the surveys can be conducted year-round. All visits must take place during the morning hours, and no more than 100 acres of suitable habitat may be surveyed per visit.

Ms. Messett (USFWS Permit No. PRT-067064-2) conducted all coastal California gnatcatcher surveys on the MacPherson property. The surveys covered all potentially suitable habitats for the coastal California gnatcatcher. A summary of the focused survey dates and conditions is shown in Table 1 below.

TABLE 1
SUMMARY OF SURVEY DATA AND CONDITIONS FOR GNATCATCHER SURVEYS

Date	Time	Weather Conditions: Temperature (°F) (Start/End)	Wind (mph) (Start/End)	Cloud Cover (%) (Start/End)
August 22, 2014	0700/1200	70/84	0–1/0–3	30/10
August 29, 2014	0640/1150	68/87	0–1/0–4	40/Clear
September 5, 2014	0630/1200	66/85	0–1/0–4	20/Clear

°F: degrees Fahrenheit; mph: miles per hour.

Source: BonTerra Psomas 2014.

Weather conditions met the USFWS survey protocol requirements for optimal gnatcatcher detection. Weather conditions that were too cold (below 55 degrees Fahrenheit [°F]), too hot (above 95°F), or too windy (wind speed greater than 15 miles per hour) were avoided. Surveys were conducted by slowly walking through all appropriate habitats while listening and watching for gnatcatcher activity. A combination of recordings of gnatcatcher vocalizations and “pishing” sounds were used in an attempt to elicit responses from any gnatcatchers that might be present. The frequency of vocalization playback and “pishing” varied depending on conditions (e.g., habitat patch size and topography). All bird species detected during the survey were recorded, including notable observations of special status wildlife species.

3.0 EXISTING BIOLOGICAL RESOURCES

This section describes the biological resources that occur or potentially occur on the MacPherson property. Vegetation types, wildlife populations and movement patterns, and special status biological resources are discussed below.

3.1 VEGETATION TYPES AND OTHER AREAS

Eleven vegetation types and other areas occur on the MacPherson property, as shown in Table 2 and Exhibit 7. Descriptions of these vegetation types are provided below. Note that classification follows *A Manual of California Vegetation* (Sawyer et al. 2009), but Gray and Bramlet's (1992) classification is provided that is more condensed than the formal classification. These vegetation types were also cross-walked to the general vegetation types used in the NCCP/HCP Plan.

TABLE 2
VEGETATION TYPES AND OTHER AREAS ON THE MACPHERSON PROPERTY

General Vegetation Types	Vegetation Types and Other Areas	Status	Amount on Property (Acres)
Chaparral	southern mixed chaparral	G5 S5	123.91
	open southern mixed chaparral	G5 S5	20.78
	Chaparral Subtotal		*144.69*
Scrub	California sagebrush scrub	G5 S5	8.23
	mixed sage scrub	G4 S4	32.12
	Scrub Subtotal		*40.35*
Grassland	annual grassland	G3? S3?	2.27
	ruderal	—	0.23
	Grassland Subtotal		*2.50*
Riparian	southern coast live oak riparian forest	G4 S4	9.48
	poison oak scrub	G4 S4	0.29
	Riparian Subtotal		*9.77*
Woodland	coast live oak woodland	G4 S4	2.80
Barren	cliff/rock	—	0.96
Developed/Non-Native	disturbed	—	2.56
	Total Acreage		***203.63***

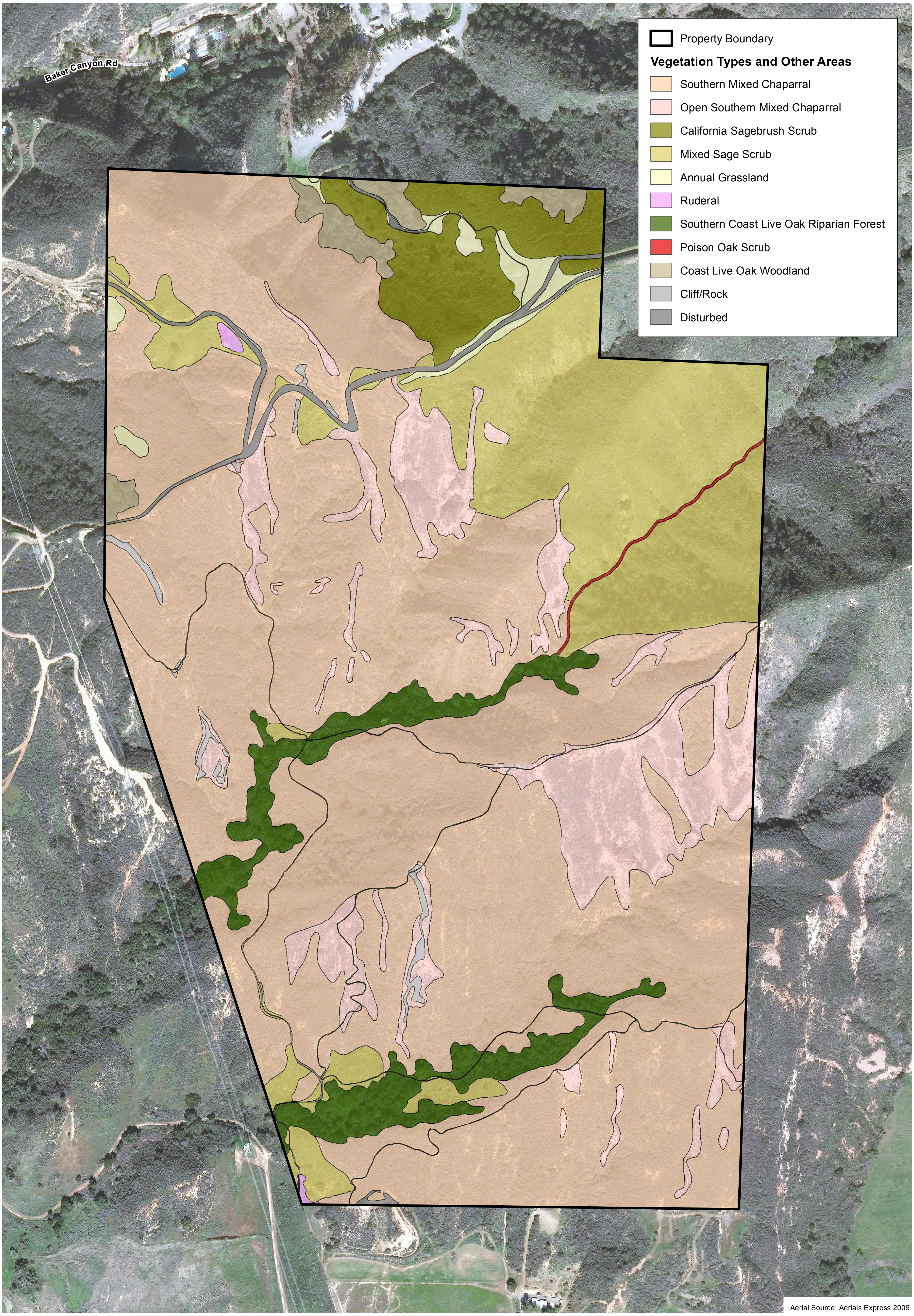
G: Global; S: State.

<u>**Status**</u>
3 Vulnerable and at moderate risk of extinction or elimination
4 Apparently secure and uncommon but not rare
5 Secure
? Inexact numeric rank, but existing information points to this rank

Chaparral

<u>Southern Mixed Chaparral</u>

A total of 123.91 acres of southern mixed chaparral (the *Adenostoma fasciculatum – Ceanothus crassifolius* Shrubland Association [Sawyer et al. 2009]) occurs on slopes throughout the property. This vegetation type is dominated by a mix of chamise (*Adenostoma fasciculatum*)



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Vegetation Types and Other Areas

Exhibit 7

Measure M2 Acquisition Properties Evaluation – MacPherson Property

N W E S

300 150 0 300 Feet

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(Rev: 12-11-2014 JAZ) R:\Projects\OCT_OCTA\J008\Graphics\MacPherson\BioTech\ex7_Veg.pdf and hoaryleaf ceanothus (*Ceanothus crassifolius*), with the proportion of each varying across the site. The plant cover is dense, with no understory vegetation except along the margins, where sage scrub species and non-native grasses and herbs extend into the chaparral.

Open Southern Mixed Chaparral

A total of 20.78 acres of open southern mixed chaparral (the *Adenostoma fasciculatum* – *Ceanothus* crassifolius Shrubland Association [Sawyer et al. 2009]) occurs on steep, eroding slopes and ridgelines throughout the property. The vegetation composition is similar to that of southern mixed chaparral, but the density of shrubs is much lower. Bare ground occurs between the shrubs.

Scrub

California Sagebrush Scrub

A total of 8.23 acres of the California sagebrush scrub (the *Artemisia californica* Shrubland Alliance [Sawyer et al. 2009]) occurs on north-facing slopes at the northern edge of the property. This vegetation type is dominated by California sagebrush (*Artemisia californica*). Some slopes contain scattered blue elderberry (*Sambucus nigra* ssp. *caerulea*) or toyon (*Heteromeles arbutifolia*).

Mixed Sage Scrub

A total of 32.12 acres of mixed sage scrub (the *Artemisia californica – Eriogonum fasciculatum – Salvia mellifera* Association [Sawyer et al. 2009]) occurs on slopes in the northeast corner of the property and in scattered patches in the southern portion of the property. This vegetation type is dominated by a mix of coastal sage scrub species, primarily black sage (*Salvia mellifera*), California sagebrush, and California buckwheat (*Eriogonum fasciculatum*). Some areas of mixed sage scrub contain needlegrass (*Stipa* sp.) or stands of laurel sumac (*Malosma laurina*) and toyon.

Grassland

Annual Grassland

A total of 2.27 acres of annual grassland (the *Deinandra fasciculata* – Annual Grass-Herb Association [Sawyer et al. 2009]) occurs along roadsides and in openings of coastal sage scrub and chaparral throughout the property. These areas are dominated by non-native grasses and herbs such as wild oat (*Avena* sp.), ripgut grass (*Bromus diandrus*), black mustard (*Brassica nigra*), and tocalote (*Centaurea melitensis*) with a seasonal component of fascicled tarweed (*Deinandra fasciculata* [*Hemizonia f.*]). Some scattered shrubs, such as California buckwheat, are also present.

Ruderal

A total of 0.23 acre of ruderal (various semi-natural herbaceous stands [Sawyer et al. 2009]) occurs in small patches near the northwestern and southwestern corners of the property. This vegetation type is dominated by non-native, weedy herbs such as black mustard, tocalote, red-stemmed filaree (*Erodium cicutarium*), and Russian thistle (*Salsola tragus*).

Riparian

Southern Coast Live Oak Riparian Forest

A total of 9.48 acres of southern coast live oak riparian forest (the *Quercus agrifolia* Woodland Alliance [Sawyer et al. 2009]) occurs in the major drainages bisecting the property. This vegetation type is dominated by a canopy of coast live oak (*Quercus agrifolia*). Understory species are scattered in varying densities and include caterpillar phacelia (*Phacelia cicutaria*), giant wild rye (*Elymus condensatus* [*Leymus c*.]), bush monkeyflower (*Mimulus aurantiacus*), western poison oak (*Toxicodendron diversilobum*), and smilo grass (*Stipa miliacea* [*Piptatherum m*.]).

Poison Oak Scrub

A total of 0.29 acre of poison oak scrub (the *Toxicodendron diversilobum* Shrubland Alliance [Sawyer et al. 2009]) occurs along a canyon bottom in the northeast corner of the property. This vegetation type consists of an approximate ten-foot-wide strip of western poison oak.

Woodland

Coast Live Oak Woodland

A total of 2.80 acres of coast live oak woodland (the *Quercus agrifolia* Woodland Alliance [Sawyer et al. 2009]) occurs on upland slopes in the northern portion of the property. This vegetation type is dominated by a canopy of coast live oak. Note that Sawyer et al. (2009) do not distinguish between riparian and upland oak woodlands, but these areas are discussed separately because the community composition differs.

Barren

Cliff/Rock

A total of 0.96 acre of cliff/rock occurs along ridgelines and on steep, eroding slopes. This represents areas of exposed rock face or eroding hillsides that lack vegetation.

Developed/Non-Native

Disturbed

A total of 2.56 acres of disturbed areas occur on the property. This represents unpaved roads and dirt trails located throughout the property. No vegetation is present in these areas.

3.2 WILDLIFE POPULATIONS AND MOVEMENT PATTERNS

Vegetation on and adjacent to the property provides potential habitat for a number of wildlife species. Common wildlife species observed or expected to occur on the property and/or in adjacent off-site areas are discussed below.

3.2.1 Fish

Most creeks and waterways in Southern California are subject to periods of high water flow in winter and spring and little to no flow during the late summer and fall. Most drainages occurring on the property are expected to convey water only following storm events. No fish species were observed on the property, nor are they expected to occur, due to lack of suitable habitat.

3.2.2 Amphibians

Amphibians require moisture for at least a portion of their life cycle and many require standing or flowing water for reproduction. Terrestrial species may or may not require standing water for reproduction; they survive in dry areas by aestivating (i.e., remaining beneath the soil in burrows or under logs and leaf litter, and emerging only when temperatures are low and humidity is high). Many of these species' habitats are associated with water and they emerge to breed once the rainy season begins. Soil moisture conditions can remain high throughout the year in some habitat types depending on factors such as amount of vegetation cover, elevation, and slope/aspect.

Marginally suitable habitat for amphibian species occurs in the drainages on the property. No amphibian species were observed on the property. Common amphibian species that may occur on the property include garden slender salamander (*Batrachoseps major*), western toad (*Anaxyrus boreas*), and Pacific treefrog (*Pseudacris* [*Hyla*] *regilla*).

3.2.3 Reptiles

Reptiles are well-adapted to life in arid habitats. They have several physiological adaptations that allow them to conserve water. Reptiles can also become dormant during weather extremes, allowing them to survive prolonged droughts and paucity of food (Ruben and Hillenius 2005). Reptilian diversity and abundance typically varies with vegetation type and character. Many species prefer only one or two vegetation types; however, most species will forage in a variety of habitats. Most reptile species that occur in open areas will excavate a burrow or use rodent burrows for cover, protection from predators, and refuge during extreme weather conditions.

Common reptile species observed on the property include western fence lizard (*Sceloperus occidentalis*), side-blotched lizard (*Uta stansburiana*), and gopher snake (*Pituophis catenifer*).

3.2.4 Birds

A variety of bird species are expected to be residents on the property, using habitats throughout the year. Other species are present only during certain seasons. For example, the white-crowned sparrow (*Zonotrichia leucophrys*) is expected to occur on the property during the winter season, but would not occur in the summer season because it migrates north to its breeding range.

Resident bird species observed on the property include California quail (*Callipepla californica*), western scrub-jay, common raven (*Corvus corax*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), wrentit (*Chamaea fasciata*), California thrasher (*Toxostoma redivivum*), spotted towhee (*Pipilo maculatus*), and California towhee (*Pipilo crissalis*). Urban-tolerant species that occur in disturbed areas and in natural vegetation types that were also observed on the property include mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), black phoebe (*Sayornis nigricans*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), house finch (*Carpodacus mexicanus*), and lesser goldfinch (*Spinus* [*Carduelis*] *psaltria*).

Wintering birds are those species that generally breed outside the region but migrate to the area for the winter season. Wintering species that may occur on the property include Townsend's warbler (*Setophaga* [*Dendroica] townsendi*), chipping sparrow (*Spizella passerina*), and fox sparrow (*Passerella iliaca*). Summer residents are species that migrate into the region to breed, but generally winter south of the region. Summer breeders that may occur on the property include black-chinned hummingbird (*Archilochus alexandri*) and western kingbird (*Tyrannus* *verticalis*). During spring and fall migration, the property also provides foraging habitat for a variety of migratory species.

Birds of prey (raptors) observed on the property include turkey vulture (*Cathartes aura*) (a scavenger), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*).

3.2.5 Mammals

Burrows provide cover for a number of small mammal species. Small ground-dwelling mammals observed or expected to occur on the property include California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), dusky-footed woodrat (*Neotoma fuscipes*), and desert woodrat (*Neotoma lepida*).

Open grassland communities and the leafy understory of scrub and woodland communities provide excellent foraging habitat for herbivorous mammals. Common herbivores observed or expected to occur on the property include mule deer (*Odocoileus hemionus*) and desert cottontail (*Sylvilagus audubonii*).

Medium to larger mammalian predators (both carnivorous and omnivorous species) observed or expected to occur on the property in a variety of habitats include common striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), and mountain lion.

Bat activity on the property may occur in the lower elevation canyons and ravines where the bats are most likely to find more abundant insect food. No suitable cliffs, buildings, or other man-made structures that would be suitable for roosting are present on the property. The property has some potential to support roosting bats in tree snags or under bark; however, the closed nature of the chaparral habitat provides limited open areas suitable for foraging. Species such as the Brazilian free-tailed bat (*Tadarida brasiliensis*), big brown bat (*Eptesicus fuscus*), and Yuma myotis (*Myotis yumanensis*), may occur on the property.

3.2.6 Wildlife Movement

Wildlife corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization creates isolated "islands" of wildlife habitat. In the absence of habitat linkages that allow movement to adjoining open space areas, various studies have concluded that some wildlife species, especially the larger and more mobile mammals, will not likely persist over time in fragmented or isolated habitat areas because they prohibit the infusion of new individuals and genetic information (MacArthur and Wilson 1967; Soule 1987; Harris and Gallagher 1989; Bennett 1990). Corridors mitigate the effects of this fragmentation by (1) allowing animals to move between remaining habitats, thereby permitting depleted populations to be replenished and promoting genetic exchange; (2) providing escape routes from fire, predators, and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or local species extinction; and (3) serving as travel routes for individual animals as they move in their home ranges in search of food, water, mates, and other necessary resources (Noss 1983; Fahrig and Merriam 1985; Simberloff and Cox 1987; Harris and Gallagher 1989).

Wildlife movement activities usually fall into one of three movement categories: (1) dispersal (e.g., juvenile animals from natal areas or individuals extending range distributions); (2) seasonal migration; and (3) movements related to home range activities (e.g., foraging for food or water, defending territories or searching for mates, breeding areas, or cover). A number of terms such as "wildlife corridor", "travel route", "habitat linkage", and "wildlife crossing" have been used in various wildlife movement studies to refer to areas in which wildlife move from one area to another. To clarify the meaning of these terms and to facilitate the discussion on wildlife movement in this analysis, these terms are defined as follows:

- **Travel Route –** a landscape feature (such as a ridgeline, drainage, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and to provide access to necessary resources (e.g., water, food, cover, den sites). The travel route is generally preferred because it provides the least amount of topographic resistance in moving from one area to another. It contains adequate food, water, and/or cover while moving between habitat areas and it provides a relatively direct link between target habitat areas.

- **Wildlife Corridor –** a piece of habitat, usually linear in nature, that connects two or more habitat patches that would otherwise be fragmented or isolated from one another. Wildlife corridors are usually bound by urban land areas or other areas unsuitable for wildlife. The corridor generally contains suitable cover, food, and/or water to support species and to facilitate movement while in the corridor. Larger, landscape-level corridors (often referred to as "habitat linkages" or "landscape linkages") can provide both transitory and resident habitat for a variety of species.

- **Wildlife Crossing –** a small, narrow area, relatively short in length and generally constricted in nature that allows wildlife to pass under or through an obstacle or barrier that otherwise hinders or prevents movement. Crossings typically are man-made and include culverts, underpasses, drainage pipes, and tunnels to provide access across or under roads, highways, pipelines, or other physical obstacles. These often represent "choke points" along a movement corridor, which may impede wildlife movement and increase the risk of predation.

It is important to note that, in a large open space area where there are few or no man-made or naturally occurring physical constraints to wildlife movement, wildlife corridors (as defined above) may not yet exist. Given an open space area that is both large enough to maintain viable populations of species and to provide a variety of travel routes (e.g., canyons, ridgelines, trails, riverbeds, and others), wildlife will use these "local" routes while searching for food, water, shelter, and mates and will not need to cross into other large open space areas. Based on their size, location, vegetative composition, and availability of food, some of these movement areas (e.g., large drainages and canyons) are used for longer lengths of time and serve as source areas for food, water and cover, particularly for small- and medium-sized animals. This is especially true if the travel route is within a larger open space area. However, once open space areas become constrained and/or fragmented as a result of urban development or construction of physical obstacles (such as roads and highways), the remaining landscape features or travel routes that connect the larger open space areas become corridors as long as they provide adequate space, cover, food and water, and do not contain obstacles or distractions (e.g., man-made noise, lighting) that would generally hinder wildlife movement.

In general, animals discussed within the context of movement corridors typically include larger, more mobile species (such as mule deer, black bear [*Ursus americanus*], mountain lion, fox [*Urocyon* sp.], and coyote) and even some of the mid-sized mammals (such as raccoon [*Procyon lotor*], striped skunk, American badger [*Taxidea taxus*], and Virginia opossum

[*Didelphis virginiana*]). Most of these species have relatively large home ranges through which they move to find adequate food, water, and breeding and wintering habitat. It is assumed that corridors that serve larger, more fragile species also serve as corridors for many smaller, less mobile species, such as reptiles, amphibians, and rodents (generally discussed within the context of local movement). Regional movement for these species facilitates gene flow and requires at least some local “stepping stone” movement of individuals between populations.

The availability of open space corridors is generally considered less important for bird species. Most bird species are believed to fly in more or less direct paths to desired locations; however, some habitat-specific species may not move great distances from their preferred habitat types, and are believed to be less inclined to travel across unsuitable areas.

Ideally, an open space corridor should encompass a heterogeneous mix of vegetation types to accommodate the ecological requirements of a wide variety of resident species in any particular region. Most species typically prefer adequate vegetation cover during movement, which can serve as both a food source and as protection from weather and predators. Drainages, riparian areas, and forested canyon bottoms typically serve as natural movement corridors because these features provide cover, food, and often water for a variety of species. Very few species will move across large expanses of open, uncovered habitat unless it is the only option available to them. For some species, landscape linkages must be able to support animals for sustained periods, not just for travel. Smaller or less mobile animals (such as rodents and reptiles) require long periods to traverse a corridor, so the corridor must contain adequate food and cover for survival.

Regional Movement

The MacPherson property occurs within the boundaries of the Cleveland National Forest and the Irvine Ranch Open Space. This represents approximately 460,000 and 50,000 acres of open space, respectively. Open space on the property is contiguous with larger areas of open space in the Santa Ana Mountains. Wildlife movement is relatively unhindered to the east of the property, with no major roads or development in that direction. Low density rural residential development occurs along Silverado Canyon Road south of the property, and a recreational vehicle (RV) park occurs to the north along Baker Canyon Road. The relatively undeveloped nature of the landscape is highly conducive to regional wildlife movement.

Local Movement

The MacPherson property contains multiple ridgelines and canyons that provide a variety of travel routes for local wildlife movement. The trails and access roads on the property may also be used for movement. Movement is expected to occur on the property, as well as between the property and contiguous off-site habitat. Coyote, a wildlife species that requires a relatively large home range, was observed on the MacPherson property.

3.3 SPECIAL STATUS BIOLOGICAL RESOURCES

This section addresses special status biological resources that were observed, reported, or have the potential to occur on the property or in adjacent off-site areas. These resources include plant and wildlife species that have been afforded special status and/or recognition by federal and State resource agencies and private conservation organizations. In general, the principal reason an individual taxon (i.e., species, subspecies, or variety) is given such recognition is the documented or perceived decline or limitations of its population size, geographic range, and/or distribution resulting in most cases from habitat loss. Tables 3 and 6 respectively provide a summary of special status plant and wildlife species known to occur in the vicinity of the MacPherson property (i.e., the USGS' Black Star Canyon and El Toro 7.5-minute quadrangles) and include information on the status; habitat; potential for occurrence; results of focused survey efforts; and definitions for the various status designations. Generally, this list includes species reported by the CNDDB and CNPS, supplemented with species from the author's experience that either occur nearby or could occur based on the presence of suitable habitat. In addition to species, special status biological resources include vegetation types and habitats that are either unique; of relatively limited distribution in the region; or of particularly high wildlife value. These resources have been defined by federal, State, and local government conservation programs. Sources used to determine the status of biological resources are listed below.

- **Plants –** <u>Electronic Inventory of Rare and Endangered Vascular Plants of California</u> (CNPS 2014b); the CNDDB (CDFW 2014a); various USFWS *Federal Register* notices regarding listing status of plant species; and the *List of Special Vascular Plants, Bryophytes, and Lichens* (CDFW 2014c).

- **Wildlife –** <u>California Wildlife Habitat Relationships Database System</u> (CDFW BDB 2014); the CNDDB (CDFW 2014a); various USFWS *Federal Register* notices regarding listing status of wildlife species; and the *List of Special Animals* (CDFW 2014b).

- **Habitats –** CNDDB (CDFW 2014a) and the *List of California Natural Communities* (CDFG 2010).

3.3.1 <u>Definitions of Special Status Biological Resources</u>

A **federally Endangered species** is one facing extinction throughout all or a significant portion of its geographic range. A **federally Threatened species** is one likely to become Endangered in the foreseeable future throughout all or a significant portion of its range. The presence of any federally Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in "take" of the species or its habitat. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct. Harm, in this sense, can include any disturbance of habitats used by the species during any portion of its life history.

Proposed species or **Candidate species** are those officially proposed by the USFWS for addition to the federal Threatened and Endangered species list. Because proposed species may soon be listed as Threatened or Endangered, these species could become listed prior to or during implementation of a proposed project. The presence of a Proposed or Candidate species within a project impact area may impose constraints on development if they are listed prior to issuance of project permits, particularly if a project would result in "take" of the species or its habitat.

The State of California considers an **Endangered species** as one whose prospects of survival and reproduction are in immediate jeopardy; a **Threatened species** as one present in such small numbers throughout its range that it is likely to become an Endangered species in the near future in the absence of special protection or management; and a **Rare species** as one present in such small numbers throughout its range that it may become Endangered if its present environment worsens. Rare species applies only to California native plants. State-listed Threatened and Endangered species are protected against take unless an Incidental Take Permit is obtained from the resource agencies. The presence of any State-listed Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in "take" of the species or its habitat.

California Species of Special Concern is an informal designation used by the CDFW for some declining wildlife species that are not State Candidates. This designation does not provide legal protection, but signifies that these species are recognized as special status by the CDFW. Recently, the CDFW downgraded some of these species from Species of Special Concern to the **Watch List.**

Species that are **California Fully Protected** and **Protected** include those protected by special legislation for various reasons, such as the mountain lion and white-tailed kite (*Elanus leucurus*). Fully Protected species may not be taken or possessed at any time. California Protected species include those species that may not be taken or possessed at any time except under special permit from the CDFW issued pursuant to the *California Code of Regulations* (Title 14, §650, §670.7) or Section 2081 of the *California Fish and Game Code.*

Species of **Local Concern** are those that have no official status with the resource agencies, but are being watched because there is either a unique population in the region or the species is declining in the region.

Special Animal is a general term that refers to species that the CNDDB is interested in tracking, regardless of legal or protective status. This term includes species designated as any of the above terms, but also includes species that may be considered biologically rare; restricted in distribution; declining throughout their range; have a critical, vulnerable stage in their life cycle that warrants monitoring; are on the periphery of their range and are threatened with extirpation in California; are associated with special status habitats; or are considered by other State or federal agencies or private organizations to be sensitive or declining.

The California Rare Plant Rank (CRPR), formerly known as CNPS List, is a ranking system by the Rare Plant Status Review group[3] and managed by the CNPS and the CDFW. A ranking is given based on information regarding the distribution, rarity, and endangerment of California's vascular plants. Plants with a CRPR of **1A** are presumed extinct in California because they have not been seen in the wild for many years. Plants with a CRPR of **1B** are Rare, Threatened, or Endangered throughout their range. Plants with a CRPR of **2A** are presumed extirpated from California, but are more common elsewhere. Plants with a CRPR of **2B** are considered Rare, Threatened, or Endangered in California, but are more common elsewhere. Plants with a CRPR of **3** require more information before they can be assigned to another rank or rejected; this is a "review" list. Plants with a CRPR of **4** are of limited distribution or infrequent throughout a broader area in California; this is a "watch" list. The CRPR Threat Rank is an extension added onto the CRPR to designate the level of endangerment by a 1 to 3 ranking (CNPS 2014a). An extension of **.1** is assigned to plants that are considered to be "seriously threatened" in California (i.e., over 80 percent of the occurrences are threatened or have a high degree and immediacy of threat). Extension **.2** indicates the plant is "fairly threatened" in California (i.e.,

[3] This group consists of over 300 botanical experts from the government, academia, non-governmental organizations, and the private sector.

between 20 and 80 percent of the occurrences are threatened or have a moderate degree and immediacy of threat). Extension **.3** is assigned to plants that are considered "not very threatened" in California (i.e., less than 20 percent of occurrences are threatened or have a low degree and immediacy of threat or no current threats known). The absence of a threat code extension indicates plants lacking any threat information.

In addition to providing an inventory of special status plant and wildlife species, the CNDDB also provides an inventory of vegetation types that are considered special status by the State and federal resource agencies, academic institutions, and various conservation groups (such as the CNPS). Determination of the level of imperilment (i.e., exposure to injury, loss, or destruction) is based on the NatureServe Heritage Program Status Ranks that rank both species and vegetation types on a global (G) and statewide (S) basis according to their rarity; trend in population size or area; and recognized threats (e.g., proposed developments, habitat degradation, and non-native species invasion) (Faber-Langendoen et al. 2009). The ranks are scaled from 1 to 5. NatureServe considers **G1** or **S1** communities to be critically imperiled and at a very high risk of extinction or elimination due to extreme rarity, very steep declines, or other factors; **G2** or **S2** communities to be imperiled and at high risk of extinction or elimination due to very restricted range, very few populations or occurrences, steep declines, or other factors; **G3** or **S3** communities to be vulnerable and at moderate risk of extinction or elimination due to a restricted range, relatively few populations or occurrences, recent and widespread declines, or other factors; **G4** or **S4** communities to be apparently secure and uncommon but not rare with some cause for long-term concern due to declines or other factors; and **G5** or **S5** communities to be secure. A question mark (?) denotes an inexact numeric rank, but existing information points to this rank (Faber-Langendoen et al. 2009). For vegetation alliances[4] that have State ranks of S1–S3, all associations within the alliance are considered to be highly imperiled.

3.3.2 Vegetation Types

Special status vegetation types observed on the property are described further below.

Chaparral Communities

The predominant vegetation type on the MacPherson property is southern mixed chaparral (123.91 acres). Open southern mixed chaparral occurs in steep, eroding slopes and has lower shrub cover. These vegetation types are considered to be the *Adenostoma fasciculatum* – *Ceanothus crassifolius* Shrubland Association, which is ranked by the CDFW as G5 S5.

Chaparral is a "drought tolerant plant community dominated by sclerophyllous, woody shrubs shaped by a Mediterranean-type climate and naturally recurring wildfires" (Halsey 2007). It is the most extensive vegetation community in California and is not presently considered to have special status, though its status in the future may be uncertain given continuing drought conditions; increased fire frequencies; and limited understanding of the system.

Scrub Communities

California sagebrush shrub (8.23 acres) and mixed sage scrub (32.12 acres) occur on the MacPherson property. California sagebrush scrub is considered to be the *Artemisia californica* Shrubland Alliance, which is ranked as G5 S5. Mixed sage scrub most closely matches the *Artemisia californica* – *Eriogonum fasciculatum* – *Salvia mellifera* Association, which is ranked as G4 S4.

[4] A vegetation alliance is "a classification unit of vegetation, containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover" (Sawyer et al. 2009).

While the Global/State rankings of California sagebrush shrub and mixed sage scrub indicate that they are secure or apparently secure, they are of local concern as part of the larger coastal sage scrub community and because they have potential to support Threatened or Endangered species. Coastal sage scrub had, as a whole, declined approximately 70 to 90 percent in its historic range in California by the mid-1990s (Noss and Peters 1995). Sage scrub has largely been lost to land use changes in Southern California basins and foothills. The ecological function of Southern California's remaining sage scrub is threatened by habitat fragmentation and degradation, which is largely the result of invasive non-native species, livestock grazing, off-highway vehicles, altered fire regime, and air pollution (O'Leary 1995; Allen et al. 2000).

Grassland Communities

Annual grassland (2.27 acres) and ruderal vegetation (0.23 acre) occur on the MacPherson property. Ruderal areas, dominated by non-native vegetation, are considered to be semi-natural herbaceous stands and so are not given a ranking. The annual grassland on the property corresponds to the *Deinandra fasciculata* – Annual Grass-Herb Association. This association is ranked as G3? S3?.

While native grasslands, which once may have covered nearly $^1/_5$ of the state, have declined by approximately 99 percent in their historic range in California (Barry 1972; Noss and Peters 1995), the annual grasslands on the property primarily contain non-native grasses and herbs. They would be considered semi-natural herbaceous stands by Sawyer et al. (2009) except for the seasonal component of the native fascicled tarweed. Therefore, this vegetation would not be considered as biologically valuable as vegetation undisturbed by non-native species.

Riparian Communities

Southern coast live oak riparian forest (9.48 acres) and poison oak scrub (0.29 acre) occur on the MacPherson property. The *Quercus agrifolia* Woodland Alliance is ranked as G5 S4. However, the CDFW considers southern coast live oak riparian forest to be ranked G4 S4. Poison oak scrub is considered to be the *Toxicodendron diversilobum* Shrubland Alliance, which is ranked as G4 S4.

Typically, riparian vegetation provides important biological functions for an ecosystem such as (1) for cover and water sources for wildlife; (2) for filtration of runoff water and groundwater to be recharged; and (3) for flood-control and sediment stabilization purposes. Riparian habitats are biologically productive as well as diverse, and are the exclusive habitat of several special status species. As a result, the resource agencies often consider riparian vegetation types to be important resources. It is estimated that as much as 95 to 97 percent of historic riparian habitats in Southern California had been lost by the late 1980s due to agriculture, urban development, flood control, and other human-caused impacts (Faber et al. 1989; Bell 1997). Additionally, since the 1970s, giant reed (*Arundo donax*) has become the greatest threat to the remaining riparian resources in coastal Southern California (Bell 1997). This invasive species competes with native species such as willows (*Salix* spp.), mule fat, and cottonwoods (*Populus* spp.); is difficult to control; and apparently does not provide food or nesting habitat for native species (Bell 1997).

Woodland Communities

Coast live oak woodland (2.80 acres) occurs on the MacPherson property. The *Quercus agrifolia* Woodland Alliance is ranked as G5 S4. However, the CDFW considers coast live oak woodland to be ranked G4 S4.

Oak woodlands are declining throughout California due to residential, commercial, and industrial development. Woodlands are an important resource in California that provide aesthetic, cultural, economic, and environmental value, in addition to wildlife habitat.

Jurisdictional Areas

Drainages, which may include wetlands and other "waters of the U.S.", are protected under Section 404 of the Clean Water Act (CWA) and are under the jurisdiction of the U.S. Army Corps of Engineers (USACE). "Waters of the U.S." include navigable coastal and inland waters, lakes, rivers, streams and their tributaries; interstate waters and their tributaries; wetlands adjacent to such waters; intermittent streams; and other waters that could affect interstate commerce. Wetland "waters of the U.S." are delineated based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology pursuant to the USACE guidance documents (i.e., Environmental Laboratory 1987; USACE 2008).

A CWA Section 401 Water Quality Certification from the Regional Water Quality Control Board (RWQCB) is required before the USACE will issue a Section 404 permit. The RWQCB shares the USACE jurisdiction unless isolated waters are present. If isolated waters are present, the RWQCB takes jurisdiction using the USACE's definition of the Ordinary High Water Mark and/or the three-parameter wetlands method.

In addition, if drainages on the property meet the criteria established by Section 1600 of the *California Fish and Game Code,* the CDFW may require a Streambed Alteration Agreement prior to any modification of the bed, bank, or channel. The CDFW's jurisdiction is defined as the top of the bank of the stream, channel, or basin or the outer limit (drip-line) of riparian vegetation located within or immediately adjacent to the river, stream, creek, pond, or lake.

The drainages on the MacPherson property are potentially under the jurisdiction of the USACE, the RWQCB, and the CDFW. A jurisdictional delineation should be performed to describe the type and extent of resources on the property. Should jurisdictional resources be impacted by management activities on the property, permits/agreements from the regulatory agencies would be required. This would consist of a USACE Section 404 Permit; an RWQCB Section 401 Water Quality Certification; and a CDFW Section 1602 Streambed Alteration Agreement.

A California Rapid Assessment Method (CRAM) analysis may be required as part of the permitting procedure. CRAM is a tool for assessing the overall condition[5] of a wetland; it was developed by a consortium of federal, State, and local scientists and managers. The results of a condition assessment can be used to infer the ability to provide various functions or services to which a wetland is most suited. This analysis can be used for a variety of applications, such as in evaluating a site to inform regulatory decisions (e.g., Section 401 and 404 permitting) or restoration or mitigation site evaluation.

CRAM scores range from 25 to 100. The maximum score possible represents how a wetland is doing relative to the best achievable conditions for that wetland type in the state. It is assumed that the same scores for different wetlands of the same type represent the same overall condition and functional capacity. Therefore, these scores may be used to track the progress of restoration efforts over time; to compare impacted sites to their in-kind mitigation sites; or to compare an individual wetland to the status and trends in ambient condition of its wetland type. Enhancement of the property, such as through targeted removal of weed species, may result in higher CRAM scores.

[5] "Condition" is defined as the state of a wetland Assessment Area's (AA's) physical and biological structure, the hydrology, and its buffer and landscape context relative to the best achievable states for the same type of wetland (CWMW 2012).

3.3.3 Special Status Plants

Based on the results of the literature review, 33 special status plant species have been reported in the vicinity of the MacPherson property. These species and their potential for occurrence (which is based on the presence of suitable habitat) are summarized in Table 3. Note that these species are listed alphabetically according to their scientific name. Three special status plant species were observed on the property. These species are discussed after the table.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR				
Abronia villosa var. *aurita* chaparral sand-verbena	–	–	1B.1	Between January and September.	Sandy places, primarily in coastal sage scrub and chaparral habitats and in alluvial washes and river benches.	Central and southern South Coast and western Sonoran (Colorado) Desert; between sea level and 5,250 feet above msl.	No suitable habitat; not expected to occur and not observed during surveys.
Astragalus brauntonii Braunton's milkvetch	FE	–	1B.1	Between March and July.	Recent burns or disturbed areas in chaparral and tecate cypress forest.	Western Transverse Ranges, San Gabriel Mountains possibly to the South Coast, and northern Peninsular Ranges; between sea level and 2,133 feet above msl.	Suitable habitat, but at edge of known range in Orange County; not observed during surveys.
Baccharis malibuensis Malibu baccharis	–	–	1B.1	Between August and September.	Grassy openings in chaparral.	Western Transverse Ranges and Peninsular Ranges; between 164 and 984 feet above msl.	Only known from Fremont Canyon in Orange County (Roberts 2008); not expected to occur and not observed during surveys.
Brodiaea filifolia thread-leaved brodiaea	FT	SE	1B.1	Between March and June.	Grasslands and vernal pools.	South Coast, San Bernardino Mountains, and western Peninsular Ranges; between 80 and 2,820 feet above msl.	No suitable habitat; not expected to occur and not observed during surveys.
Calandrinia breweri Brewer's calandrinia	–	–	4.2	Between March and June, uncommonly as early as February.	Heavy soils in open grasslands, coastal sage scrub, and chaparral.	Southern Central Coast, western South Coast, and Channel Islands; between sea level and 2,300 feet above msl.	Suitable habitat; not observed during surveys.
Calochortus catalinae Catalina mariposa lily	–	–	4.2	Between May and July.	Coastal sage scrub; dry, rocky chaparral; and yellow-pine forest.	South Coast and Peninsular Ranges; between sea level and 5,580 feet above msl.	Suitable habitat; not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR				
Calochortus plummerae Plummer's mariposa lily	–	–	4.2	Between August and September.	Grassy openings in chaparral.	Western Transverse Ranges and Peninsular Ranges; between 164 and 984 feet above msl.	Suitable habitat but at edge of known range in Orange County; not observed during surveys.
***Calochortus weedii* var. *intermedius* intermediate mariposa lily[a]**	**–**	**–**	**1B.2**	**Between May and July.**	**Coastal sage scrub and chaparral on dry, rocky, open slopes.**	**South Coast and northern Peninsular Ranges; between sea level and 2,230 feet above msl.**	**Suitable habitat; observed during surveys.**
Camissoniopsis lewisii Lewis' evening-primrose	–	–	3	Between March and June.	Sandy or clay soils of coastal grassland.	South Coast, western Peninsular Ranges, and northern Baja California, Mexico; between sea level and 984 feet above msl.	Outside elevation range; not expected to occur and not observed during surveys.
Centromadia parryi ssp. *australis* southern tarplant[a]	–	–	1B.1	Between May and November.	Seasonally moist, silty, alkaline soils in salt marshes, alkali meadows, mesic grasslands, vernal pools, ditches, and coastal scrub.	South Coast to northwestern Baja California, Mexico; between sea level and 655 feet above msl.	Outside elevation range; not expected to occur and not observed during surveys.
Chorizanthe parryi var. *fernandina* San Fernando Valley spineflower	FC	SE	1B.1	Between April and June.	Sandy areas.	Laskey Mesa in Ventura County and the northern Santa Susana Mountains of Los Angeles County; between 295 and 1,640 feet above msl.	Outside current known range; not expected to occur and not observed during surveys.
Chorizanthe polygonoides var. *longispina* long-spined spineflower	–	–	1B.2	Between April and June.	Sandy areas.	Peninsular Ranges; between 98 and 4,921 feet above msl.	Only known from Gypsum Canyon in Orange County (Roberts 2008); not expected to occur and not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR				
Deinandra paniculata **paniculate tarplant**	**–**	**–**	**4.2**	**Between April and September.**	**Open or disturbed sites, grassland, scrub, woodland, and vernal pools.**	**Southern Central Coast, western Outer South Coast Ranges, Southwestern California to central Baja California, Mexico; between sea level and 3,937 feet above msl.**	**Suitable habitat; observed during surveys.**
Dodecahema leptoceras slender-horned spineflower	FE	SE	1B.1	Between April and June.	Sandy or gravelly areas.	East-central South Coast, adjacent foothills of the Transverse Ranges, and Peninsular Ranges; between 655 and 2,295 feet above msl.	Outside current known range; not expected to occur and not observed during surveys.
Dudleya multicaulis many-stemmed dudleya[a]	–	–	1B.2	Between April and July.	Heavy (often clayey) soils in coastal sage scrub and native grassland on coastal plains and sandstone outcrops.	South Coast; between sea level and 1,970 feet above msl.	Suitable habitat; not observed during surveys.
Dudleya stolonifera Laguna Beach dudleya	FT	ST	1B.1	Between May and July.	North-facing cliffs and outcrops.	San Joaquin Hills; between sea level and 820 feet above msl.	No suitable habitat; not expected to occur and not observed during surveys.
Eriastrum densifolium ssp. *sanctorum* Santa Ana River woollystar	FE	SE	1B.1	Between May and September.	Washes, floodplains, and dry river beds.	Eastern South Coast (i.e., the Santa Ana River drainage and southwestern San Bernardino County); between sea level and 1,640 feet above msl.	No suitable habitat; not expected to occur and not observed during surveys.
Harpagonella palmeri Palmer's grapplinghook	–	–	4.2	Between March and April.	Dry, semi-barren sites in chaparral, coastal scrub, and grassland.	South Coast, Peninsular Ranges, southwest Sonoran Desert, southwestern Arizona, to northwestern Mexico; between sea level and 3,281 feet above msl.	Suitable habitat; not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR				
Hesperocyparis [*Callitropsis*] *forbesii* Tecate cypress	–	–	1B.1	—	Chaparral.	Western Peninsular Ranges to northwestern Baja California, Mexico; planted outside native range; between 1,476 and 4,921 feet above msl.	Suitable habitat; not observed during surveys.
Hesperocyparis [*Callitropsis*] *goveniana* Gowen cypress	FT	–	1B.2	—	Closed-cone pine/cypress forests, mixed-evergreen forest, maritime chaparral, and coastal terraces.	Monterey Peninsula of the Central Coast; between 164 and 525 feet above msl.	Outside current known range; not expected to occur and not observed during surveys.
Lepechinia cardiophylla heart-leaved pitcher sage	–	–	1B.2	Between April and July.	Chaparral.	Peninsular Ranges; between 1,969 and 3,937 feet above msl.	Suitable habitat, but at edge of elevation range; not observed during surveys.
Lepidium virginicum var. *robinsonii* Robinson's pepper-grass[b]	–	–	4.3	Between January and July.	Dry, sandy, or thin soils in coastal sage scrub and chaparral.	Southwestern California and Baja California, Mexico; between sea level and 1,640 feet above msl.	Suitable habitat; not observed during surveys.
Lilium humboldtii ssp. *ocellatum* ocellated Humboldt lily	–	–	4.2	Between May and August.	Oak canyons, chaparral, and yellow-pine forest.	Southern, central-western, and southwestern California; between sea level and 5,906 feet above msl.	Suitable habitat; not observed during surveys.
Monardella hypoleuca ssp. *intermedia* intermediate monardella[a]	–	–	1B.3	Between June and September.	Dry slopes of chaparral, oak woodland, and occasionally conifer forest.	Northwestern Peninsular Ranges (Orange, western Riverside, and northern San Diego counties); between 656 and 4,101 feet above msl.	Suitable habitat; not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR				
Nama stenocarpum mud nama	–	–	2B.2	Between March and October.	Intermittently wet areas and margins of vernal pools and ponds.	San Joaquin Valley, South Coast, southern Channel Islands, western Peninsular Ranges, southeastern Sonoran Desert to Texas and northern Mexico; between sea level and 2,657 feet above msl.	No suitable habitat; not expected to occur and not observed during surveys.
Nolina cismontana **chaparral nolina**	**–**	**–**	**1B.2**	**Between May and July.**	**Dry chaparral or coastal mountains.**	**South Coast, Western Transverse Ranges, and Peninsular Ranges; between 655 and 4,265 feet above msl.**	**Suitable habitat; observed during surveys.**
Penstemon californicus California beardtongue	–	–	1B.2	Between May and June.	Sandy soils of yellow-pine forest or pinyon/juniper woodland.	Peninsular Ranges and Mexico; between 3,937 and 7,546 feet above msl.	No suitable habitat and outside current known range; not expected to occur and not observed during surveys.
Pentachaeta aurea ssp. *allenii* Allen's pentachaeta	–	–	1B.1	Between March and May.	Grassy areas.	Southern South Coast and Peninsular Ranges of Orange County; between sea level and 1,640 feet above msl.	Suitable habitat; not observed during surveys.
Pickeringia montana var. *tomentosa* woolly chaparral-pea	–	–	4.3	Between May and August.	Chaparral and washes.	San Bernardino Mountains, Peninsular Ranges to Baja California, Mexico; between sea level and 5,577 feet above msl.	Suitable habitat; not observed during surveys.
Polygala cornuta var. *fishiae* Fish's milkwort	–	–	4.3	Between May and August.	Chaparral and oak woodland.	Southern Outer South Coast Ranges, Western Transverse Ranges, San Gabriel Mountains, and Peninsular Ranges to northern Baja California, Mexico; between 295 and 4,167 feet above msl.	Suitable habitat; not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR				
Pseudognaphalium leucocephalum white rabbit-tobacco	–	–	2B.2	Between August and November, uncommonly as early as July or as late as December.	Sandy or gravelly benches, dry stream bottoms, and canyon bottoms.	South Coast, San Bernardino Mountains, and Peninsular Ranges to Arizona, New Mexico, and Mexico; between sea level and 1,640 feet above msl.	Marginally suitable habitat; not observed during surveys.
Romneya coulteri Coulter's matilija poppy	–	–	4.2	Between March and July.	Dry washes and canyons.	South Coast, Western Transverse Ranges, and Peninsular Ranges; between sea level and 3,937 feet above msl.	Suitable habitat; observed just east of the property.
Senecio aphanactis chaparral ragwort	–	–	2B.2	Between January and April.	Alkaline flats and dry, open rocky areas of coastal bluff scrub and coastal sage scrub.	Central Western California and South Coast to Baja California, Mexico; between 30 and 1,805 feet above msl.	Suitable habitat; not observed during surveys.

USFWS: U.S. Fish and Wildlife Service; CDFW: California Department of Fish and Wildlife; CRPR: California Rare Plant Rank; msl: mean sea level.

Federal (USFWS)
FE Endangered
FT Threatened
FC Candidate

State (CDFW)
SE Endangered
ST Threatened

CRPR
1B Plants Rare, Threatened, or Endangered Throughout Their Range
2B Plants Rare, Threatened, or Endangered in California But More Common Elsewhere
3 Plants that require more information before they can be assigned to another rank or rejected
4 Plants of Limited Distribution – A Watch List

CRPR Threat Rank Extensions
None Plants lacking any threat information
.1 Seriously Endangered in California (over 80% of occurrences threatened; high degree and immediacy of threat)
.2 Fairly Endangered in California (20–80% of occurrences threatened; moderate degree and immediacy of threat)
.3 Not very Threatened in California (<20% of occurrences threatened; low degree and immediacy of threat or no current threats known)

[a] A Covered Species
[b] Robinson's pepper-grass is not recognized in Baldwin et al. (2012); however, it is still tracked by the CNDDB.

Intermediate Mariposa Lily

Intermediate mariposa lily has a CRPR of 1B.2. It typically blooms between June and July (Baldwin et al. 2012). This perennial bulbiferous herb occurs on dry, rocky, open slopes in chaparral and coastal sage scrub at elevations between sea level and approximately 2,231 feet above msl (Roberts 2008; Baldwin et al. 2012). This species is known from the South Coast and northern Peninsular Ranges (Baldwin et al. 2012).

A total of 18 intermediate mariposa lily individuals were observed in 9 locations on the property (Table 4; Exhibit 8). These plants were observed primarily on south-facing slopes and ridgelines in loamy soils. The species generally associated with these populations included chamise, black sage, chaparral yucca (*Hesperoyucca whipplei*), California buckwheat, California sagebrush, hoaryleaf ceanothus, blue dicks (*Dichelostemma capitatum*), wild oat, and red brome (*Bromus madritensis* ssp. *rubens*). A voucher specimen was not collected due to the small population size.

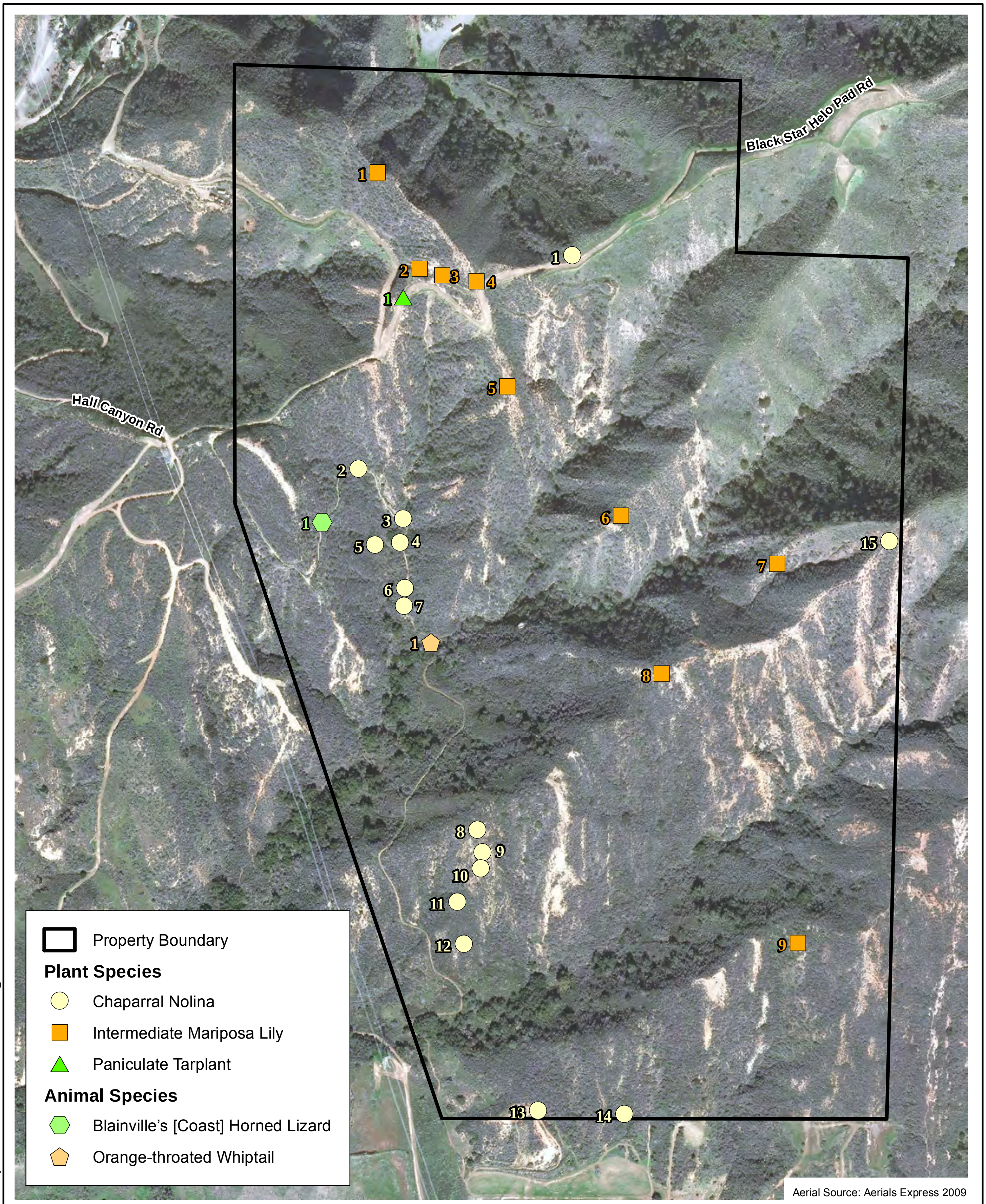
TABLE 4
INTERMEDIATE MARIPOSA LILY
POPULATIONS OBSERVED
ON THE PROPERTY

Population	Number of Individuals	Phenology Percentage		
		Vegetative	Flowering	Fruiting
1	3	100	–	–
2	2	–	50	50
3	1	–	–	100
4	5	80	20	–
5	1	–	100	–
6	3	–	100	–
7	1	–	100	–
8	1	–	100	–
9	1	–	100	–
Total	**18**	**N/A**	**N/A**	**N/A**

Paniculate Tarplant

Paniculate tarplant (*Deinandra paniculata* [formerly in *Hemizonia*]) has a CRPR of 4.2. It typically blooms between May and November (Baldwin et al. 2012). This annual herb occurs in grassland, open chaparral and woodland, and disturbed areas at elevations between sea level and approximately 4,331 feet above msl (Baldwin et al. 2012). This species is known from the southern Central Coast/Outer South Coast Ranges, southern Outer South Coast Ranges, South Coast, eastern Santa Ynez Mountains of the Western Transverse Ranges, Peninsular Ranges, and northern Baja California, Mexico (Baldwin et al. 2012).

One paniculate tarplant individual was observed blooming along an access road in the northern portion of the property (Exhibit 8). The species generally associated with this individual included California buckwheat, chamise, fascicled tarweed, deerweed, and wild oat. A voucher specimen was not collected due to the small population size.



Special Status Species

Exhibit 8

Measure M2 Acquisition Properties Evaluation – MacPherson Property

BonTerra PSOMAS

(Rev: 10-09-2014 JAZ) R:\Projects\OCT_OCTA\J008\Graphics\MacPherson\BioTech\ex8_SSSpecies.pdf

Chaparral Nolina

Chaparral nolina has a CRPR of 1B.2. It typically blooms between May and July (Baldwin et al. 2012). This perennial subshrub occurs in dry chaparral and coastal sage scrub at elevations between approximately 656 and 4,265 feet above msl (Roberts 2008; Baldwin et al. 2012). This species is known from the South Coast, Western Transverse Ranges, and Peninsular Ranges (Baldwin et al. 2012).

A total of 326 chaparral nolina individuals were observed in 15 locations on the property (Table 5; Exhibit 8). These plants were observed primarily on south-facing slopes and canyon bottoms in loamy soils. The species generally associated with these populations included chamise, black sage, hoaryleaf ceanothus, and California buckwheat. A voucher specimen was not collected due to the growth form of the species.

TABLE 5
CHAPARRAL NOLINA POPULATIONS OBSERVED ON THE PROPERTY

Population	Number of Individuals	Phenology Percentage		
		Vegetative	Flowering	Fruiting
1	20	100	0	0
2	10	100	0	0
3	1	100	0	0
4	2	100	0	0
5	2	100	0	0
6	2	100	0	0
7	1	100	0	0
8	6	84	0	16
9	15	100	0	0
10	30	100	0	0
11	20	100	0	0
12	5	100	0	0
13	10	100	0	0
14	200	~80	0	~20
15	2	100	0	0
Total	**326**	**N/A**	**N/A**	**N/A**

3.3.4 <u>Special Status Wildlife</u>

Based on the results of the literature review and the list of proposed covered wildlife species for the NCCP/HCP, 57 special status wildlife species are known to occur in vicinity of the MacPherson property. These species and their potential for occurrence (which is based on the presence of suitable habitat) are summarized in Table 6. Note that these species are listed taxonomically. Two special status wildlife species were observed on the property. These species are discussed after the table.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Invertebrates					
Branchinecta sandiegonensis San Diego fairy shrimp	FE	–	Vernal pools and ephemeral ponds.	Coastal Orange County and San Diego County.	No suitable habitat; not expected to occur.
Streptocephalus woottoni Riverside fairy shrimp	FE	–	Vernal pools and ephemeral ponds.	Coastal Ventura County south to Baja California, Mexico.	No suitable habitat; not expected to occur.
Fish					
Catostomus santaanae Santa Ana sucker	FT	SSC	Small to medium-sized perennial streams, preferably with coarse gravel, rubble, or boulder substrate.	Los Angeles, San Gabriel, and Santa Ana River drainages.	No suitable habitat; not expected to occur.
Gila orcuttii arroyo chub[a]	–	SSC	Coastal freshwater streams and rivers with steady current and emergent vegetation.	Currently found at three native locations: Santa Margarita and De Luz Creeks in San Diego County, Trabuco and San Juan Creeks in Orange County, and Malibu Creek in Los Angeles County; introduced elsewhere.	No suitable habitat; not expected to occur.
Rhinichthys osailolus Santa Ana speckled dace	–	SSC	Small streams, springs, large rivers, deep lakes; prefer clear oxygenated water with movement from current or waves and typically with overhanging vegetation cover.	Restricted to the headwaters of the Los Angeles, Santa Ana, and San Gabriel rivers.	No suitable habitat; not expected to occur.
Amphibians					
Spea hammondii western spadefoot	–	SSC	Quiet streams, vernal pools, and temporary ponds.	Great Valley and bordering foothills and Coast Ranges from Monterey Bay south to Baja California, Mexico.	Limited suitable habitat; limited potential to occur.
Anaxyrus californicus [*Bufo microscaphus californicus*] arroyo toad	FE	SSC	Semi-arid regions near washes or intermittent streams; requires suitable breeding pools.	Southern California and northwestern Baja California, Mexico.	No suitable habitat; not expected to occur.
Lithobates [*Rana*] *pipiens* northern leopard frog (native populations)	–	SSC	Variety of habitats such as grasslands, brushlands, woodlands, and forests; requires aquatic habitat for overwintering and breeding.	Broadly distributed; native in California only from Modoc and Lassen Counties.	Outside native range of species; not expected to occur as a native population.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Taricha torosa Coast Range newt	–	SSC	Wet forests, oak forests, chaparral, and grasslands. Breeds in streams, rivers, ponds, lakes, and reservoirs.	Coast and coast range mountains from Mendocino County south to San Diego County.	Limited suitable habitat; limited potential to occur.
Reptiles					
Actinemys marmorata [*Emys m.*] Pacific [western] pond turtle[a]	–	SSC	In ponds, lakes, marshes, rivers, streams, and irrigation ditches with a rocky or muddy bottom and aquatic vegetation.	Pacific slope drainages from Washington south to northern Baja California, Mexico.	No suitable habitat; not expected to occur.
Phrynosoma blainvillii **Blainville's [coast] horned lizard[a]**	**–**	**SSC**	**Scrubland, grassland, coniferous forests, and broadleaf woodland with friable soil for burrowing.**	**Northern California south to northern Baja California, Mexico.**	**Suitable habitat; observed on the property.**
Aspidoscelis hyperytha **[*Cnemidophorus hyperythus beldingi*]** **orange-throated whiptail[a]**	**–**	**SSC**	**Washes and open areas of sage scrub and chaparral in friable, gravelly soil.**	**Western Peninsular Ranges from Orange and San Bernardino Counties south to Baja California, Mexico.**	**Suitable habitat; observed on the property.**
Aspidoscelis [*Cnemidophorus*] *tigris stejnegeri* coastal whiptail [coastal western whiptail]	–	SA	Hot and dry open areas with sparse foliage (e.g., chaparral, woodland).	Coastal Southern California, mostly west of the Peninsular Ranges, south of the Transverse Ranges, and north into Ventura County.	Suitable habitat; may occur.
Salvadora hexalepis virgultea coast patch-nosed snake	–	SSC	Sandy or rocky grasslands, chaparral, sagebrush plains, piñon-juniper woodlands, and desert scrub.	Coast of California from San Luis Obispo County south to Baja California, Mexico.	Suitable habitat; may occur.
Thamnophis hammondii two-striped garter snake	–	SSC	Perennial or intermittent freshwater streams with rocky beds bordered by willows or other dense vegetation.	From Monterey County south to El Rosario in Baja California, Mexico.	Limited suitable habitat; limited potential to occur.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Crotalus ruber red-diamond rattlesnake	–	SSC	Open scrub, chaparral, woodland, and grassland.	Orange County and San Bernardino County south to Baja California, Mexico.	Suitable habitat; may occur.
Birds					
Accipiter cooperii Cooper's hawk (nesting)	–	WL	Prefers to nest in oak woodlands and riparian woodlands; forages primarily in forest habitats.	Breeds from southern Canada into northwestern and north-central Mexico; wintering range extends south.	Suitable foraging and nesting habitat; expected to occur for foraging and nesting.
Accipiter striatus sharp-shinned hawk (nesting)	–	WL	Nests and forages in forest habitats.	Breeds in Alaska and Canada; portions of the U.S.; in the West Indies; and south through Mexico, Central America, and South America. Migrant and winter visitor in Orange County.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Aquila chrysaetos golden eagle (nesting and non-breeding/wintering)	–	FP, WL	Nests in open and semi-open habitats (e.g., tundra, shrublands, grasslands, woodland-brushlands, coniferous forests, farmland, and riparian habitats). Forages in broad expanses of open country.	Resident throughout Southern California, except in the Colorado Desert and Colorado River, where it is a casual winter visitor.	Suitable foraging habitat; may occur for foraging. Limited suitable nesting habitat; limited potential to occur for nesting.
Buteo regalis ferruginous hawk (non-breeding/ wintering)	–	WL	Open, dry habitats such as grasslands, shrublands, rangelands, and plowed agricultural fields.	Winter resident in California; visitor along the coast of Southern California.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Circus cyaneus northern harrier (nesting)	–	SSC	Breeds on the ground within dense vegetation. Forages in open habitats such as marshes and fields.	Winter migrant throughout Southern California, but a scarce local breeder.	Limited suitable foraging and nesting habitat; limited potential to occur for foraging and nesting.
Elanus leucurus white-tailed kite (nesting)	–	FP	Low elevation grassland, agricultural areas, wetlands, oak woodlands, savannahs, and riparian habitat adjacent to open areas.	Resident in coastal Southern California and a visitor and local breeder on the western edge of the deserts.	Suitable foraging and nesting habitat; may occur for foraging and nesting.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Haliaeetus leucocephalus bald eagle (nesting and wintering)	Delisted	SE, FP	Forested areas adjacent to large bodies of water.	Occurs from Alaska and Canada; throughout the U.S.; and Baja California, Mexico.	Limited suitable foraging and nesting habitat; limited potential to occur for foraging and nesting.
Falco columbarius merlin (non-breeding/ wintering)	–	WL	Breeds in forests and prairies. Occures along the coast in open grasslands and savannahs; in inland and montane valleys; and in the desert.	Breeds in northern North America, Europe, and Asia. Fall transient and rare winter visitor in California.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Falco mexicanus prairie falcon (nesting)	–	WL	Nests on cliffs; forages in grassland and scrub vegetation.	Year-round resident of interior Southern California. Winter resident and rare summer resident along the Southern California coast.	Suitable foraging habitat; may occur for foraging. No suitable nesting habitat; not expected to occur for nesting.
Asio otus long-eared owl (nesting)	–	SSC	Nests in dense trees such as oaks and willows. Forages over grasslands and other open habitats.	Breeds in Canada south to northern Baja California, Mexico. Winters throughout breeding range to the interior of Mexico.	Limited suitable foraging habitat; limited potential to occur for foraging. Suitable nesting habitat; may occur for nesting.
Athene cunicularia burrowing owl (burrow sites; wintering in northern counties)	–	SSC	Sparse vegetation in arid and semi-arid habitats such as grasslands, steppes, deserts, prairies, and agricultural areas. Nests in mammal burrows or man-made cavities.	In California from the Central Valley and Southern California.	No suitable habitat; not expected to occur.
Empidonax traillii extimus southwestern willow flycatcher[a] (nesting)	FE	SE	Riparian habitats with dense growths of willows, often with a scattered overstory of cottonwood.	Breeds in coastal Southern California.	No suitable habitat; not expected to occur.
Lanius ludovicianus loggerhead shrike (nesting)	–	SSC	Grasslands and other dry, open habitats.	Throughout North America; a year-round resident in Southern California.	Suitable foraging and nesting habitat; may occur for foraging and nesting.
Vireo bellii pusillus least Bell's vireo[a] (nesting)	FE	SE	Riparian habitat dominated by willows with dense understory vegetation.	Breeds throughout the Central Valley and other low-elevation river systems in California and Baja California, Mexico.	No suitable habitat; not expected to occur.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Eremophila alpestris actia California horned lark	–	WL	Open habitats with bare ground or short vegetation, such as shortgrass prairie, deserts, brushy flats, alpine, shrubsteppe, and agricultural areas.	From Alaska and the Canadian arctic south to Mexico. Common migrant and winter resident that remains to breed along the Southern California coast.	Limited suitable habitat; limited potential to occur.
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren[a] (San Diego and Orange Counties)	–	SSC	Coastal sage scrub and alluvial sage scrub with prickly pear cactus and/or cholla.	Southern Orange County and San Diego County to northwestern Baja California, Mexico.	No suitable habitat; not expected to occur.
Polioptila californica californica coastal California gnatcatcher[a]	FT	SSC	Coastal sage scrub vegetation.	Los Angeles, Orange, Riverside, and San Diego Counties south to Baja California, Mexico.	Suitable habitat; not observed during focused surveys.
Dendroica petechia brewsteri yellow warbler (nesting)	–	SSC	Riparian vegetation, often with willows and cottonwoods.	Breeds in Southern California.	No suitable habitat; not expected to occur.
Icteria virens yellow-breasted chat (nesting)	–	SSC	The border of streams, creeks, sloughs, and rivers in dense thickets and tangles of blackberry, wild grape, and willow.	Summer resident in Southern California along the coast and in the deserts.	No suitable habitat; not expected to occur.
Aimophila ruficeps canescens Southern California rufous-crowned sparrow	–	WL	Steep, dry, rocky, south- or west-facing slopes in scrub vegetation interspersed with grasses and forbs or rock outcrops.	Year-round in Southern California.	Suitable habitat; may occur.
Ammodramus savannarum grasshopper sparrow (nesting)	–	SSC	Dense, dry or well-drained grassland.	Across North America from southern Canada south to Ecuador. Summer resident along the coastal slope of Southern California.	Limited suitable foraging and nesting habitat habitat; limited potential to occur for foraging and nesting.
Amphispiza belli belli Bell’s sage sparrow	–	WL	Low, dense chamise chaparral and dry scrub vegetation, often with stands of cactus.	Resident in interior foothills or coastal Southern California.	Suitable habitat; may occur.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Mammals					
Antrozous pallidus pallid bat	–	SSC	Low elevation grasslands, shrublands, woodlands, and forests. Roosts in caves, crevices, mines, bridges, and occasionally in hollow trees.	Throughout California except the high Sierra Nevada from Shasta County to Kern County and in the northwestern portion of the State.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.
Corynorhinus townsendii Townsend's big-eared bat	–	CT, SSC	Wide variety of habitats except subalpine and alpine. Roosts in caves, mines, tunnels, buildings, or other human-made structures.	Throughout most of California.	Suitable foraging habitat; may occur for foraging. No suitable roosting habitat; not expected to occur for roosting.
Euderma maculatum spotted bat	–	SSC	Foothills, mountains, arid deserts, grasslands, and mixed conifer forests. Roosts in rock crevices, occasionally in caves and buildings.	Western North America from southern British Columbia to Mexico.	Suitable foraging habitat; may occur for foraging. No suitable roosting habitat; not expected to occur for roosting.
Lasionycteris noctivagans silver-haired bat	–	SA	Coastal and montane forests, valley foothill woodlands, pinyon-juniper woodlands, and valley foothill and montane riparian habitats. Primarily a forest dweller.	North America, from southern British Columbia to northern Mexico.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.
Lasiurus blossevillii western red bat	–	SSC	Prefers riparian areas dominated by walnuts, oaks, willows, cottonwoods, and sycamores where they roost in these broad-leafed trees.	Found in western Canada, the western U.S., western Mexico and Central America.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.
Lasiurus cinereus hoary bat	–	SA	Prefers open habitats or habitat mosaics, with access to trees and open areas or habitat edges.	Widest range of any New World bat, living from Argentina and Chile northward through Canada.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Lasiurus xanthinus western yellow bat	–	SSC	Valley foothill riparian, desert riparian, desert wash, and palm oasis. Roosts in trees.	Mexican Plateau, coastal western Mexico, and deserts of the southwestern U.S.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.
Myotis ciliolabrum western small-footed myotis	–	SA	Arid uplands, primarily in arid wooded and brushy uplands near water. Roosts in caves, buildings, mines, crevices, and occasionally under bridges and under bark.	Southern British Columbia, Alberta, and Saskatchewan, Canada to the southwestern U.S.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.
Myotis evotis long-eared myotis	–	SA	Nearly all brush, woodland, and forest habitats, but appears to prefer coniferous woodlands and forests. Roosts in buildings, crevices, spaces under bark, and snags.	Western Canada; western U.S.; and Baja California, Mexico.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.
Myotis yumanensis Yuma myotis	–	SA	Open forests and woodlands, closely associated with water bodies. Roosts in buildings, mines, caves, crevices, swallow nests, and under bridges.	Southwestern British Columbia through the western U.S., and into central Mexico.	Suitable foraging habitat; may occur for foraging. No suitable roosting habitat; not expected to occur for roosting.
Eumops perotis californicus western mastiff bat	–	SSC	Open, semi-arid to arid habitats including conifer and deciduous woodland, coastal scrub, grasslands, palm oases, chaparral, desert scrub, and urban. Roosts in crevices in cliffs, high buildings, trees, and tunnels.	Southeastern San Joaquin Valley and Coastal Ranges from Monterey County south through Southern California, and from the coast eastward to the Colorado Desert.	Suitable foraging habitat; may occur for foraging. Limited suitable roosting habitat; limited potential to occur for roosting.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Nyctinomops femorosaccus pocketed free-tailed bat	–	SSC	Pinyon-juniper woodland, desert scrub, desert succulent scrub, desert riparian, and desert. Roosts in crevices in cliffs, caverns, or buildings.	Southwestern U.S. to south-central Mexico.	Suitable foraging habitat; may occur for foraging. No suitable roosting habitat; not expected to occur for roosting.
Lepus californicus bennettii San Diego black-tailed jackrabbit	–	SSC	Herbaceous and desert-shrub areas and open, early stages of forest and chaparral.	Pacific slope from Santa Barbara County south to northwestern Baja California, Mexico.	Limited suitable habitat; limited potential to occur.
Chaetodipus fallax fallax northwestern San Diego pocket mouse	–	SSC	Chaparral, coastal sage scrub, and grassland.	Southwest San Bernardino County south to northern Baja California, Mexico.	Suitable habitat; may occur.
Perognathus longimembris brevinasus Los Angeles pocket mouse	–	SSC	Lower elevation grasslands and coastal sage scrub with fine sandy soils.	Los Angeles Basin to San Bernardino, Cabazon, Hemet, and Aguanga.	Suitable habitat; may occur.
Neotoma lepida intermedia San Diego desert woodrat	–	SSC	Joshua tree woodland, pinyon-juniper, mixed and chamise-redshank chaparral, sagebrush, and desert habitats.	Pacific slope from San Luis Obispo south to northwestern Baja California, Mexico.	Suitable habitat; may occur.
Taxidea taxus American badger	–	SSC	Drier, open stages of shrub, forest, and herbaceous habitats with friable soil.	Throughout California except the extreme northwest.	Suitable habitat; may occur.
Puma [*Felis*] *concolor* mountain lion[a]	–	–	Broad variety of habitats in range except shrubless deserts and agricultural areas.	Latitudinal range of 110 degrees in North and South America.	Suitable habitat; may occur.

TABLE 6
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status		Habitat	Range	Potential to Occur on the Property/ Results of Focused Surveys
	USFWS	CDFW			
Lynx rufus bobcat[a]	–	–	Broad variety of habitats.	Throughout contiguous U.S. and Mexico south to Rio Mescale, and Canada.	Suitable habitat; may occur.

USFWS: U.S. Fish and Wildlife Service; CDFW: California Department of Fish and Wildlife.

LEGEND

Federal (USFWS)
FE Endangered
FT Threatened

State (CDFW)
SE Endangered
CT Candidate Threatened
SSC Species of Special Concern
WL Watch List
FP Fully Protected
SA Special Animal

[a] Proposed Covered Species in the NCCP/HCP.

Blainville's [Coast] Horned Lizard

Blainville's [coast] horned lizard is a California Species of Special Concern. It is a small, spiny, somewhat rounded lizard that occurs in scrubland, grassland, coniferous forests, and broadleaf woodland vegetation types. It prefers open areas for basking and loose, friable soil for burrowing. The Blainville's [coast] horned lizard occurs throughout much of California, west of the desert and Cascade-Sierra highlands south to Baja California, Mexico. However, many of the populations in lowland areas have been reduced or eliminated due to urbanization and agricultural expansion (Stebbins 2003). Three factors have contributed to its decline: loss of habitat, overcollecting, and the introduction of exotic ants (Jennings and Hayes 1994). Blainville's [coast] horned lizard was observed in an opening of southern mixed chaparral vegetation in the western portion of the property.

Orange-Throated Whiptail

Orange-throated whiptail is a California Species of Special Concern. The orange-throated whiptail occurs in washes and in open areas of sage scrub and chaparral with gravelly soils, often with rocks. It prefers well drained, friable soil on slopes with a southern exposure that are barren or only sparsely covered with vegetation. This species occurs between sea level and 2,000 feet above msl in the western Peninsular Ranges from Orange and San Bernardino Counties south to Baja California, Mexico. Approximately 75 percent of the former range has been lost to development, and the remaining populations are highly fragmented (Stebbins 2003). Orange-throated whiptail was observed in an opening of mixed sage scrub vegetation in the center of the property.

3.3.5 Critical Habitat

The federal Endangered Species Act defines critical habitat as follows:

> (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of this [Endangered Species] Act, on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of this [Endangered Species] Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

On February 9, 2011, the USFWS published a Final Rule designating critical habitat for arroyo toad. This Final Rule designates 98,366 acres in Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego Counties as critical habitat. The property is within Unit 8 of the current final critical habitat for arroyo toad.

3.4 COVERED SPECIES SUMMARY

The baseline surveys described in this document were focused towards establishing baseline knowledge of the set of species covered by the OCTA M2 NCCP/HCP. The OCTA M2 NCCP/HCP includes requirements to understand and document the status of Covered Species and their habitats within the Preserves. Table 7 provides a summary of the OCTA M2 NCCP/HCP Covered Species; whether they were observed during the baseline surveys; other information documenting the potential for the Covered Species to occur on site; and a description of the threats and opportunities for management of the Preserve to benefit Covered Species.

Potential threats to Covered Species and their habitats on the property include habitat destruction by hikers and mountain bikers; illegal hunting; the spread of non-native plants and wildlife (e.g., Spanish broom and non-native ants); and wildland fires. A RMP may incorporate restricting unauthorized access on the property; restoring native habitat by removing invasive plants; and maintaining movement opportunities through the property. A grant from the Wildlife Conservation Board (WCB), which provides funding for watershed-wide habitat enhancement, may be available to assist with restoration activities.

The grasslands on the property represent the primary candidate areas for habitat restoration to native grassland, scrub, or woodland communities, depending on the slope, aspect, and soils present. Control of species such as ripgut grass, wild oat, black mustard, and tocalote presents a challenge given their prevalence throughout the wildlands of Orange County. However, the Spanish broom (*Spartium junceum*), which was observed in the southwestern corner of the property (see Exhibit 6), should be targeted for removal.

TABLE 7
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Opportunities, Threats, and Management
Plants			
Calochortus weedii* var. *intermedius **intermediate mariposa lily**	**Observed on site.**	**Suitable habitat; additional individuals/populations may be present.**	**Potential threats include hikers and mountain bikers.** **Opportunities occur to establish the species in areas with suitable conditions (e.g., soils) that are currently degraded.** **An RMP may restrict unauthorized access on site and allow for transplantation and/or seeding of this variety in suitable areas on site.**
Centromadia parryi ssp. *australis* southern tarplant	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.
Dudleya multicaulis many-stemmed dudleya	Not observed on site.	Suitable habitat; may establish on site.	Potential threats include hikers and mountain bikers. Opportunities occur to establish the species in areas with suitable conditions (e.g., soils) that are currently degraded. An RMP may restrict unauthorized access on site and allow for transplantation and/or seeding of this variety in suitable areas on site.
Fish			
Gila orcuttii arroyo chub	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.
Reptiles			
Actinemys marmorata [*Emys m.*] Pacific [western] pond turtle	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.

TABLE 7
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Opportunities, Threats, and Management
Phrynosoma blainvillii **Blainville's [coast] horned lizard**	**Observed on site.**	**Suitable habitat; additional individuals/populations are likely present.**	**Potential threats include mortality and habitat destruction due to hikers and mountain bikers, intense fire events, and the spread of non-native ant species.** **Habitat restoration opportunities for coastal sage scrub and other suitable habitat occurs on site.** **An RMP may restrict unauthorized access on site and ensure any plant/soil material brought on site is free of non-native ant species.**
***Aspidoscelis hyperytha* [*Cnemidophorus hyperythus beldingi*]** **orange-throated whiptail**	**Observed on site.**	**Suitable habitat; additional individuals/populations are likely present.**	**Potential threats include mortality and habitat destruction due to hikers and mountain bikers and intense fire events.** **Habitat restoration opportunities for coastal sage scrub and other suitable habitat occurs on site.** **An RMP may incorporate restoration opportunities for coastal sage scrub and other native habitats utilized by this species.**
Birds			
Empidonax traillii extimus southwestern willow flycatcher (nesting)	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.
Vireo bellii pusillus least Bell's vireo (nesting)	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren (San Diego and Orange Counties)	Not observed on site.	Suitable habitat present.	Potential threats include mortality and habitat destruction due to hikers and mountain bikers and intense fire events. Protection of coastal sage scrub habitat that contains cactus is crucial for the preservation of this subspecies. Habitat restoration opportunities for coastal sage scrub with cactus species occur on site.

TABLE 7
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Opportunities, Threats, and Management
Polioptila californica coastal California gnatcatcher	Not observed on site.	Suitable habitat present.	Potential threats include mortality and habitat destruction due to hikers and mountain bikers and intense fire events. Protection of coastal sage scrub habitat is crucial for the preservation of this subspecies. There are limited opportunities to provide habitat for this subspecies on site because coastal sage scrub is a component of the chaparral vegetation. Coastal sage scrub may be established in suitable semi-natural herbaceous stands on site.
Mammals			
Puma [*Felis*] *concolor* mountain lion	Not observed on site.	Suitable habitat present.	Potential threats include illegal hunting and intense fire events. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintenance of movement opportunities through the site.
Lynx rufus bobcat	Not observed on site.	Suitable habitat present.	Potential threats include illegal hunting and intense fire events. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintenance of movement opportunities through the site.

4.0 REFERENCES

Allen, E.B, S.A. Eliason, V.J. Marquez, G.P. Schultz, N.K. Storms, C.D. Stylinski, T.A. Zink, and M.F. Allen. 2000. What are the Limits to Restoration of Coastal Sage Scrub in Southern California (pp. 253–262). *2nd Interface Between Ecology and Land Development in California* (J.E. Keeley, M. Baer-Keeley, and C.J. Fotheringham, Eds.). Sacramento, CA: U.S. Geological Survey.

American Ornithologists' Union (AOU). 2013 (September). *Check-list of North American Birds* (7th ed., as revised through 54th Supplement). Washington, D.C.: AOU. http://www.aou.org/checklist/north/index.php.

Baldwin, B.G., D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken (Eds.). 2012. *The Jepson Manual: Vascular Plants of California* (Second ed.). Berkeley, CA: University of California Press.

Barry, W.J. 1972. *California Prairie Ecosystems*. *Vol. 1: The Central Valley Prairie.* Sacramento, CA: State of California Resources Agency, Department of Parks and Recreation.

Bell, G. 1997. Ecology and Management of *Arundo donax* and Approaches to Riparian Habitat Restoration in Southern California (pp. 103–113). *Plant Invasions: Studies from North America and Europe* (J.H. Brock, M. Wade, P. Pysek, and D. Green, Eds.). Leiden, The Netherlands: Blackhuys Publishers.

Bennett, A.F. 1990. Habitat Corridors and the Conservation of Small Mammals in the Fragmented Forest Environment. *Landscape Ecology* 4(2–3):109–122. New York, NY: International Association for Landscape Ecology.

BonTerra Psomas. 2014 (October 16). *Results of Focused Presence/Absence Coastal California Gnatcatcher Surveys for the MacPherson Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California.* Irvine, CA: BonTerra Psomas.

California Department of Fish and Game (CDFG). 2010 (September). *List of Vegetation Alliances and Associations, Vegetation Classification and Mapping Program.* Sacramento, CA: CDFG.

———. 2009 (November 24). *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. Sacramento, CA: CDFG.

California Department of Fish and Wildlife (CDFW). 2014a. California Natural Diversity Database. Records of Occurrence for the USGS Black Star Canyon and El Toro 7.5-minute quadrangles. Sacramento, CA: CDFW, Natural Heritage Division.

———. 2014b (September). *Special Animals.* Sacramento, CA: CDFW, Natural Heritage Division.

———. 2014c (October). *Special Vascular Plants, Bryophytes, and Lichens List.* Sacramento, CA: CDFW, Natural Heritage Division.

California Department of Fish and Wildlife, Biogeographic Data Branch (CDFW BDB). 2014. Wildlife Habitats — California Wildlife Habitat Relationships System. Sacramento, CA: CDFW BDB. http://www.dfg.ca.gov/bdb/html/wildlife_habitats.html.

California Department of Forestry and Fire Protection (CAL FIRE). 2014. Fire Perimeter Data. Sacramento, CA: CAL FIRE, U.S. Department of Agriculture Forest Service Region 5 Remote Sensing Lab, Bureau of Land Management, National Park Service. http://frap.cdf.ca.gov/projects/fire_data/fire_perimeters/.

California Irrigation Management Information System (CIMIS). 2014. CIMIS Monthly Report for Irvine – South Coast Valleys Station #75. Sacramento, CA: California Department of Water Resources, CIMIS. http://www.cimis.water.ca.gov.

Canyon Land Conservation Fund (CLCF). 2011. Canyon History. Silverado, CA: CLCF. http://www.canyonland.org/canyonhistory.html.

California Native Plant Society (CNPS). 2014a. *The CNPS Ranking System*. Sacramento, CA: CNPS. http://www.cnps.org/cnps/rareplants/ranking.php.

———. 2014b. Electronic Inventory of Rare and Endangered Vascular Plants of California. Records of Occurrence for the USGS Black Star Canyon and El Toro 7.5-minute quadrangles. Sacramento, CA: CNPS. http://www.cnps.org/inventory.

California Wetlands Monitoring Workgroup (CWMW). 2012 (March). *California Rapid Assessment Method (CRAM) for Wetlands and Riparian Areas* (Version 6.0).

Crother, B.I. (Ed.). 2008 (May 2011, last update). Scientific and Standard English Names of Amphibians and Reptiles of North American North of Mexico, with Comments Regarding Confidence in our Understanding (Edition 6.1). Shoreview, MN: Society for the Study of Amphibians and Reptiles. http://www.ssarherps.org/pages/comm_names/Index.php.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual* (Technical Report Y-87-1). Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Faber, P., E. Keller, A. Sands, B. Massey. 1989. *The Ecology of Riparian Habitats of the Southern California Coastal Region: A Community Profile* (Biological Report 85 [7.27]). Washington, D.C: U.S. Fish and Wildlife Service, Research and Development, National Wetlands Research Center.

Faber-Langendoen, D., L. Master, J. Nichols, K. Snow, A. Tomaino, R. Bittman, G. Hammerson, B. Heidel, L. Ramsay, and B. Young. 2009. *NatureServe Conservation Status Assessments: Methodology for Assigning Ranks.* Arlington, VA: NatureServe. http://www.natureserve.org/publications/ConsStatusAssess_RankMethodology.pdf.

Fahrig, L. and G. Merriam. 1985. Habitat Patch Connectivity and Population Survival. *Ecology* 66(6): 1762–1768. Tempe, AZ: Ecological Society of America.

Gray, J. and D. Bramlet. 1992. *Habitat Classification System Natural Resources Geographic Information System (GIS) Project* (Prepared for the County of Orange Environmental Management Agency). Santa Ana, CA: Gray and Bramlet.

Halsey, R.W. 2007. Chaparral: Pure California. *Fremontia* 35(4): 2–7. Sacramento, CA: CNPS.

———. 2005. *Fire, Chaparral, and Survival in Southern California*. San Diego, CA: Sunbelt Publications, Inc.

Harris, L.D. and P.B. Gallagher. 1989. New Initiatives for Wildlife Conservation: The Need for Movement Corridors (pp. 11–34). *Preserving Communities and Corridors* (G. Mackintosh, Ed.). Washington, D.C.: Defenders of Wildlife.

Hickman, J.C., Ed. 1993. *The Jepson Manual of Higher Plants of California*. Berkeley, CA: University of California Press.

Howard, J.L. 1992. Malomsa laurina. In: Fire Effects Information System, [Online]. Golden, CO: U.S., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

Jennings, M.R. and M.P. Hayes. 1994. Decline of Native Ranid Frogs in the Desert Southwest. In *Herpetology of the North American Deserts: Proceedings of a Symposium* (P.R. Brown and J.W. Wright, Eds.). *Southwestern Herpetologists Society Special Publication No. 5.* Van Nuys, CA: Southwestern Herpetologists Society.

Keeley, J.E. and P.H. Zedler. 2009. Large, High-intensity Fire Events in Southern California Shrublands: Debunking the Fine-grain Age Patch Model. *Ecological Applications* 19(1): 69-94. Tempe, AZ: Ecological Society of America.

Los Angeles, County of, Santa Monica Mountains Conservancy, City of Brea, City of La Habra Heights, City of Whittier, and City of Diamond Bar (Los Angeles County et al.). 2003 (October 14, adopted). Wildlife Corridor Conservation Authority Joint Exercise of Powers Agreement (an agreement "to provide for the proper planning, conservation, environmental protection, and maintenance of the habitat and wildlife corridor between the Whittier-Puente Hills and the Cleveland National Forest in the Santa Monica Mountains.").

MacArthur, R.H. and E.O. Wilson. 1967. *The Theory of Island Biogeography*. Princeton, NJ: Princeton University Press.

McCreary, D.D. 2004. *Fire in California's Oak Woodlands*. University of California Integrated Hardwood Range Management Program. Davis, CA: University of California, Agricultural Issues Center, Integrated Hardwood Range Management Program. http://ucanr.org/faqs/filegroups/faqs14-sep-09-1109/16808.pdf.

Minnich, R.A. and R.J. Dezzani. 1998. Historic Decline of Coastal Sage Scrub in the Riverside – Perris Plain, California. *Western Birds.* 29(4): 366–391. San Diego, CA: Western Field Ornithologists.

Munz, P.A. 1974. *A Flora of Southern California*. Berkeley, CA: University of California Press.

National Weather Service (NWS). 2014. International Station Meteorological Climate Summary for El Toro Station 722974. Salt Lake City, UT: National Oceanic and Atmospheric Administration, NWS Western Region Headquarters.

Noss, R.F. 1983. A Regional Landscape Approach to Maintain Diversity. *BioScience.* 33(11): 700–706. Washington, D.C.: American Institute of Biological Sciences.

Noss, R.F. and R.L. Peters. 1995. *Endangered Ecosystems: a Status Report on America's Vanishing Habitat and Wildlife.* Washington, D.C.: Defenders of Wildlife.

O'Leary, J. 1995. Coastal Sage Scrub: Threats and Current Status. *Fremontia.* 23(4): 27–31. Sacramento, CA: California Native Plant Society.

Orange, County of. 1977 (as amended). *Silverado-Modjeska Specific Plan*. Santa Ana, CA: Orange County Board of Supervisors.

Orange County Fire Authority (OCFA). 2008 (November 15). *After Action Report: Freeway Complex Fire*. Irvine, CA: OCFA.

———. 2007 (October). *After Action Report: Santiago Fire*. Irvine, CA: OCFA.

Orange County Transportation Authority (OCTA). 2010 (December 3). Notice of Preparation to Prepare an Environmental Impact Report. Orange, CA: OCTA.

Ritter, M.E. 2006. The Physical Environment: Mediterranean or Dry Summer Subtropical Climate. Stevens Point, WI: University of Wisconsin. http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/climate_systems/mediterranean.html.

Roberts, F.M. 2008. *The Vascular Plants of Orange County, California: An Annotated Checklist*. San Luis Rey, CA: F.M. Roberts Publications.

Ruben, J.A. and W.J. Hillenius. 2005 (May). Cold Blooded. *Natural History*. New York, NY: American Museum of Natural History.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation* (2nd ed.). Sacramento, CA: CNPS.

Schoenherr, A.A. 1992. *A Natural History of California.* Berkeley, CA: University of California Press.

Simberloff, D. and J. Cox. 1987. Consequences and Costs of Conservation Corridors*. Conservation Biology* 1(1): 63–71. Boston, MA: Blackwell Scientific Publications.

Smithsonian National Museum of Natural History (SNMNH). 2011. Mammal Species of the World (3rd ed.) (a database based on Wilson, D.E. and D.M. Reeder's 2005 publication entitled *Mammal Species of the World, A Taxonomic and Geographic Reference, 3rd ed*). Washington, D.C.: SNMNH. http://www.vertebrates.si.edu/msw/mswcfapp/msw/index.cfm.

Soule, M.E. 1987. *Viable Populations for Conservation*. New York, NY: Cambridge University Press.

Stebbins, R.C. 2003. *A Field Guide to Western Reptiles and Amphibians* (3rd ed.). Boston, MA: Houghton-Mifflin Company.

Steinberg, P.D. 2002. Quercus agrifolia. In: Fire Effects Information System, [Online]. Golden, CO: USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).* (J.S. Wakeley, R.W. Lichvar, and C.V. Noble, Eds.). Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Fish and Wildlife Service (USFWS). 2011 (February 9). Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Arroyo Toad; Final Rule. *Federal Register* 76(27): 7245–7467. Washington, D.C.: USFWS.

———. 2006 (March 24). Wetland Mapper [Information for the MacPherson Property]. Washington D.C.: USFWS, National Wetlands Inventory. http://www.fws.gov/wetlands/Data/Mapper.html.

———. 1997 (February 28). *Coastal California Gnatcatcher (Polioptila californica californica). Presence/Absence Survey Guidelines.* Washington, D.C.: USFWS.

U.S. Forest Service (USFS). 2013 (March). Cleveland National Forest: History Heritage. San Diego, CA: Cleveland National Forest.

ATTACHMENT A

PLANT AND WILDLIFE COMPENDIA

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
***PTERIDOPHYTES* – FERNS AND ALLIES**	
PTERIDACEAE – BRAKE FAMILY	
Pellaea mucronata	bird's-foot fern
Pentagramma triangularis ssp. *triangularis*	goldenback fern
SELAGINELLACEAE – SPIKE-MOSS FAMILY	
Selaginella bigelovii	Bigelow's or bushy spike-moss
***ANGIOSPERMAE* – FLOWERING PLANTS**	
EUDICOTS	
ADOXACEAE – MUSKROOT FAMILY	
Sambucus nigra ssp. *caerulea* [*S. mexicana*]	blue elderberry
ANACARDIACEAE – SUMAC FAMILY	
Malosma laurina	laurel sumac
Rhus integrifolia	lemonade berry
Rhus ovata	sugar bush
Toxicodendron diversilobum	western poison oak
APIACEAE – CARROT FAMILY	
Lomatium lucidum	shiny lomatium
Sanicula sp.	sanicle
ASTERACEAE – SUNFLOWER FAMILY	
Acourtia microcephala	sacapellote
Artemisia californica	California sagebrush
Artemisia douglasiana	mugwort
Baccharis pilularis ssp. *consanguinea* [*B. pilularis*]	coyote brush
Baccharis salicifolia ssp. *salicifolia* [*B. salicifolia*]	mule fat
Carduus pycnocephalus ssp. *pycnocephalus**	Italian thistle
*Centaurea melitensis**	tocalote, Malta star-thistle
Chaenactis artemisiifolia	white pincushion
Corethrogyne filaginifolia [*Lessingia f.*]	California-aster
*Cynara cardunculus**	cardoon, globe artichoke
Deinandra fasciculata [*Hemizonia f.*]	fascicled tarweed
Deinandra paniculata [*Hemizonia p.*]	San Diego, paniculate tarplant
Encelia californica	California brittlebush
Erigeron foliosus	leafy fleabane
Eriophyllum confertiflorum	golden-yarrow
*Gazania linearis**	gazania
Hazardia squarrosa	saw-toothed goldenbush
Helianthus gracilentus	slender sunflower
Heterotheca grandiflora	telegraph weed
*Hypochaeris glabra**	smooth cat's-ear
Isocoma menziesii	coastal goldenbush
*Lactuca serriola**	prickly lettuce
Logfia filaginoides [*Filago californica*]	California cottonrose
Logfia gallica [*Filago g.*]*	daggerleaf cottonrose
Malacothrix saxatilis	malacothrix
Osmadenia tenella	osmadenia

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
Pseudognaphalium californicum [*Gnaphalium c.*]	California everlasting
Pseudognaphalium canescens [*Gnaphalium c.*]	everlasting
Pseudognaphalium microcephalum [*Gnaphalium canescens* ssp. *m.*]	white everlasting
*Silybum marianum**	milk thistle
*Sonchus oleraceus**	common sow thistle
Stephanomeria exigua	wreath plant
Stylocline gnaphaloides	everlasting neststraw
Uropappus lindleyi [*Microseris l.*]	silver puffs
BORAGINACEAE – BORAGE FAMILY	
Cryptantha sp.	cryptantha
Eriodictyon crassifolium	thick-leaf yerba santa
Eucrypta chrysanthemifolia	common eucrypta
Phacelia cicutaria	caterpillar phacelia
Phacelia minor	wild canterbury-bell
Phacelia parryi	Parry's phacelia
BRASSICACEAE – MUSTARD FAMILY	
*Brassica nigra**	black mustard
*Hirschfeldia incana**	shortpod mustard
*Raphanus sativus**	radish
CACTACEAE – CACTUS FAMILY	
Opuntia littoralis	coastal prickly-pear
Opuntia x occidentalis	western prickly-pear
CARYOPHYLLACEAE – PINK FAMILY	
*Silene gallica**	small-flower catchfly
CHENOPODIACEAE – GOOSEFOOT FAMILY	
*Salsola tragus**	Russian thistle
CISTACEAE – ROCK-ROSE FAMILY	
Helianthemum scoparium	peak rush-rose
CONVOLVULACEAE – MORNING-GLORY FAMILY	
Calystegia macrostegia	large-bracted morning-glory????/
*Convolvulus arvensis**	bindweed
Cuscuta californica	chaparral dodder
Cuscuta subinclusa	canyon dodder
CRASSULACEAE – STONECROP FAMILY	
Dudleya lanceolata	lance-leaved dudleya, lanceleaf, coastal dudleya, coastal live-forever
CUCURBITACEAE – GOURD FAMILY	
Marah macrocarpus	wild cucumber, chilicothe
EUPHORBIACEAE – SPURGE FAMILY	
Chamaesyce albomarginata [*Euphorbia a.*]	rattlesnake weed
FABACEAE – LEGUME FAMILY	
Acmispon glaber [*Lotus scoparius*]	deerweed
Acmispon strigosus [*Lotus s.*]	strigose lotus
Lupinus hirsutissimus	stinging lupine

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
*Medicago polymorpha**	California burclover
*Melilotus indica**	sourclover
Pickeringia montana	chaparral pea
*Spartium junceum**	Spanish broom
FAGACEAE – OAK/BEECH FAMILY	
Quercus agrifolia	coast live oak
GERANIACEAE – GERANIUM FAMILY	
*Erodium botrys**	long-beaked filaree
*Erodium cicutarium**	red-stemmed filaree
GROSSULARIACEAE – GOOSEBERRY FAMILY	
Ribes indecorum	white-flowered currant
Ribes malvaceum	chaparral currant
Ribes speciosum	fuchsia-flowered gooseberry
LAMIACEAE – MINT FAMILY	
Salvia apiana	white sage
Salvia columbariae	chia
Salvia mellifera	black sage
Trichostema lanatum	woolly blue curls
LOASACEAE – LOASA FAMILY	
Mentzelia micrantha	small-flowered stick-leaf
MALVACEAE – MALLOW FAMILY	
Malacothamnus fasciculatus	chaparral bushmallow
*Malva parviflora**	cheeseweed
MYRSINACEAE – MYRSINE FAMILY	
*Anagallis arvensis**	scarlet pimpernel
MYRTACEAE – MYRTLE FAMILY	
*Eucalyptus globulus**	blue gum
NYCTAGINACEAE – FOUR-O'CLOCK FAMILY	
Mirabilis laevis var. *crassifolia* [*M. californica*]	wishbone bush, California wishbone bush
ONAGRACEAE – EVENING-PRIMROSE FAMILY	
Eulobus californicus [*Camissonia californica*]	mustard-like evening primrose
OXALIDACEAE – WOOD-SORREL FAMILY	
Oxalis californica [*O. albicans* ssp. *c.*]	California wood-sorrel
PAPAVERACEAE – POPPY FAMILY	
Eschscholzia californica	California poppy
PHRYMACEAE – LOPSEED FAMILY	
Mimulus aurantiacus	bush monkeyflower
Mimulus brevipes	slope semaphore
PLANTAGINACEAE – PLANTAIN FAMILY	
Antirrhinum kelloggii	Kellogg's/climbing snapdragon
Keckiella cordifolia	heart-leaved bush-penstemon
Penstemon centranthifolius	scarlet bugler
Plantago erecta	dwarf plantain, California plantain

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
POLEMONIACEAE – PHLOX FAMILY	
Eriastrum sapphirinum	sapphire woollystar
POLYGONACEAE – BUCKWHEAT FAMILY	
Eriogonum elongatum var. *elongatum*	long-stemmed wild buckwheat
Eriogonum fasciculatum	California buckwheat
Pterostegia drymarioides	woodland threadstem
RHAMNACEAE – BUCKTHORN FAMILY	
Ceanothus crassifolius	hoaryleaf ceanothus
Rhamnus crocea	spiny redberry
Rhamnus ilicifolia	hollyleaf redberry
ROSACEAE – ROSE FAMILY	
Adenostoma fasciculatum	chamise
Heteromeles arbutifolia	toyon, Christmas berry
RUBIACEAE – MADDER FAMILY	
Galium angustifolium	narrowly leaved bedstraw
Galium nuttallii ssp. *nuttallii*	San Diego bedstraw
SOLANACEAE – NIGHTSHADE FAMILY	
Solanum xanti	chaparral nightshade
***MONOCOTYLEDONES* – MONOCOTS**	
AGAVACEAE – CENTURY PLANT FAMILY	
Chlorogalum parviflorum	miniature soap plant
Hesperoyucca whipplei [*Yucca w.*]	chaparral yucca
IRIDACEAE – IRIS FAMILY	
Sisyrinchium bellum	western blue-eyed grass
LILIACEAE – LILY FAMILY	
Calochortus splendens	splendid mariposa lily
Calochortus weedii var. *intermedius*	intermediate mariposa lily
POACEAE – GRASS FAMILY	
*Avena barbata**	slender wild oat
*Avena fatua**	wild oat
Bothriochloa barbinodis	cane bluestem
*Brachypodium distachyon**	purple false brome
*Bromus diandrus**	ripgut grass
*Bromus hordeaceus**	soft chess
Bromus madritensis ssp. *rubens**	red brome
*Cynodon dactylon**	bermuda grass
Elymus condensatus [*Leymus c.*]	giant wild rye
*Eragrostis cilianensis**	stink grass
Festuca myuros [*Vulpia m.* var. *myuros*]*	rattail fescue
*Lamarckia aurea**	goldentop
Melica imperfecta	little California melic grass
Muhlenbergia microsperma	littleseed muhly
*Pennisetum setaceum**	crimson fountain grass
Poa secunda	one-sided bluegrass, malpais bluegrass
*Schismus barbatus**	Mediterranean schismus

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
Stipa lepida [*Nassella l.*]	foothill needlegrass
Stipa miliacea [*Piptatherum miliacea*]*	smilo grass
Stipa pulchra [*Nassella p.*]	purple needlegrass
RUSCACEAE – BUTCHER'S-BROOM FAMILY	
Nolina cismontana	chaparral nolina
THEMIDACEAE – BRODIAEA FAMILY	
Bloomeria crocea	common goldenstar
Dichelostemma capitatum	blue dicks
* non-native to the region it was found	

A-2
WILDLIFE SPECIES OBSERVED DURING SURVEYS

Species	
REPTILES	
***LEPIDOSAURIA* – LIZARDS AND SNAKES**	
PHRYNOSOMATIDAE – ZEBRA-TAILED, FRINGE-TOED, SPINY, TREE, SIDE-BLOTCHED, AND HORNED LIZARDS	
Sceloporus occidentalis	western fence lizard
Uta stansburiana	side-blotched lizard
Phrynosoma blainvillii	Blainville's [coast] horned lizard
TEIIDAE – WHIPTAIL LIZARDS	
Aspidoscelis [*Cnemidophorus*] *hyperythra*	orange-throated whiptail
COLUBRIDAE – COLUBRID SNAKES	
Pituophis catenifer	gopher snake
BIRDS	
***AVES* – BIRDS**	
ODONTOPHORIDAE – QUAILS	
Callipepla californica	California quail
CATHARTIDAE – NEW WORLD VULTURES	
Cathartes aura	turkey vulture
ACCIPITRIDAE – HAWKS, KITES, EAGLES, AND ALLIES	
Buteo jamaicensis	red-tailed hawk
COLUMBIDAE – PIGEONS AND DOVES	
Zenaida macroura	mourning dove
CUCULIDAE – CUCKOOS AND ROADRUNNERS	
Geococcyx californianus	greater roadrunner
APODIDAE – SWIFTS	
Aeronautes saxatalis	white-throated swift
TROCHILIDAE – HUMMINGBIRDS	
Calypte anna	Anna's hummingbird
Selasphorus sasin	Allen's hummingbird
FALCONIDAE – FALCONS	
Falco sparverius	American kestrel
TYRANNIDAE – TYRANT FLYCATCHERS	
Sayornis nigricans	black phoebe
Tyrannus vociferans	Cassin's kingbird
CORVIDAE – CROWS AND JAYS	
Aphelocoma californica	western scrub-jay
Corvus brachyrhynchos	American crow
Corvus corax	common raven
HIRUNDINIDAE – SWALLOWS	
Tachycineta thalassina	violet-green swallow
Petrochelidon pyrrhonota	cliff swallow
AEGITHALIDAE – BUSHTITS	
Psaltriparus minimus	bushtit
TROGLODYTIDAE – WRENS	
Salpinctes obsoletus	rock wren
Thryomanes bewickii	Bewick's wren

A-2
WILDLIFE SPECIES OBSERVED DURING SURVEYS

Species	
POLIOPTILIDAE – GNATCATCHERS AND GNATWRENS	
Polioptila caerulea	blue-gray gnatcatcher
SYLVIIDAE – SYLVIID WARBLERS	
Chamaea fasciata	wrentit
TURDIDAE – THRUSHES AND ROBINS	
Sialia mexicana	western bluebird
MIMIDAE – THRASHERS	
Toxostoma redivivum	California thrasher
Mimus polyglottos	northern mockingbird
PTILOGONATIDAE – SILKY-FLYCATCHERS	
Phainopepla nitens	phainopepla
PARULIDAE – WARBLERS	
Setophaga [*Dendroica*] *nigrescens*	black-throated gray warbler
EMBERIZIDAE – SPARROWS AND JUNCOS	
Pipilo maculatus	spotted towhee
Melozone [*Pipilo*] *crissalis*	California towhee
Chondestes grammacus	lark sparrow
FRINGILLIDAE – FINCHES	
Haemorhous [*Carpodacus*] *mexicanus*	house finch
Spinus [*Carduelis*] *psaltria*	lesser goldfinch
Spinus [*Carduelis*] *tristis*	American goldfinch
MAMMALS	
***MAMMALIA* – MAMMALS**	
LEPORIDAE – HARES AND RABBITS	
Sylvilagus audubonii	desert cottontail
CANIDAE - DOGS, FOXES, AND WOLVES	
Canis latrans	coyote
* introduced species Note that this compendium only includes vertebrate species.	

ATTACHMENT B

SITE PHOTOGRAPHS

Overview of the project site from the north end facing south.

Mixed sage scrub (foreground) and southern mixed chaparral (background) in the southwestern corner of the property.

Patches of annual grassland and southern mixed chaparral in the northwestern corner of the property.

Southern coast live oak riparian forest in the southern portion of the property.

Disturbed access road and cliff/rock surrounded by mixed chaparral and mixed sage scrub in the northern portion of the property.

Spanish broom observed in the southwestern corner of the property.

Site Photographs

Attachment B

Measure M2 Acquisition Properties Evaluation – MacPherson Property

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BonTerra PSOMAS

Baseline Biological Surveys Technical Report for the Aliso Canyon Property

Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California

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October 2015

TABLE OF CONTENTS

Section **Page**

1.0 Introduction 1
1.1 Background 1
1.2 Project Location and Physical Environmental Setting 2
2.0 Survey Methods 6
2.1 Literature Review 6
2.2 Vegetation Mapping and General Surveys 6
2.3 Focused Biological Surveys 7
2.4 Jurisdictional Delineation 8
3.0 Existing Biological Resources 10
3.1 Vegetation Types and Other Areas 10
3.2 Wildlife Populations and Movement Patterns 13
3.3 Special Status Biological Resources 17
3.4 Covered Species Summary 45
4.0 References 49

TABLES

Table **Page**

1 Vegetation Types and Other Areas on the Aliso Canyon Property 10
2 Jurisdictional Resources on the Aliso Canyon Property 22
3 Special Status Plant Species Reported from the Property Vicinity 23
4 Catalina Mariposa Lily Populations Observed on the Aliso Canyon Property 33
5 Intermediate Mariposa Lily Populations Observed on the Aliso Canyon Property 34
6 Paniculate Tarplant Populations Observed on the Aliso Canyon Property 34
7 Many-stemmed Dudleya Populations Observed on the Aliso Canyon Property 35
8 Special Status Wildlife SPecies Reported from the Property Vicinity 37
9 Summary of Covered Species 46

EXHIBITS

Exhibit		**Follows Page**
1	Project Location	2
2	USGS 7.5-Minute Quadrangle	2
3	Soil Types	2
4	Regional Environmental Setting	2
5	Anthropogenic Features and Invasive Species	5
6	Vegetation Types and Other Areas	10
7	Jurisdictional Resources	21
8	Special Status Species	33

APPENDICES

A Plant and Wildlife Compendia
B Site Photographs

1.0 INTRODUCTION

This Biological Technical Report has been prepared to support California Environmental Quality Act (CEQA) documentation and resource management planning for the Measure M2 Freeway Environmental Mitigation Program (EMP) Acquisition Properties Evaluation Project. The EMP project originally included five separate Orange County Transportation Authority (OCTA) acquisition properties (Hayashi, Ferber Ranch, O'Neill Oaks, Hafen, and Saddle Creek South). Two additional acquisitions were made: the MacPherson property, located in unincorporated Orange County, and the Aliso Canyon property, located in the City of Laguna Beach, California. This report is limited to the Aliso Canyon property; separate reports were previously prepared for the other properties.

This information has been reported in accordance with accepted scientific and technical standards that are consistent with the requirements of the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW).

1.1 BACKGROUND

1.1.1 Project Description

In 2006, Orange County voters approved the renewal of Measure M, effectively extending the half-cent sales tax in the County from April 2011 to March 2041. Renewed Measure M (or Measure M2) will continue to provide funding for transportation projects and programs in the County, including select freeway and roadway improvements, transit programs, and two environmental programs.

The OCTA's M2 Freeway EMP provides comprehensive mitigation measures to offset the environmental impacts of the 13 Measure M2-funded freeway projects. The EMP is spearheaded by the Environmental Oversight Committee (EOC), which is made up of OCTA Board members and representatives from the California Department of Transportation (Caltrans), resource agencies, environmental groups, and the public.

Instead of mitigating the natural resource impacts of Measure M2 freeway projects on a project-by-project basis, the EMP presents a comprehensive mitigation approach that not only replaces habitat, but also provides the opportunity to improve the overall functions and values of sensitive biological resources throughout Orange County. Working collaboratively with the resource and regulatory agencies, the OCTA ultimately decided that creation of a Natural Community Conservation Plan (NCCP)/Habitat Conservation Plan (HCP) and a programmatic wetland permitting program would best serve as the EMP's main implementation tools.

As one of the key components of the conservation strategy for the NCCP/HCP and wetlands permitting, the OCTA has undertaken a systematic approach to identifying and acquiring habitat preserves to meet the goals and objectives of the NCCP/HCP and wetland mitigation programs. A formal conservation assessment was completed by Conservation Biology Institute (CBI) for Orange County, which resulted in the identification of Priority Conservation Areas (PCAs); these included candidate parcels and properties that could be considered for habitat and wildlife conservation purposes. The OCTA solicited willing sellers and evaluated each property using standardized criteria and a prioritization process to rank properties for purchase. Properties for acquisition were selected based on conservation values, policy considerations, mitigation credits, mitigation plan review, and adoption and real estate value/economics.

The Aliso Canyon property was selected and acquired on April 22, 2015. Baseline biological surveys were completed in 2015 with the following purposes:

- A general biological assessment was completed to establish the baseline biological value of the property and to identify any biological threats that have the potential to reduce the long-term biological value. In addition, information on the overall condition of the property will guide the development of a site-specific Resource Management Plan (RMP).
- Comprehensive surveys of vegetation types were completed to provide detailed knowledge of the natural habitat and a quantification of habitat type credits on the property.
- Focused surveys for OCTA M2 NCCP/HCP Covered Species and their habitats were completed to establish a baseline of the property's status and conditions. Results of future biological monitoring will be compared to the baseline results to evaluate habitat and Covered Species trends.

1.2 PROJECT LOCATION AND PHYSICAL ENVIRONMENTAL SETTING

1.2.1 Property Location and Physical Condition

The approximate 150-acre Aliso Canyon property is located east of Pacific Coast Highway in the City of Laguna Beach in Orange County (Exhibit 1). The northwestern edge of the property is adjacent to residential development along Barracuda Way and Loretta Drive, while the southeastern edge of the property is adjacent to the Aliso Creek Inn and Golf Course. The northern and eastern boundaries abut open space in Aliso and Wood Canyons Wilderness Park. The property is located on the U.S. Geological Survey's (USGS') Laguna Beach and San Juan Capistrano 7.5-minute topographic quadrangle maps in Sections 31 and 32 of Township 7 South, Range 8 West (Exhibit 2).

Topography on the property is hilly, with the main ridgeline running through the middle of the property and canyons draining steep slopes to either side. Elevations range from approximately 40 feet above mean sea level (msl) at the southeastern edge of the property to 840 feet above msl at the northwestern edge. Two unnamed blueline streams occur in the northwestern portion of the property, with smaller drainage features present in the canyon bottoms. Soil types mapped on the property consist of Alo clay (25 to 30 and 30 to 50 percent slopes), Capistrano sandy loam (2 to 9 percent slopes), Chesterton loamy sand (2 to 15 and 15 to 30 percent slopes), Cieneba sandy loam (15 to 30 and 30 to 75 percent slopes, eroded), Cieneba-Rock outcrop complex (30 to 75 percent slopes), Soper loam (30 to 50 percent slopes), and Soper gravelly loam (15 to 30 and 30 to 50 percent slopes) (Exhibit 3).

1.2.2 Regional Environmental Setting

The Aliso Canyon property is located in the steep, coastal hills of South Laguna (Exhibit 4). It is the most coastal of the acquisition properties. The property is part of the "Laguna Greenbelt", which encompasses 10,000 acres of largely undeveloped land surrounding the City. The City of Laguna Beach considers Hobo Canyon, particularly its surrounding ridges, including the Moulton Meadows marine terrace and the continuous south-facing slope of Aliso Canyon down to the golf course, to be the single-most significant habitat block in Laguna (Laguna Beach 2006).

Predominant topographic features of the area are Hobo Canyon and its flanking ridges and the south-facing slopes above Aliso Canyon, which is located just east of the property. These canyons are part of the 498-square-mile Aliso-San Onofre Watershed. The upper reaches of

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Project Location

Exhibit 1

Measure M2 Acquisition Properties Evaluation - Aliso Canyon Property

N W E S

1,000 500 0 1,000 Feet

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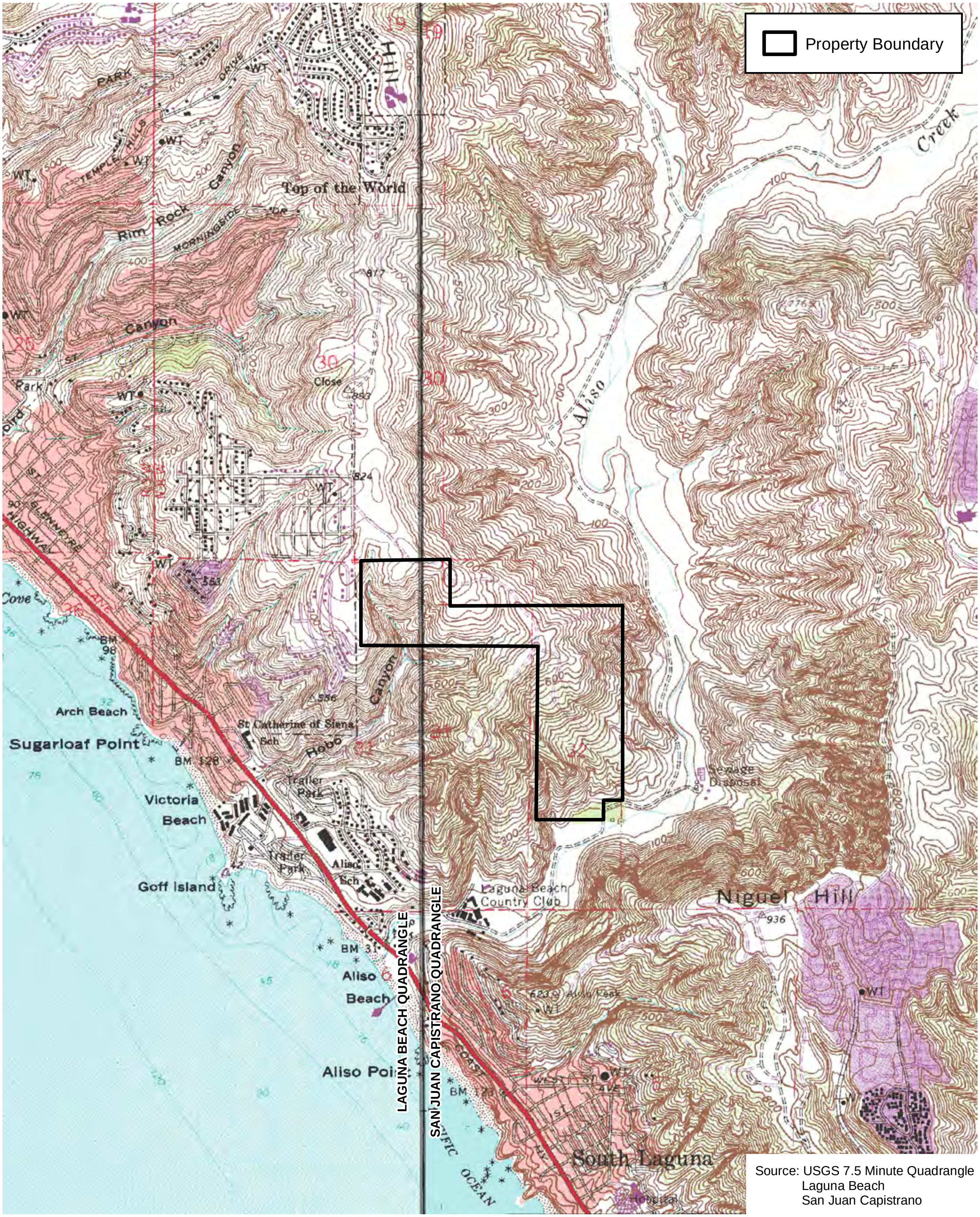

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USGS 7.5-Minute Quadrangle

Exhibit 2

Measure M2 Acquisition Properties Evaluation - Aliso Canyon Property

N W E S

2,000 1,000 0 2,000

Feet

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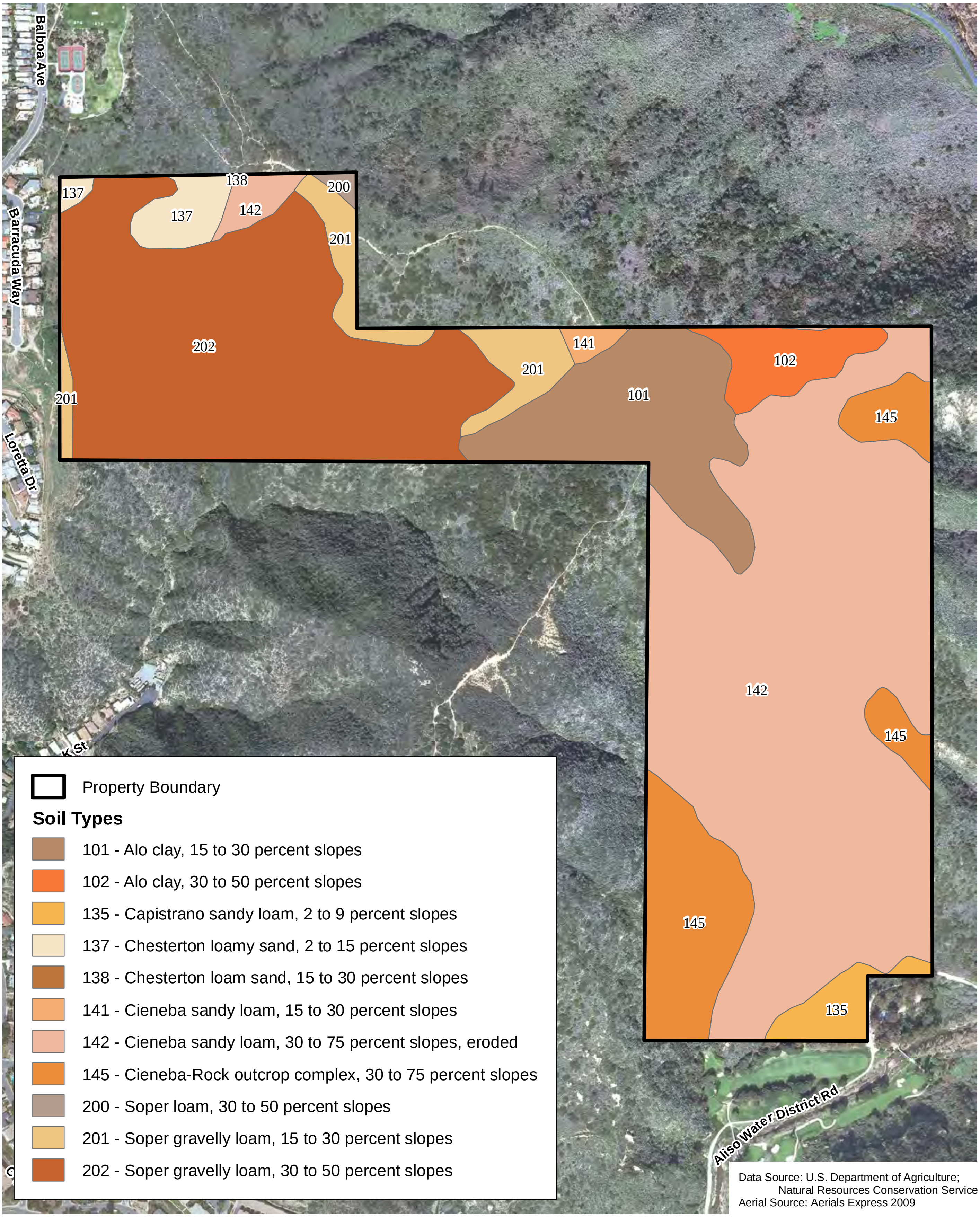

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Soil Types

Exhibit 3

Measure M2 Acquisition Properties Evaluation - Aliso Canyon Property

N W E S

600 300 0 600 Feet

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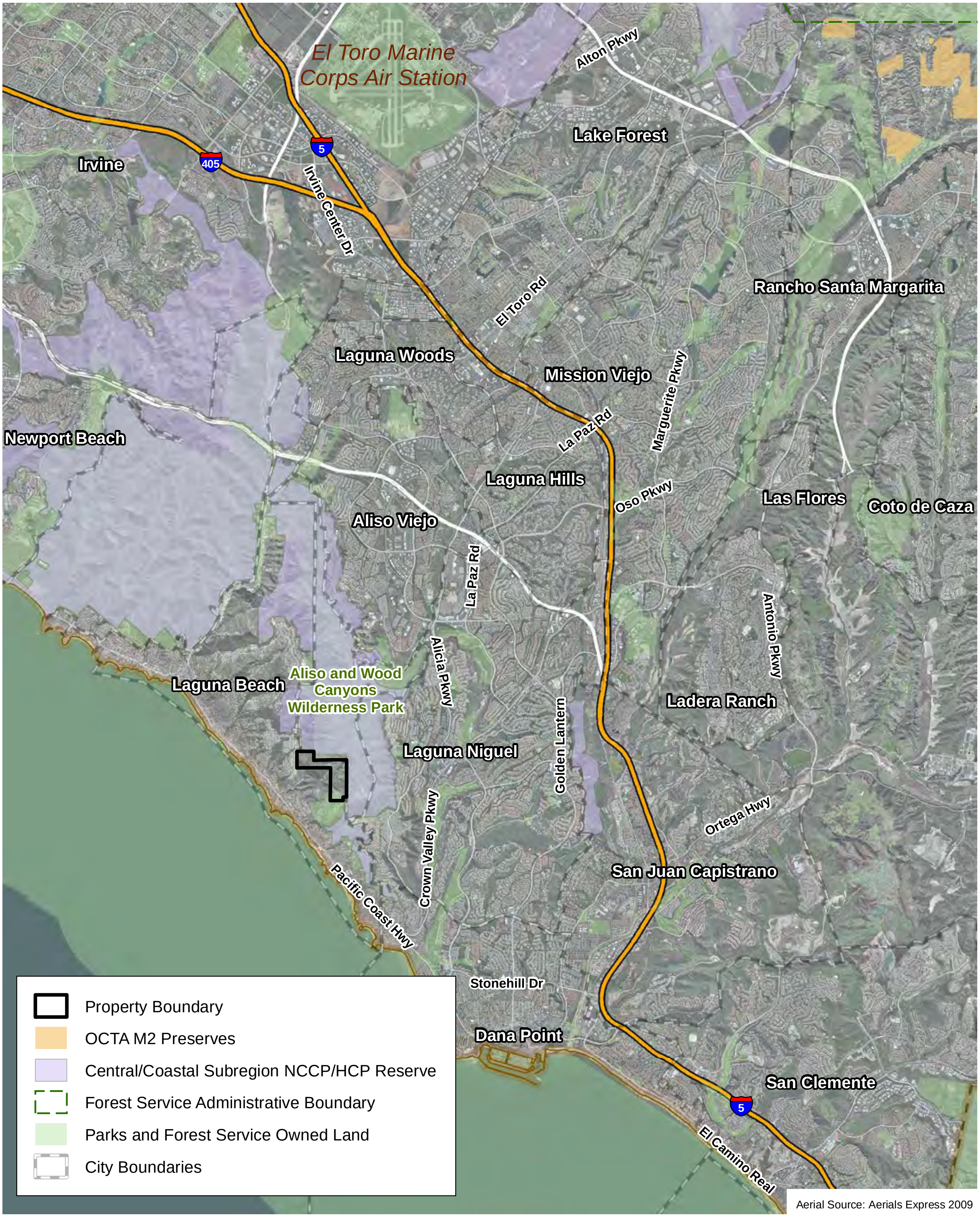

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Regional Environmental Setting

Exhibit 4

Measure M2 Acquisition Properties Evaluation - Aliso Canyon Property

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Hobo Canyon are mapped by the National Wetlands Inventory as temporarily flooded Riverine and Palustrine wetlands (USFWS 2006). The property is within the Orange County Central-Coastal Subregion NCCP/HCP; the northern and eastern property boundaries abut the NCCP/HCP reserve.

1.2.3 <u>Fire History</u>

There are various hypotheses regarding the fire history of Southern California, what constitutes a “natural” fire regime, and the role of fire for chaparral plant species. Traditionally, the fire season in Southern California is from May through September (OCFA 2007). In the past, fires were started by lightning and typically moved down slopes due to falling brands and coals. According to one school of thought, fires only occasionally formed the hot runs on steep slopes that are typical of today’s fires, and large, intense fires were uncommon (Howard 1992). This fire regime resulted in a mosaic of numerous small burns. New fires were limited by recently burned regions with very little fuel; dead wood and other fuels could not accumulate for long. However, an opposing hypothesis is that large, high-intensity chaparral fires were regular occurrences in the 19th century, often driven by severe weather that involved high temperatures, low humidity, and high winds (Keeley and Zedler 2009).

Mediterranean shrub communities, including those types found on the property, are resilient to infrequent wildfires and historically burned at a frequency of every 30 to 150 years (Halsey 2005). Many plant species associated with chaparral and scrub communities exhibit characteristics that constitute adaptations to fire. A new fire will typically burn hot and high into the canopy, killing much of the aboveground biomass. These canopy fires facilitate seed establishment by removing shrub cover and eliminating competing species. In the first few years after a fire, herbs and herbaceous shrubs—such as deerweed (*Acmispon glaber*), lupines (*Lupinus* spp.), paintbrushes (*Castilleja* spp.), and phacelias (*Phacelia* spp.)—are abundant. Because chaparral fires burn nitrogenous compounds in plant tissues and detritus, there is a large loss of nitrogen from the ecosystem. This allows species equipped with nitrogen-fixing bacteria to grow quickly after a fire.

While herbaceous species are establishing, the previously dominant chaparral species are also returning. Many chaparral species rely on fire to release and germinate seeds. Others resprout from roots or buds at the base of the stem. As the shrub canopy closes, whether due to resprouting of individuals burned by the fire or due to seedling growth, these herbaceous species decrease in abundance.

Although fires are a natural part of chaparral and scrub communities, both unnatural increases and decreases in fire frequency can have a negative impact. Now, nearly all wildfires are started by humans, either through arson or accidents (Schoenherr 1992). While the fire season traditionally occurred from May through September, in the past 15 years, Orange County has experienced its most devastating wildfires from October through April (OCFA 2008). Drought conditions contribute to an increase in dead fuels, drier and more explosive fuels, and more intense fire behavior. In addition, sustained Santa Ana Winds increase the speed of fire and magnify the effects on the available fuel bed. Santa Ana Winds are strong, warm, and dry and flow down into the valleys when stable; during these conditions, high-pressure air is forced across and then down the lee-side slopes of a mountain range. The descending air is warmed and dried, which produces critical fire weather conditions.

Anthropogenic increases in fire frequency can change the natural resilience of native communities. With a high frequency of fires, plants may not store enough energy between fires to resprout from roots or buds. In general, when an area burns too often for the community to mature, native plants may not be able to maintain dominance, often resulting in a habitat type conversion. Ruderal species, including annual grasses and invasive forbs, often thrive in post-fire conditions. As a result, fires often promote the spread of non-native species into native habitats. In turn, this high degree of non-native grass and forb cover can lead to more frequent fire return intervals (e.g., intervals of less than eight years have been reported) (Minnich and Dezzani 1998).

A decrease in fire frequency may also hinder reproduction of fire-adapted species. In the past, government agencies tried to prevent and stop the spread of wildfires through a policy of fire suppression. These efforts were found to be unsuccessful, and they occasionally resulted in larger and more catastrophic fires. While they are less frequent, unnaturally large fires may burn so hot and intense that the canopy, roots, and even the seeds of fire-adapted plants are destroyed. Habitat type conversion may occur in scrub and chaparral communities where fire suppression allows oaks to increase in density (McCreary 2004). When fire is not allowed to regenerate the understory of oak savannahs, the shrub component increases and more severe, crown-consuming fires may result.

Over the past 60 years, Orange County has experienced a number of major (i.e., burned greater than 2,000 acres, burned for an extended period or time, and/or resulted in extraordinary property loss) wildland fires, including 20 that burned over 2,000 acres (OCFA 2008). However, no significant fire has been reported in Aliso and Wood Canyons Wilderness Park according to the California Department of Forestry and Fire Protection (CAL FIRE).

1.2.4 Climate

Southern California experiences a Mediterranean climate characterized by mild, rainy winters and hot, dry summers. There can also be dramatic differences in rainfall from year to year. Consequently, the vegetation types in the Southern California area consist of drought-tolerant, woody shrubs and trees and annual, fall/winter-sprouting grasses.

The temperature in Southern California is moderated by the coastal influence of the Pacific Ocean, which creates mild conditions throughout most of the year. The stable atmosphere creates cloudless conditions, producing dry summers and a subtropical climate with many days of sunshine (Ritter 2006). The most distinguishing characteristic of a Mediterranean climate is its seasonal precipitation. In Southern California, precipitation is characterized by brief, intense storms generally between November and March. It is not unusual for a majority of the annual precipitation to fall during a few storms over a close span of time. Rainfall patterns are subject to extreme variations from year to year and longer-term wet and dry cycles.

In the region, the average daily temperature in the summer[1] is approximately 69 degrees Fahrenheit (°F). The average daily temperature in the winter is approximately 56°F. The region receives an average of 13.8 inches of rain per year; the majority of this rain falls in the winter months, which receive an average of 8.5 inches; summer rain is approximately 0.20 inch (WRCC 2015).

1.2.5 Anthropogenic Uses of the Property

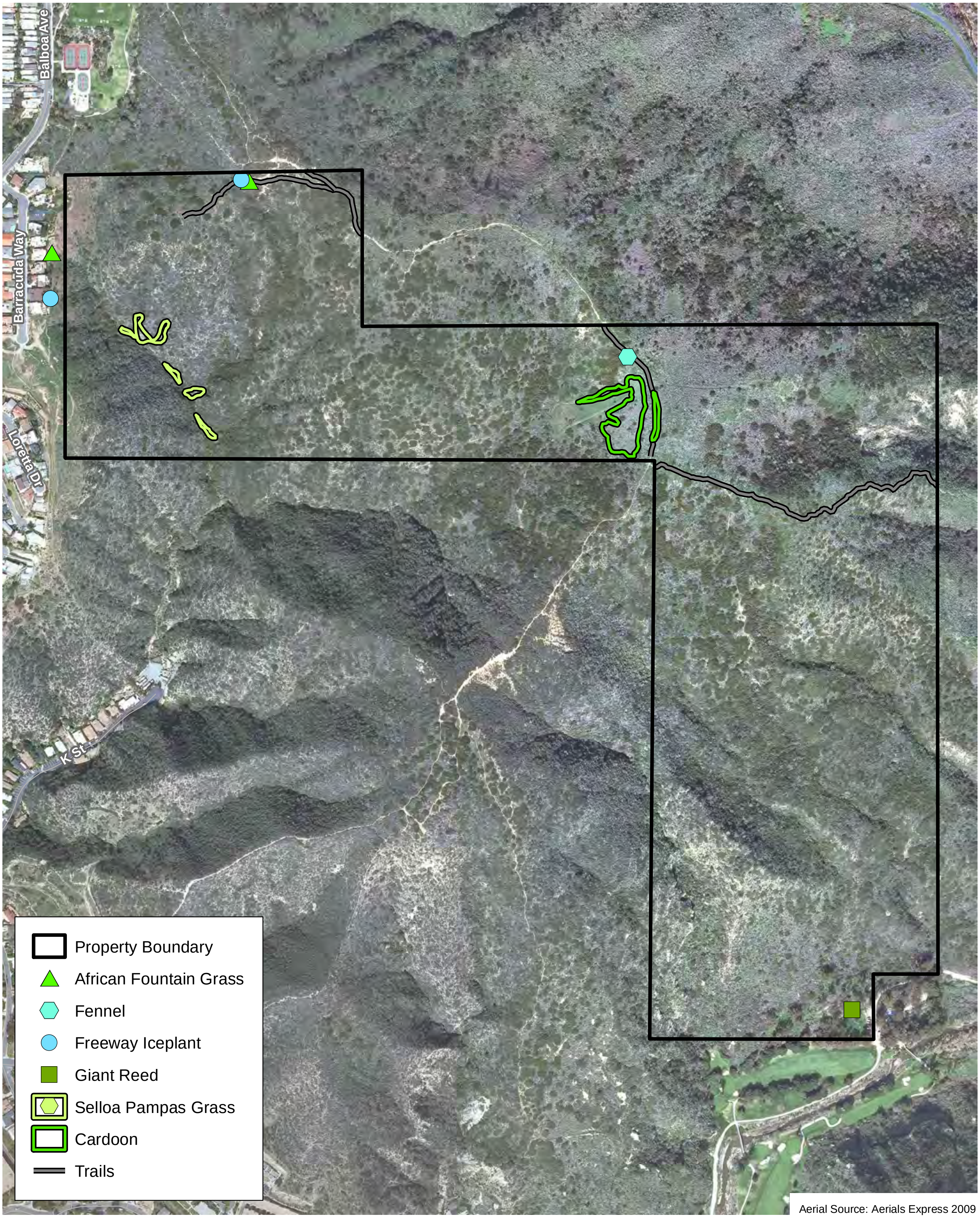
The Tongva Native Americans originally inhabited the Aliso Creek and Laguna Lakes area (LBHS 2015). Juan Rodriguez Cabrillo arrived in 1542, but the land did not undergo significant change until the establishment of the California missions by Junipero Serra and a ranching culture. According to the City of Laguna Beach General Plan Open Space/Conservation Element (Laguna Beach 2006), the city was one of the only coastal Southern California areas excluded from the Mexican land grants of the 1840s, which resulted in it being subject to

[1] Seasons are climatological; winter is considered to be December, January and February, and summer is considered to be June, July, and August.

homestead claims in the 1880s. In the late 1880s and early 1900s, it became popular as a vacation and resort town, and much of the flatter property was subdivided. Development in the late 1950s and mid-1960s primarily occurred in the more accessible ridgelines, hilltops, and hillsides.

A review of historic aerial photographs of the property shows that, in general, vegetation communities have not significantly altered since 1939. The residential development at the northern end of the property is in the process of being built in aerial photographs from 1967. Structures in Aliso Canyon at the southern end of the property are evident in 1963 aerials. Buildings or otherwise significant structures are not identified in the historic aerials on the property.

Anthropogenic features on the property are shown on Exhibit 5. The property is currently used by hikers and mountain bikers; the trails on the property are included in the trail network of the *Laguna Beach General Plan* Open Space/Conservation Element as “trails on private property” (Laguna Beach 2006). Relatively little trash (e.g., cans, bottles, golf balls) was observed during the surveys. Evidence of grazing is not present on this property.



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Anthropogenic Features and Invasive Species

Exhibit 5

Measure M2 Acquisition Properties Evaluation - Aliso Canyon Property

N W E S

600 300 0 600

Feet

BonTerra PSOMAS

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2.0 SURVEY METHODS

This section describes the methods used to conduct the literature review; perform general biological surveys, vegetation mapping, focused biological surveys, and a jurisdictional delineation; and assess the property's potential to support special status species. A cumulative list of all plant and wildlife species observed on the property is included as Appendices A-1 and A-2, respectively. Photographs of the property are included as Appendix B.

2.1 LITERATURE REVIEW

BonTerra Psomas conducted a literature search to identify special status plants, wildlife, and habitats reported to occur in the vicinity of the Aliso Canyon property. This search included a review of the USGS' Laguna Beach and San Juan Capistrano 7.5-minute quadrangles in the California Native Plant Society's (CNPS') Locational Inventory of Rare and Endangered Vascular Plants of California (CNPS 2015a) and the CDFW's California Natural Diversity Database (CNDDB) (CDFW 2015a). The *City of Laguna Beach General Plan* was reviewed for species of local concern reported from Hobo and Aliso Canyons. In addition, a species list was obtained from the USFWS' Information, Planning, and Conservation System (IPaC) for the property.

2.2 VEGETATION MAPPING AND GENERAL SURVEYS

BonTerra Psomas Senior Biologist Allison Rudalevige and Biologist Jonathan Aguayo conducted a general survey to describe and map the vegetation types on the property on March 25, 2015; Ms. Rudalevige refined the vegetation mapping for the southern end of the site on April 9, 2015. Nomenclature for vegetation types follows *A Manual of California Vegetation* (Sawyer et al. 2009) for recognized Alliances or Associations.[2] Vegetation was mapped in the field on an aerial photograph at a scale of 1 inch equals 300 feet (1″=300′).

The general surveys included an evaluation of the property's potential to support special status plant and wildlife species, with special focus on M2 NCCP/HCP Covered Species. Covered Species include intermediate mariposa lily (*Calochortus weedii* var. *intermedius*), southern tarplant (*Centromadia parryi* ssp. *australis* [*Hemizonia p.* ssp. *a.*]), many-stemmed dudleya (*Dudleya multicaulis*), arroyo chub (*Gila orcutti*), Blainville's [coast] horned lizard (*Phrynosoma blainvillii*), orange-throated whiptail (*Aspidoscelis hyperythra* [*Cnemidophorus h.*]), Pacific [western] pond turtle (*Actinemys marmorata* [*Emys m.*]), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), coastal cactus wren (*Campylorhynchus brunneicapillus sandiegensis*), coastal California gnatcatcher (*Polioptila californica californica*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor* [*Felis c.*]). Suitable habitat and/or observed individuals were documented in field notes and with global positioning system (GPS) units, and a CNDDB form was filled out for each occurrence.

During field surveys, natural or physical resources and opportunities were identified (mapped and included in field notes) that "preserve, restore and enhance aquatic, riparian and terrestrial natural communities and ecosystems that support Covered Species" (OCTA 2010). Resources that provide valuable enhancement, restoration, or preservation opportunities were mapped and documented in field notes, such as significant stands of non-native species requiring eradication/control; presence of rock outcroppings that provide niche areas for unusual plants, bats, ringtails (*Bassariscus astutus*), or other species; nesting cavities; large mammal burrows;

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[2] Alliance is "a classification unit of vegetation, containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover". Association is "a vegetation classification unit defined by a diagnostic species, a characteristic range of species composition, physiognomy, and distinctive habitat conditions" (Sawyer et al. 2009).

avian rookeries/roosts; and dens. This may include significant stands of invasive plant species based on the California Invasive Plant Council (Cal-IPC) Inventory. Anthropogenic influences/structures on the property (e.g., paved and unpaved roads, trails, cell towers, water towers, abandoned vehicles, and/or "dumped" trash or debris) were also documented. GPS devices were utilized for recording all point locations.

Plant species were identified in the field or collected for subsequent identification using keys in Baldwin et al. (2012), Hickman (1993), and Munz (1974). Taxonomy follows the Jepson eFlora (Jepson Herbarium 2014); where the Jepson eFlora does not recognize a taxon, naming conforms to Baldwin et al. (2012), Hickman (1993), or current scientific data (e.g., scientific journals) for scientific and common names. Active searches for reptiles and amphibians included lifting, overturning, and carefully replacing rocks and debris. Birds were identified by visual and auditory recognition. Surveys for mammals were conducted during the day and included searching for and identifying diagnostic sign including scat, footprints, burrows, and trails. Taxonomy and nomenclature for wildlife generally follows Crother (2012) for amphibians and reptiles, the American Ornithologists' Union (AOU 2013) for birds, and the Smithsonian National Museum of Natural History (SNMNH 2011) for mammals. All species observed were recorded in field notes and are included in Appendices A-1 and A-2.

2.3 FOCUSED BIOLOGICAL SURVEYS

Focused biological surveys were conducted in 2015 for special status plant species and the coastal California gnatcatcher. Surveys were conducted in suitable habitat based on the Senior Biologists' best professional judgment.

2.3.1 Special Status Plant Species

Special status plant surveys were floristic in nature and were conducted following the *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFG 2009). Target species included the following Covered Species: intermediate mariposa lily (*Calochortus weedii* var. *intermedius*) and many-stemmed dudleya (*Dudleya multicaulis*).

Rainfall received in the winter and spring determines the germination of many annual and perennial herb species. The region received approximately 4.4 inches of precipitation between March 1, 2014, and February 28, 2015 (data taken from Laguna Beach Station No. 044647) (WRCC 2015). The average annual precipitation for this area is approximately 12.1 inches. In years of low or unusual rainfall patterns, monitoring of reference populations is important in order to ensure that the surveys were comprehensive. Prior to conducting the field surveys, accessible reference populations of target species known in the Orange County area were monitored to ensure that the scheduled surveys were comprehensive and conducted during the appropriate blooming period for these species. Many-stemmed dudleya was confirmed blooming at the University of California, Irvine, Ecological Reserve on March 24, 2014, and intermediate mariposa lily was confirmed blooming in Bee Canyon on May 14, 2015. Rainfall throughout the region was below average for the year. Although reference populations and regional rainfall amounts were monitored to ensure the scientific adequacy of these focused surveys, there is always a minimal potential for false negative survey results, as species could possibly be present on a site but may not be detectable at the time of the surveys.

The survey area for special status plant species consisted of the entire property. Botanical data were collected concurrent with vegetation mapping on March 25, 2015; additional surveys were conducted on May 20, 2015, by Ms. Rudalevige and field assistant Matheson Lowe, and on June 7, 2015, by Ms. Rudalevige. Systematic walking surveys were conducted in all areas of suitable special status plant habitat (e.g., sage scrub, openings in chaparral, ridgelines, canyon bottoms); binoculars were used to search for plants in areas considered inaccessible due to steep terrain or high shrub density. The habitat preferences of target species (see Table 8, below) were compared to the resources on site (e.g., community associations, soil, slope, shade) to determine which portions of the property represented suitable habitat. All plant species observed were recorded in field notes. Plant species were identified in the field or collected for later identification. Plants were identified to the taxonomic level necessary to determine whether or not they are a special status species using taxonomic keys, descriptions, and illustrations in Baldwin et al. (2012), Hickman (1993), and Munz (1974). Taxonomy and nomenclature follow the CNPS (2015b) for special status species and the Jepson eFlora (Jepson Herbarium 2014) for other species. Any voucher specimens collected would be deposited at the herbarium at Rancho Santa Ana Botanic Gardens in Claremont, California.

2.3.2 Coastal California Gnatcatcher

Surveys for the coastal California gnatcatcher were conducted in accordance with the guidelines issued by the USFWS for areas participating in an NCCP/HCP (USFWS 1997). These guidelines stipulate that three surveys must be conducted in suitable habitats with at least one week between site visits; the surveys can be conducted year-round. All visits must take place during the morning hours, and no more than 100 acres of suitable habitat may be surveyed per visit.

CDFW Environmental Scientist Christine Beck (USFWS Permit No. TE-15544A-2) and OCTA Biologist Lesley Hill conducted all coastal California gnatcatcher surveys on the Aliso Canyon property. Surveys were conducted on May 13, May 20, and June 20, 2015, between the hours of 6:00 AM and 10:30 AM in appropriate weather conditions (i.e., temperature averaged 65°F with a slight wind and 100 percent cloud cover). Surveys were conducted by slowly walking through all appropriate habitats, including the scrub and mixed scrub vegetation; approximately 75 acres was surveyed during each field visit. Surveys in the southern portion of the property were discontinued after the first visit determined that the steep habitat and dense chaparral vegetation were not suitable for the gnatcatcher. Recordings of coastal California gnatcatcher vocalizations were used to attempt to elicit responses for any gnatcatchers that might be present when gnatcatchers were not observed in suitable habitat after waiting/searching for approximately 10 to 15 minutes. All bird species detected during the survey were recorded.

2.4 JURISDICTIONAL DELINEATION

Drainages and waterbodies, which may include wetlands and other “waters of the U.S.”, are protected under Section 404 of the Clean Water Act (CWA) and are under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Non-wetland “waters of the U.S.” are delineated based on the limits of the Ordinary High Water Mark (OHWM), which can be determined by a number of factors including erosion, the deposition of vegetation or debris, and changes in vegetation. The OHWM limits (i.e., active floodplain) occurring on the property were further verified using methodologies contained in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States*, *A Delineation Manual* (Lichvar and McColley 2008), and in *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) In the Arid West Region of the Western United States* (Curtis and Lichvar 2010).

In September 2008, the USACE issued the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008). This regional supplement is designed for use with the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Both the 1987 Wetlands Manual and the Arid West Supplement to the manual provide technical methods and guidelines for determining the presence of wetland “waters of the U.S.”. A three-parameter approach is used to identify wetlands and requires evidence of wetland hydrology, hydrophytic vegetation, and hydric soils. Wetlands generally include swamps, marshes, bogs, and similar areas. In order to be considered a wetland, an area must exhibit at least minimal hydric characteristics within the three parameters. However, problem areas may periodically or permanently lack certain indicators due to seasonal or annual variability of the nature of the soils or plant species on site. Atypical wetlands lack certain indicators due to recent human activities or natural events. Guidance for determining the presence of wetlands in these situations is presented in the regional supplement.

Section 401 of the CWA provides the Regional Water Quality Control Board (RWQCB) with the authority to regulate, through a Water Quality Certification, any proposed, federally permitted activity that may affect water quality. It should be noted that the RWQCB shares USACE jurisdiction unless isolated conditions are present. If isolated waters conditions are present, the RWQCB takes jurisdiction using the USACE's definition of the OHWM and/or the three-parameter wetlands methods pursuant to the 1987 Wetlands Manual.

The CDFW has jurisdictional authority over wetland resources associated with rivers, streams, and lakes pursuant to *California Fish and Game Code* Sections 1600 through 1616. The CDFW's jurisdiction is defined as the top of the bank to the top of the bank of the stream, channel, or basin or to the outer limit of riparian vegetation located within or immediately adjacent to the river, stream, creek, pond, or lake or other impoundment.

Waters in the "coastal zone" are regulated by the California Coastal Commission (CCC). Wetlands under Section 30121 of the Coastal Act are defined as "lands within the coastal zone which may be covered periodically or permanently with shallow water and includes salt marshes, freshwater marshes, open and closed brackish water marshes, swamps, mudflats, and fens". The wetland boundary is based on a "one parameter" definition determined by at least one of the following: hydrology, hydric soils, and hydrophytic vegetation. The CCC approved the City of Laguna Beach's Local Coastal Program in 1993; however, the Hobo Canyon Area of Deferred Certification is currently uncertified.

The jurisdictional delineation was conducted by Ms. Rudalevige and Psomas Biologist Tanessa Hartwig on July 7, 2015, to describe and map the extent of resources under the jurisdiction of the USACE, the RWQCB, and the CDFW. Jurisdictional features were delineated on a 1 inch equlas 300 feet (1"=300') scale aerial photograph either as a drainage centerline with corresponding width measurements or, for riparian vegetation canopy clearly visible on aerial imagry, as a polygon. Inaccessible areas were mapped remotely.

3.0 EXISTING BIOLOGICAL RESOURCES

This section describes the biological resources that occur or potentially occur on the Aliso Canyon property. Vegetation types, wildlife populations and movement patterns, and special status biological resources are discussed below.

3.1 VEGETATION TYPES AND OTHER AREAS

Fourteen vegetation types and other areas occur on the Aliso Canyon property, as shown in Table 1 and Exhibit 6. Descriptions of these vegetation types are provided below. Note that classification follows Gray and Bramlet (1992), which is a regional classification system for Orange County, and these names are grouped according to the general vegetation types used in the NCCP/HCP (i.e., chaparral, scrub, grassland, barren, and developed/non-native). In the vegetation descriptions below, each vegetation type is also cross-walked to *A Manual of California Vegetation* (Sawyer et al. 2009), which is commonly used by the resource agencies.

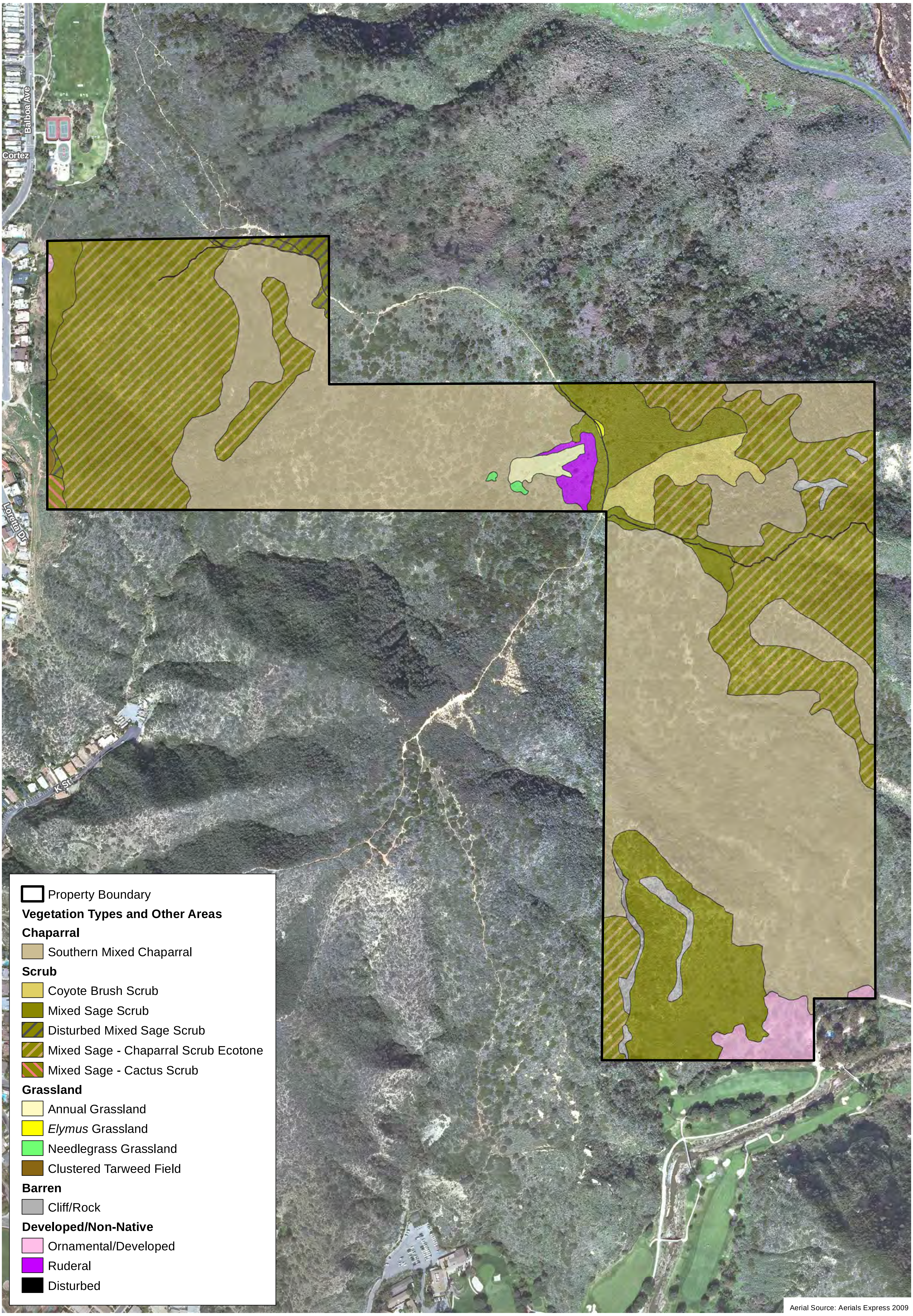
TABLE 1
VEGETATION TYPES AND OTHER AREAS ON THE ALISO CANYON PROPERTY

General Vegetation Types	Vegetation Types and Other Areas	Amount on Property (Acres)
Chaparral	southern mixed chaparral	78.18
	Chaparral Subtotal	*78.18*
Scrub	coyote brush scrub	2.79
	mixed sage scrub	17.77
	disturbed mixed sage scrub	1.25
	mixed sage–chaparral scrub ecotone	44.59
	mixed sage–cactus scrub	0.29
	Scrub Subtotal	*66.69*
Grassland	annual grassland	0.79
	Elymus grassland	0.05
	needlegrass grassland	0.11
	clustered tarweed field	0.09
	Grassland Subtotal	*1.04*
Barren	cliff/rock	1.56
	Barren Subtotal	*1.56*
Developed/Non-Native	ornamental/developed	2.43
	ruderal	1.00
	disturbed	0.24
	Developed/Non-Native Subtotal	*3.67*
	Total Acreage	***151.14***

Chaparral

Southern Mixed Chaparral

A total of 78.18 acres of southern mixed chaparral occurs on slopes throughout the property and is the predominant vegetation. This vegetation type is dominated by large, evergreen shrubs such as lemonade berry (*Rhus integrifolia*), laurel sumac (*Malosma laurina*), and spiny redberry



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Vegetation Types and Other Areas

Exhibit 6

Measure M2 Acquisition Properties Evaluation - Aliso Canyon Property

N W E S

425 212.5 0 425
Feet

BonTerra PSOMAS

(Rev: 09-22-2015 LEW) R:\Projects\OCT_OCTA\J008.01\Graphics\Aliso_Cyn\BioTech\Ex6_Veg_20150921.pdf

(*Rhamnus crocea*); vegetative cover is generally very dense. Scattered sage scrub species, such as California sagebrush (*Artemisia californica*), black sage (*Salvia mellifera*), and coastal prickly pear (*Opuntia littoralis*) are also present. Understory species, where present, include needlegrass (*Stipa* sp.), blue dicks (*Dichelostemma capitatum*), and splendid mariposa lily (*Calochortus splendens*). This vegetation type most closely corresponds to a mix of the *Rhus integrifolia* Shrubland Association and *Malosma laurina* Shrubland Association in Sawyer et al. (2009).

Scrub

<u>Coyote Brush Scrub</u>

A total of 2.79 acres of coyote brush scrub occurs on a southeastern-facing slope near the center of the property. This vegetation type is dominated by coyote brush (*Baccharis pilularis*) with California sagebrush and bush monkeyflower (*Mimulus aurantiacus*) also present. Giant wildrye (*Elymus condensatus*) and cardoon (*Cynara cardunculus*) are present at the top of the slope. This vegetation type most closely corresponds to the *Baccharis pilularis–Artemisia californica* Shrubland Association in Sawyer et al. (2009).

Mixed Sage Scrub

A total of 17.77 acres of mixed sage scrub occurs on slopes throughout the property. This vegetation type is dominated by species such as black sage, California buckwheat (*Eriogonum fasciculatum*), and California sagebrush. Some areas have scattered lemonadeberry and laurel sumac. In some places, the shrub cover is dense while other areas are more open. This vegetation type most closely corresponds to a mix of the *Artemisia californica* Shrubland Association and the *Eriogonum fasciculatum–Salvia mellifera* Shrubland Association in Sawyer et al. (2009).

<u>Disturbed Mixed Sage Scrub</u>

A total of 1.25 acres of disturbed mixed sage scrub occurs along the northern edge of the property. This area has a similar species composition of mixed sage scrub, but has encroaching non-native species such as freeway iceplant (*Carpobrotus edulis*) and Selloa pampas grass (*Cortaderia selloana*). This area is also disturbed by foot-traffic and off-road bicycle use. This vegetation type most closely corresponds to a mix of the *Artemisia californica* Shrubland Association, the *Eriogonum fasciculatum–Salvia mellifera* Shrubland Association, and the *Carpobrotus edulis* Semi-natural Herbaceous Stand in Sawyer et al. (2009).

<u>Mixed Sage–Chaparral Scrub Ecotone</u>

A total of 44.59 acres of mixed sage–chaparral scrub ecotone generally occurs on slopes between the southern mixed chaparral and mixed sage scrub. This vegetation type represents a transition between the two communities instead of an abrupt change in vegetation. It contains a mix of both chaparral and sage scrub species.

<u>Mixed Sage–Cactus Scrub</u>

A total of 0.29 acre of mixed sage–cactus scrub occurs along the ridgeline at the western end of the property. This vegetation type consists of a mix of sage scrub species, such as California sagebrush and California buckwheat, with large patches of coastal prickly pear. There is a discontinuous shrub canopy with bare ground between the shrubs. This vegetation type most closely corresponds to the *Opuntia littoralis*–Mixed Coastal Sage Scrub Association in Sawyer et al. (2009).

Grassland

Annual Grassland

A total of 0.79 acre of annual grassland occurs as a large patch on a western-facing slope in the center of the property. This vegetation type is dominated by wild oat (*Avena fatua*). Towards the bottom of the slope there is an increasing density of native species, such as western blue-eyed-grass (*Sisyrinchium bellum*), blue dicks, needlegrass (*Stipa* sp.), and Catalina mariposa lily (*Calochortus catalinae*). This vegetation type most closely corresponds to the *Avena fatua* Semi-Natural Herbaceous Stand in Sawyer et al. (2009).

Elymus Grassland

A total of 0.05 acre of Elymus grassland occurs on the ridgeline in the center of the property on either side of the trail. This vegetation type is dominated by giant wild rye. California sagebrush is present along the edge of this patch, and non-native grasses grow below the giant wild rye. This vegetation type most closely corresponds to the *Leymus condensatus* Herbaceous Association in Sawyer et al. (2009).

Needlegrass Grassland

A total of 0.11 acre of needlegrass grassland occurs at the bottom of a western-facing slope below the annual grassland. While the dominant species is soft chess (*Bromus hordeaceus*), this vegetation type is characterized by native needlegrass at approximately 15 percent cover. Other species scattered in this area include blue-eyed grass, Catalina mariposa lily, lemonade berry, and bush monkeyflower. This vegetation type most closely corresponds to one of the *Nassella* (spp.) Herbaceous Alliances in Sawyer et al. (2009).

Clustered Tarweed Field

A total of 0.09 acre of clustered tarweed field occurs along the ridgeline at the western end of the property. At the time of the surveys, this vegetation type was dominated by fascicled tarplant (*Deinandra fasciculata*); however, non-native grasses likely grow in this area at other times of the year. This vegetation type most closely corresponds to the *Deinandra fasciculata* Herbaceous Alliance in Sawyer et al. (2009).

Barren

Cliff/Rock

A total of 1.56 acres of cliff/rock occurs on the steep slopes at the southern end of the property. These areas consist of exposed, weathered rock face. Sawyer et al. (2009) does not provide a classification for this mapping unit.

Developed/Non-native

Ornamental/Developed

A total of 2.43 acres of ornamental/developed areas occurs along the northwestern and southern edges of the property. The northwestern area consists of landscaping from the surrounding residential development encroaching within the property boundary. The southern area consists of landscaping associated with the Aliso Creek Golf Course and includes a stand of gum trees (*Eucalyptus* sp.) and turf grass.

Ruderal

A total of 1.00 acre of ruderal vegetation occurs at the ridgeline and down a slope in the center of the property. This vegetation type is dominated by the non-native cardoon. Sawyer et al. (2009) does not provide a corresponding vegetation type for this area, but it may be considered functionally equivalent to *Centaurea* (*solstitialis*, *melitensis*) semi-natural herbaceous stands.

Disturbed

A total of 0.24 acre of disturbed areas occurs throughout the property and consist of dirt trails. These areas lack vegetation and are actively used by hikers and off-road cyclists. There is some erosion evident on the steeper trails. Sawyer et al. (2009) does not provide a classification for this mapping unit.

3.2 WILDLIFE POPULATIONS AND MOVEMENT PATTERNS

Vegetation on and adjacent to the property provides potential habitat for a number of wildlife species. Common wildlife species observed or expected to occur on the property and/or in adjacent off-site areas are discussed below.

3.2.1 Fish

Most creeks and waterways in Southern California are subject to periods of high water flow in winter and spring and little to no flow during the late summer and fall. Most drainages occurring on the property are expected to convey water only following storm events. While fish species are expected to occur in nearby Aliso Creek, no fish species were observed on the property, nor are they expected to occur due to lack of suitable habitat.

3.2.2 Amphibians

Amphibians require moisture for at least a portion of their life cycle and many require standing or flowing water for reproduction. Terrestrial species may or may not require standing water for reproduction; they survive in dry areas by aestivating (i.e., remaining beneath the soil in burrows or under logs and leaf litter, and emerging only when temperatures are low and humidity is high). Many of these species' habitats are associated with water, and they emerge to breed once the rainy season begins. Soil moisture conditions can remain high throughout the year in some habitat types depending on factors such as amount of vegetation cover, elevation, and slope/aspect.

Marginally suitable habitat for amphibian species occurs in the drainages on the property. No amphibian species were observed on the property. Common amphibian species that may occur on the property include garden slender salamander (*Batrachoseps major*), western toad (*Anaxyrus boreas*), and Pacific treefrog (*Pseudacris* [*Hyla*] *regilla*).

3.2.3 Reptiles

Reptiles are well-adapted to life in arid habitats. They have several physiological adaptations that allow them to conserve water. Reptiles can also become dormant during weather extremes, allowing them to survive prolonged droughts and paucity of food (Ruben and Hillenius 2005). Reptilian diversity and abundance typically varies with vegetation type and character. Many species prefer only one or two vegetation types; however, most species will forage in a variety of habitats. Most reptile species that occur in open areas will excavate a burrow or use rodent burrows for cover, protection from predators, and refuge during extreme weather conditions.

Common reptile species observed or expected to occur on the property include western fence lizard (*Sceloperus occidentalis*), side-blotched lizard (*Uta stansburiana*), and gopher snake (*Pituophis catenifer*).

3.2.4 Birds

A variety of bird species are expected to be residents on the property, using habitats throughout the year. Other species are present only during certain seasons. For example, the white-crowned sparrow (*Zonotrichia leucophrys*) is expected to occur on the property during the winter season, but would not occur in the summer season because it migrates north to its breeding range.

Resident bird species observed on the property include California quail (*Callipepla californica*), western scrub-jay (*Aphelocoma californica*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), wrentit (*Chamaea fasciata*), California thrasher (*Toxostoma redivivum*), spotted towhee (*Pipilo maculatus*), and California towhee (*Pipilo crissalis*). Urban-tolerant species that occur in disturbed areas and in natural vegetation types that were also observed on the property include mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), northern mockingbird (*Mimus polyglottos*), house finch (*Carpodacus mexicanus*), and lesser goldfinch (*Spinus* [*Carduelis*] *psaltria*).

Wintering birds are those species that generally breed outside the region but migrate to the area for the winter season. Wintering species that may occur on the property include white-crowned sparrow and fox sparrow (*Passerella iliaca*). Summer residents are species that migrate into the region to breed, but generally winter south of the region. Summer breeders that may occur on the property include black-chinned hummingbird (*Archilochus alexandri*), western kingbird (*Tyrannus verticalis*), and hooded oriole (*Icterus cucullatus*). During spring and fall migration, the property also provides foraging habitat for a variety of migratory species.

Birds of prey (raptors) observed on the property include northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), and red-tailed hawk (*Buteo jamaicensis*).

3.2.5 Mammals

Burrows provide cover for a number of small mammal species. Small ground-dwelling mammals observed or expected to occur on the property include California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), and Bryant's woodrat (*Neotoma bryanti*).

Open grassland communities and the leafy understory of scrub and woodland communities provide excellent foraging habitat for herbivorous mammals. Common herbivores observed or expected to occur on the property include southern mule deer (*Odocoileus hemionus*) and desert cottontail (*Sylvilagus audubonii*).

Medium to larger mammalian predators (both carnivorous and omnivorous species) expected to occur on the property include common striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), and mountain lion.

Bat activity on the property may occur in the lower elevation canyons and ravines where the bats are most likely to find more abundant insect food. While there are no buildings or other man-made structures on the property, on-site cliffs would be suitable for roosting. The property also has some potential to support roosting bats in tree snags or under bark; however, the closed nature of the chaparral habitat provides limited open areas suitable for foraging. Species such as the Brazilian free-tailed bat (*Tadarida brasiliensis*) and big brown bat (*Eptesicus fuscus*) may occur on the property.

3.2.6 Wildlife Movement

Wildlife corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization creates isolated "islands" of wildlife habitat. In the absence of habitat linkages that allow movement to adjoining open space areas, various studies have concluded that some wildlife species, especially the larger and more mobile mammals, will not likely persist over time in fragmented or isolated habitat areas because they prohibit the infusion of new individuals and genetic information (MacArthur and Wilson 1967; Soule 1987; Harris and Gallagher 1989; Bennett 1990). Corridors mitigate the effects of this fragmentation by (1) allowing animals to move between remaining habitats, thereby permitting depleted populations to be replenished and promoting genetic exchange; (2) providing escape routes from fire, predators and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or local species extinction; and (3) serving as travel routes for individual animals as they move in their home ranges in search of food, water, mates, and other necessary resources (Noss 1983; Fahrig and Merriam 1985; Simberloff and Cox 1987; Harris and Gallagher 1989).

Wildlife movement activities usually fall into one of three movement categories: (1) dispersal (e.g., juvenile animals from natal areas or individuals extending range distributions); (2) seasonal migration; and (3) movements related to home range activities (e.g., foraging for food or water, defending territories or searching for mates, breeding areas, or cover). A number of terms such as "wildlife corridor", "travel route", "habitat linkage", and "wildlife crossing" have been used in various wildlife movement studies to refer to areas in which wildlife moves from one area to another. To clarify the meaning of these terms and to facilitate the discussion on wildlife movement in this analysis, these terms are defined as follows:

- **Travel Route**—a landscape feature (such as a ridgeline, drainage, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and to provide access to necessary resources (e.g., water, food, cover, den sites). The travel route is generally preferred because it provides the least amount of topographic resistance in moving from one area to another. It contains adequate food, water, and/or cover while moving between habitat areas, and it provides a relatively direct link between target habitat areas.

- **Wildlife Corridor**—a piece of habitat, usually linear in nature, that connects two or more habitat patches that would otherwise be fragmented or isolated from one another. Wildlife corridors are usually bound by urban land areas or other areas unsuitable for wildlife. The corridor generally contains suitable cover, food, and/or water to support species and to facilitate movement while in the corridor. Larger, landscape-level corridors (often referred to as "habitat linkages" or "landscape linkages") can provide both transitory and residential habitat for a variety of species.

- **Wildlife Crossing**—a small, narrow area, relatively short in length and generally constricted in nature, that allows wildlife to pass under or through an obstacle or barrier that otherwise hinders or prevents movement. Crossings typically are man-made and include culverts, underpasses, drainage pipes, and tunnels to provide access across or under roads, highways, pipelines, or other physical obstacles. These obstacles often represent "choke points" along a movement corridor, which may impede wildlife movement and increase the risk of predation.

It is important to note that, in a large open space area where there are few or no man-made or naturally occurring physical constraints to wildlife movement, wildlife corridors (as defined above) may not yet exist. Given an open space area that is both large enough to maintain viable populations of species and to provide a variety of travel routes (e.g., canyons, ridgelines, trails, riverbeds, and others), wildlife will use these "local" routes while searching for food, water, shelter, and mates and will not need to cross into other large open space areas. Based on their size, location, vegetative composition and availability of food, some of these movement areas (e.g., large drainages and canyons) are used for longer lengths of time and serve as source areas for food, water and cover, particularly for small- and medium-sized animals. This is especially true if the travel route is within a larger open space area. However, once open space areas become constrained and/or fragmented as a result of urban development or construction of physical obstacles (such as roads and highways), the remaining landscape features or travel routes that connect the larger open space areas become corridors as long as they provide adequate space, cover, food, and water and do not contain obstacles or distractions (e.g., man-made noise or lighting) that would generally hinder wildlife movement.

In general, animals discussed within the context of movement corridors typically include larger, more mobile species (such as southern mule deer, black bear [*Ursus americanus*], mountain lion, fox [*Urocyon* sp.], and coyote) and even some of the mid-sized mammals (such as raccoon [*Procyon lotor*], striped skunk, American badger [*Taxidea taxus*], and Virginia opossum [*Didelphis virginiana*]). Most of these species have relatively large home ranges through which they move to find adequate food, water, and breeding and wintering habitat. It is assumed that corridors that serve larger, more fragile species also serve as corridors for many smaller, less mobile species, such as reptiles, amphibians, and rodents (generally discussed within the context of local movement). Regional movement for these species facilitates gene flow and requires at least some local "stepping stone" movement of individuals between populations.

The availability of open space corridors is generally considered less important for bird species. Most bird species are believed to fly in more or less direct paths to desired locations; however, some habitat-specific species may not move great distances from their preferred habitat types and are believed to be less inclined to travel across unsuitable areas.

Ideally, an open space corridor should encompass a heterogeneous mix of vegetation types to accommodate the ecological requirements of a wide variety of resident species in any particular region. Most species typically prefer adequate vegetation cover during movement, which can serve as both a food source and as protection from weather and predators. Drainages, riparian areas, and forested canyon bottoms typically serve as natural movement corridors because these features provide cover, food, and often water for a variety of species. Very few species will move across large expanses of open, uncovered habitat unless it is the only option available to them. For some species, landscape linkages must be able to support animals for sustained periods, not just for travel. Smaller or less mobile animals (such as rodents and reptiles) require long periods to traverse a corridor, so the corridor must contain adequate food and cover for survival.

Local Movement

The Aliso Canyon property contains multiple ridgelines and canyons (such as the upper end of Hobo Canyon) that provide a variety of travel routes for local wildlife movement. The trails on the property may also be used for movement. Movement is expected to occur on the property as well as between the property and contiguous off-site habitat.

Regional Movement

The relatively undeveloped nature of the landscape on and surrounding the Aliso Canyon property is highly conducive to regional wildlife movement. Wildlife moving across the property are not presently confined to a "corridor", as described above. The property is contiguous with approximately 4,500 acres of undeveloped open space in Aliso and Wood Canyons Wilderness Park to the north and east. The southern boundary of the western half of the property is contiguous with approximately 171 acres of open space as part of the Driftwood Estates and Pacific Triangle dedications. Wildlife movement is relatively unhindered across these areas, with minimal barbed wire fencing and trails along the property boundary and no major roads or development.

To the south, wildlife movement between the property and the wilderness park on the northern-facing slopes of Aliso Canyon is hindered to some extent by the upper portion of the Aliso Canyon Golf Course; however, wildlife is still expected to cross this area, especially at night when the golf course is closed. While there are patches of open space in canyons west of the northern end of the property, these areas are separated by residential development. Wildlife traveling to these canyons would have two options: (1) cross Balboa Avenue in an approximate 150-foot corridor between residences at the northwestern end of the property or (2) move south down Hobo Canyon and across slopes adjacent to residential development to cross Nyes Place.

3.3 SPECIAL STATUS BIOLOGICAL RESOURCES

This section addresses special status biological resources that were observed, reported, or have the potential to occur on the property or in adjacent off-site areas. These resources include plant and wildlife species that have been afforded special status and/or recognition by federal and State resource agencies and private conservation organizations. In general, the principal reason an individual taxon (i.e., species, subspecies, or variety) is given such recognition is the documented or perceived decline or limitations of its population size, geographic range, and/or distribution resulting in most cases from habitat loss. Tables 3 and 8, respectively, provide a summary of special status plant and wildlife species known to occur in the vicinity of the Aliso Canyon property (i.e., the USGS' Laguna Beach and San Juan Capistrano 7.5-minute quadrangles) and include information on the status, habitat, potential for occurrence, results of focused survey efforts, and definitions for the various status designations. Generally, this list includes species reported by the CNDDB and CNPS, supplemented with species from the author's experience that either occur nearby or could occur based on the presence of suitable habitat. In addition to species, special status biological resources include vegetation types and habitats that are either unique, of relatively limited distribution in the region, or of particularly high wildlife value. These resources have been defined by federal, State, and local government conservation programs. Sources used to determine the status of biological resources are listed below.

- **Plants**—Taxonomic and Status Inventory of Rare and Endangered Vascular Plants of California (CNPS 2015b); the CNDDB (CDFW 2015a); an official species list provided by the USFWS; various USFWS *Federal Register* notices regarding the listing status of plant species; and the *List of Special Vascular Plants, Bryophytes, and Lichens* (CDFW 2015c).

- **Wildlife**—California Wildlife Habitat Relationships Database System (CDFW BDB 2014); the CNDDB (CDFW 2015a); an official species list provided by the USFWS; various USFWS *Federal Register* notices regarding listing status of wildlife species; and the *List of Special Animals* (CDFW 2015b).

- **Habitats**—the CNDDB (CDFW 2015a) and the *List of Vegetation Alliances and Associations, Vegetation Classification and Mapping Program* (CDFG 2010).

3.3.1 Definitions of Special Status Biological Resources

A **federally Endangered species** is one facing extinction throughout all or a significant portion of its geographic range. A **federally Threatened species** is one likely to become Endangered in the foreseeable future throughout all or a significant portion of its range. The presence of any federally Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in “take” of the species or its habitat. The term “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct. “Harm”, in this sense, can include any disturbance of habitats used by the species during any portion of its life history.

Proposed species or **Candidate species** are those officially proposed by the USFWS for addition to the federal Threatened and Endangered species lists. Because proposed species may soon be listed as Threatened or Endangered, these species could become listed prior to or during implementation of a proposed project. The presence of a Proposed or Candidate species in a project impact area may impose constraints on development if they are listed prior to issuance of project permits, particularly if a project would result in “take” of the species or its habitat.

The State of California considers an **Endangered species** as one whose prospects of survival and reproduction are in immediate jeopardy; a **Threatened species** as one present in such small numbers throughout its range that it is likely to become an Endangered species in the near future in the absence of special protection or management; and a **Rare species** as one present in such small numbers throughout its range that it may become Endangered if its present environment worsens. “Rare species” applies only to California native plants. State-listed Threatened and Endangered species are protected against take unless an Incidental Take Permit is obtained from the resource agencies. The presence of any State-listed Threatened or Endangered species in a project impact area generally imposes severe constraints on development, particularly if a project would result in “take” of the species or its habitat.

California Species of Special Concern is an informal designation used by the CDFW for some declining wildlife species that are not State Candidates. This designation does not provide legal protection, but signifies that these species are recognized as special status by the CDFW. Recently, the CDFW downgraded some of these species from Species of Special Concern to the **Watch List.**

Species that are **California Fully Protected** and **Protected** include those protected by special legislation for various reasons, such as the mountain lion and white-tailed kite (*Elanus leucurus*). Fully Protected species may not be taken or possessed at any time. California Protected species include those species that may not be taken or possessed at any time except under special permit from the CDFW issued pursuant to the *California Code of Regulations* (Title 14, §650, §670.7) or Section 2081 of the *California Fish and Game Code.*

Species of **Local Concern** are those that have no official status with the resource agencies, but are being watched because there is either a unique population in the region or the species is declining in the region. Species listed in the *City of Laguna Beach General Plan* are included here.

Special Animal is a general term that refers to species that the CNDDB is interested in tracking, regardless of legal or protective status. This term includes species designated as any of the above terms, but also includes species that may be considered biologically rare; restricted in distribution; declining throughout their range; have a critical, vulnerable stage in their life cycle that warrants monitoring; are on the periphery of their range and are threatened with extirpation in California; are associated with special status habitats; or are considered by other State or federal agencies or private organizations to be sensitive or declining.

The California Rare Plant Rank (CRPR), formerly known as CNPS List, is a ranking system by the Rare Plant Status Review group[3] and managed by the CNPS and the CDFW. A ranking is given based on information regarding the distribution, rarity, and endangerment of California's vascular plants. Plants with a CRPR of **1A** are presumed extinct in California because they have not been seen in the wild for many years. Plants with a CRPR of **1B** are Rare, Threatened, or Endangered throughout their range. Plants with a CRPR of **2A** are presumed extirpated from California, but are more common elsewhere. Plants with a CRPR of **2B** are considered Rare, Threatened, or Endangered in California, but are more common elsewhere. Plants with a CRPR of **3** require more information before they can be assigned to another rank or rejected; this is a "review" list. Plants with a CRPR of **4** are of limited distribution or infrequent throughout a broader area in California; this is a "watch" list. The CRPR Threat Rank is an extension added onto the CRPR to designate the level of endangerment by a 1 to 3 ranking (CNPS 2014). An extension of **.1** is assigned to plants that are considered to be "seriously threatened" in California (i.e., over 80 percent of the occurrences are threatened or have a high degree and immediacy of threat). Extension **.2** indicates the plant is "fairly threatened" in California (i.e., between 20 and 80 percent of the occurrences are threatened or have a moderate degree and immediacy of threat). Extension **.3** is assigned to plants that are considered "not very threatened" in California (i.e., less than 20 percent of occurrences are threatened or have a low degree and immediacy of threat or no current threats known). The absence of a threat code extension indicates plants lacking any threat information.

In addition to providing an inventory of special status plant and wildlife species, the CNDDB also provides an inventory of vegetation types that are considered special status by the State and federal resource agencies, academic institutions, and various conservation groups (such as the CNPS). Determination of the level of imperilment (i.e., exposure to injury, loss, or destruction) is based on the NatureServe Heritage Program Status Ranks that rank both species and vegetation types on a global (G) and statewide (S) basis according to their rarity; trend in population size or area; and recognized threats (e.g., proposed developments, habitat degradation, and non-native species invasion) (Faber-Langendoen et al. 2009). The ranks are scaled from 1 to 5. NatureServe considers **G1** or **S1** communities to be critically imperiled and at a very high risk of extinction or elimination due to extreme rarity, very steep declines, or other factors; **G2** or **S2** communities to be imperiled and at high risk of extinction or elimination due to very restricted range, very few populations or occurrences, steep declines, or other factors; **G3** or **S3** communities to be vulnerable and at moderate risk of extinction or elimination due to a restricted range, relatively few populations or occurrences, recent and widespread declines, or other factors; **G4** or **S4** communities to be apparently secure and uncommon but not rare with some cause for long-term concern due to declines or other factors; and **G5** or **S5** communities to be secure. A question mark (?) denotes an inexact numeric rank, but existing information points to this rank (Faber-Langendoen et al. 2009). For vegetation alliances[4] that have State ranks of S1–S3, all associations within the alliance are considered to be highly imperiled.

3 This group consists of over 300 botanical experts from the government, academia, non-governmental organizations, and the private sector.

4 A vegetation alliance is "a classification unit of vegetation, containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover" (Sawyer et al. 2009).

3.3.2 Vegetation Types

Special status vegetation types observed on the property are described further below.

Chaparral

The predominant vegetation type on the Aliso Canyon property is southern mixed chaparral (78.18 acres). This vegetation type most closely corresponds to a mix of the *Rhus integrifolia* Shrubland Association and *Malosma laurina* Shrubland Association in Sawyer et al. (2009), which are ranked as G3 S3 and G4 S4, respectively.

Chaparral is a "drought tolerant plant community dominated by sclerophyllous, woody shrubs shaped by a Mediterranean-type climate and naturally recurring wildfires" (Halsey 2007). It is the most extensive vegetation community in California and is not presently considered to have special status by the resource agencies, though its status in the future may be uncertain given continuing drought conditions, increased fire frequencies, and limited understanding of the system. The City of Laguna Beach considers sumac-toyon chaparral to have moderate biological value (Marsh 1992).

Scrub

Coyote brush scrub (2.79 acres) most closely corresponds to the *Baccharis pilularis–Artemisia californica* Shrubland Association in Sawyer et al. (2009), which is ranked as G5 S5. Mixed sage scrub (17.77 acres) most closely corresponds to a mix of the *Artemisia californica* Shrubland Association and the *Eriogonum fasciculatum–Salvia mellifera* Shrubland Association in Sawyer et al. (2009), which are both ranked as G5 S5; disturbed mixed sage scrub (1.25 acres) is also present on the property. Mixed sage–chaparral scrub ecotone (44.59 acres) may be considered G3 S3 or G4 S4 (based on ranking of Associations of lemonade berry, black sage, and California sagebrush versus laurel sumac, California sagebrush, and California buckwheat). Mixed sage–cactus scrub (0.29 acre) most closely corresponds to *Opuntia littoralis*–mixed coastal sage scrub, which is ranked as G4 S3.

While the Global/State rankings of coyote brush scrub, mixed sage scrub, and disturbed mixed sage scrub indicate that they are secure or apparently secure, they are of local concern (Laguna Beach 2006) as part of the larger coastal sage scrub community and because they have potential to support Threatened or Endangered species. Coastal sage scrub had, as a whole, declined approximately 70 to 90 percent in its historic range in California by the mid-1990s (Noss and Peters 1995). Sage scrub has largely been lost to land use changes in Southern California basins and foothills. The ecological function of Southern California's remaining sage scrub is threatened by habitat fragmentation and degradation, which is largely the result of invasive non-native species, livestock grazing, off-highway vehicles, altered fire regime, and air pollution (O'Leary 1995; Allen et al. 2000).

Grassland

Annual grassland (0.79 acre) is considered to be a semi-natural herbaceous stand and therefore is not given a ranking. Elymus grassland (0.05 acre) most closely corresponds to the *Leymus condensatus* Herbaceous Association in Sawyer et al. (2009), which is ranked as G3 S3. Needlegrass grassland (0.11 acre) most closely corresponds to one of the *Nassella* (spp.) Herbaceous Associations in Sawyer et al. (2009), which are ranked as either G4 S3? (for *N. cernua* and *N. pulchra*) or G3? S3? (for *N. lepida*). The clustered tarweed field (0.09 acre) most closely corresponds to the *Deinandra fasciculata* Herbaceous Alliance in Sawyer et al. (2009), which is ranked as G3? S3?.

Native grasslands, which once may have covered nearly $^{1}/_{5}$ of the State, have declined by approximately 99 percent in their historic range in California (Barry 1972; Noss and Peters 1995). "Floweriferous native grasslands" are considered to have very high biological value by the City of Laguna Beach while needlegrass grassland is considered to have high biological value (Marsh 1992). Annual grassland is considered to have moderate biological value.

Other Areas

The cliff/rock (1.56 acres), ornamental/developed (2.43 acres), ruderal (1.00 acre), and disturbed (0.24 acre) areas provide limited habitat for plant or wildlife species and would not be considered special status by the resource agencies. However, the City of Laguna Beach considers rock outcrops to have very high biological value in their capacity to support special status plant species (Marsh 1992). Eucalyptus woodlands and other "urban forests" are considered to have moderate biological value.

Jurisdictional Areas

Multiple drainages are present on the Aliso Canyon property (Exhibit 7). These all exhibit evidence of bed, bank, and OHWM and would be considered under the jurisdiction of the RWQCB, the CDFW, and the CCC. Some of the on-site drainage features would be considered tributaries[5] of Hobo Canyon and Aliso Creek, which convey flow into the Pacific Ocean southwest of the property. Therefore, these drainages would be considered under the jurisdiction of the USACE. Five on-site drainage features do not exhibit a connection to Hobo Canyon or Aliso Creek and so would not be considered tributaries (i.e., they dissipate at the canyon bottom and do not cross under the paved road east of the property). These isolated drainage features would not be considered under the jurisdiction of the USACE. No wetlands "waters of the U.S." were observed on the property.

Based on the field observations and data collected, a total of approximately 0.597 acre of non-wetland "waters of the U.S." under the jurisdiction of the USACE, 1.281 acres of "waters of the State" under the jurisdiction of the RWQCB (of which 0.684 acre are isolated waters), 1.281 acres of waters under CDFW jurisdiction, and 1.281 acres of waters under CCC jurisdiction occur on the property (Table 2; Exhibit 7).

Should jurisdictional resources be impacted by management activities on the property, permits/agreements from the regulatory agencies would be required. This would consist of a USACE Section 404 Permit, an RWQCB Section 401 Water Quality Certification, a CDFW Section 1602 Streambed Alteration Agreement, and a CCC Coastal Development Permit.

A California Rapid Assessment Method (CRAM) analysis may be required as part of the permitting procedure. CRAM is a tool for assessing the overall condition[6] of a wetland; it was developed by a consortium of federal, State, and local scientists and managers. The results of a condition assessment can be used to infer the ability to provide various functions or services to which a wetland is most suited. This analysis can be used for a variety of applications, such as evaluating a site to inform regulatory decisions (e.g., Section 401 and 404 permitting) or restoration or mitigation site evaluation.

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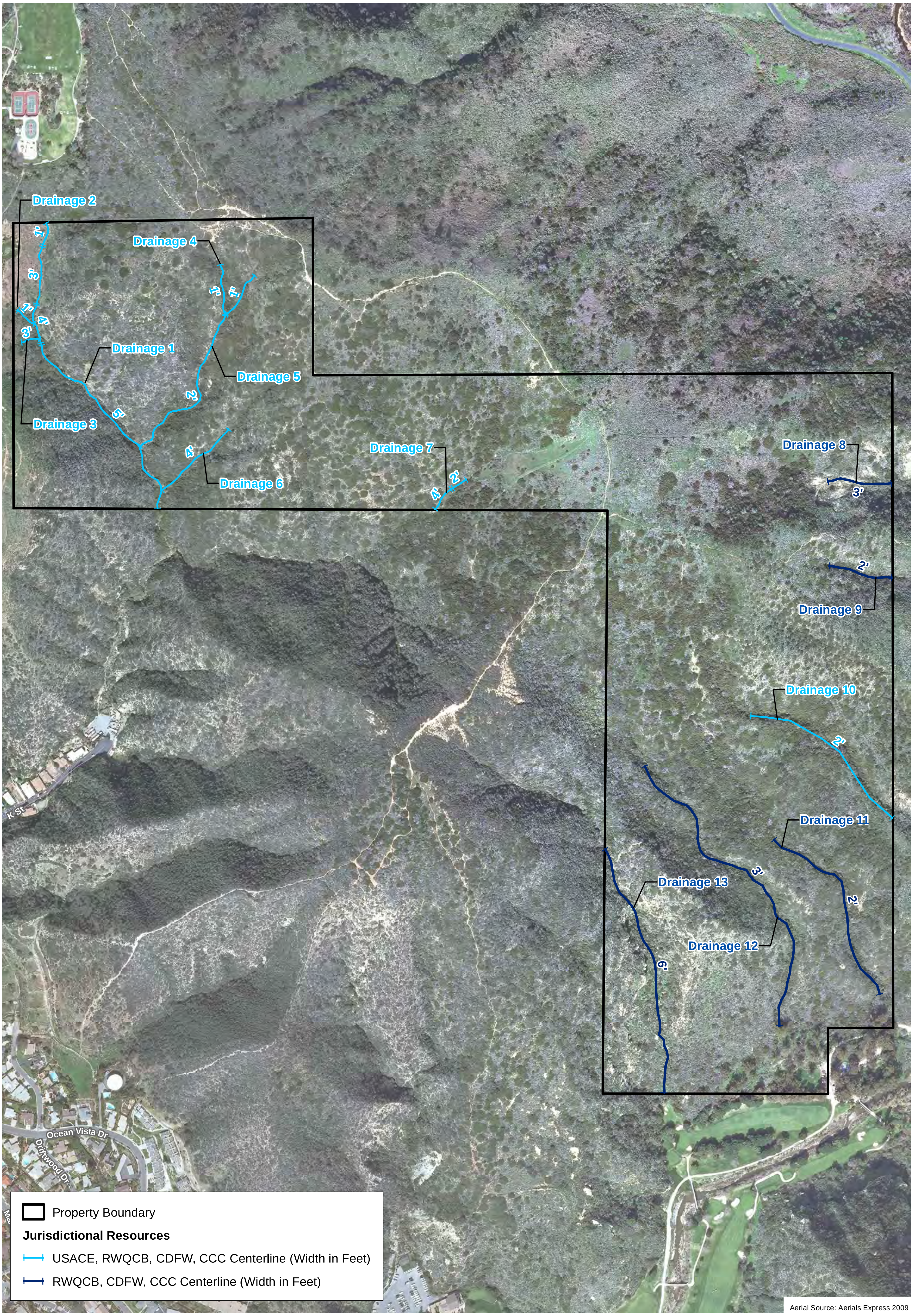
[5] "Tributaries" are defined as waters that are characterized by the presence of physical indicators of flow—bed and banks and OHWM—and that contribute flow directly or indirectly to a traditional navigable water, interstate water, or territorial sea.

[6] "Condition" is defined as the state of a wetland Assessment Area's (AA's) physical and biological structure, the hydrology, and its buffer and landscape context relative to the best achievable states for the same type of wetland (CWMW 2013).



Jurisdictional Resources

Exhibit 7

Measure M2 Acquisition Properties Evaluation – Aliso Canyon Property

N W E S

400 200 0 400 Feet

BonTerra PSOMAS

(Rev: 09-22-2015 LEW) R:\Projects\OCT_OCTA\J008.01\Graphics\Aliso_Cyn\BioTech\Ex7_JD_Resources_20150917.pdf

TABLE 2
JURISDICTIONAL RESOURCES ON THE ALISO CANYON PROPERTY

Drainage	Amount of Jurisdictional Resources (Acres)				
	USACE	Isolated	RWQCB[a]	CDFW	CCC
Drainage 1	0.302	–	0.302	0.302	0.302
Drainage 2	0.005	–	0.005	0.005	0.005
Drainage 3	0.013	–	0.013	0.013	0.013
Drainage 4	0.011	–	0.011	0.011	0.011
Drainage 5	0.083	–	0.083	0.083	0.083
Drainage 6	0.077	–	0.077	0.077	0.077
Drainage 7	0.030	–	0.030	0.030	0.030
Drainage 8	–	0.041	0.041	0.041	0.041
Drainage 9	–	0.027	0.027	0.027	0.027
Drainage 10	0.076	–	0.076	0.076	0.076
Drainage 11	–	0.085	0.085	0.085	0.085
Drainage 12	–	0.208	0.208	0.208	0.208
Drainage 13	–	0.323	0.323	0.323	0.323
Total	**0.597**	**0.684**	**1.281**	**1.281**	**1.281**

USACE: U.S. Army Corps of Engineers; RWQCB: Regional Water Quality Control Board; CDFW: California Department of Fish and Wildlife; CCC: California Coastal Commission; –: not present in this drainage.

[a] RWQCB jurisdictional boundaries are defined as those determined for the USACE under "waters of the U.S."; however, the RWQCB also takes jurisdiction over isolated waters.

CRAM scores range from 25 to 100. The maximum score possible represents how a wetland is doing relative to the best achievable conditions for that wetland type in the state. It is assumed that the same scores for different wetlands of the same type represent the same overall condition and functional capacity. Therefore, these scores may be used to track the progress of restoration efforts over time; to compare impacted sites to their in-kind mitigation sites; or to compare an individual wetland to the status and trends in ambient condition of its wetland type. Enhancement of the property, such as through targeted removal of weed species, may result in higher CRAM scores.

3.3.3 Special Status Plants

Based on the results of the literature review, 44 special status plant species have been reported in the vicinity of the Aliso Canyon property. These species, survey results, and their potential for occurrence (which is based on the presence of suitable habitat) are summarized in Table 3. Note that these species are listed alphabetically according to their scientific name. One federally and State-listed Threatened species, five non-listed special status plant species with a CRPR, and two species of local concern were observed on the property; two additional species of local concern were tentatively observed on the property. These species are discussed after the table. Note that detailed information and mapping of special status plant species populations were only recorded for listed species and those with a CRPR; species of local concern are discussed generally below.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Adenostoma fasciculatum var. *obtusifolium* San Diego chamise	–	–	–	ND	Between May and June	Dry slopes, ridges, chaparral.	Southern South Coast, southwest Peninsular Ranges, and Baja California, Mexico; between sea level and 2,625 feet above msl.	Suitable habitat, but not observed during surveys.
Adiantum jordanii California maidenhair	–	–	–	LI	–	Shaded hillsides, moist woodland.	California, Oregon, and Baja California, Mexico; between sea level and 3,940 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Anemopsis californica yerba mansa	–	–	–	LI	Between March and September	Saline or alkaline soil in wet or moist areas, seeps, and springs.	High Cascade Range, southern Sierra Nevada, possibly Tehachapi Mountain Area, southwestern Sacramento Valley, San Joaquin Valley, Central Western California, South Coast, Channel Islands, Western Transverse Ranges, possibly San Gabriel Mountains and San Bernardino Mountains, Peninsular Ranges, east of Sierra Nevada, Mojave Desert, possibly Sonoran Desert to Oregon, Kansas, Texas, and northwestern Mexico; between sea level and 6,560 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Aphanisma blitoides aphanisma	–	–	1B.2	–	Between June and September	Saline sand, coastal scrub, and bluffs.	Central Coast, South Coast, Channel Islands, and Baja California, Mexico; between sea level and 655 feet above msl.	Suitable habitat, but not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Atriplex coulteri Coulter's saltbush	–	–	1B.2	–	Between March and October.	Alkaline soils in open sites, coastal bluffs, and dry hillsides; often on clay barrens in native perennial grasslands, coastal sage scrub, and coastal bluff scrub.	South Coast, Channel Islands, and Baja California, Mexico; between sea level and 1,640 feet above msl.	Suitable habitat, but not observed during surveys.
Atriplex pacifica South Coast saltscale	–	–	1B.2	–	Between March and October.	Coastal bluff scrub and dunes.	South Coast, Channel Islands, and Baja California, Mexico; between sea level and 985 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Atriplex parishii Parish's brittlescale	–	–	1B.1	–	Between June and October.	Alkaline or clay soils in chenopod scrub, playas, and vernal pools.	South Coast, Peninsular Ranges, and Baja California, Mexico; between sea level and 1,540 feet above msl.	No suitable habitat, considered extirpated from Orange County (Roberts 2008), and not observed during surveys; not expected to occur.
Atriplex serenana var. *davidsonii* Davidson's saltscale	–	–	1B.2	–	Between April and October	Alkaline soils in coastal bluffs, coastal scrub, and borders of cultivated fields.	South Coast; between sea level and 655 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Brodiaea filifolia thread-leaved brodiaea	FT	SE	1B.1	–	Between March and June.	Clay soils, especially Alo clays, in grasslands, openings in coastal sage scrub, and vernal pools.	South Coast (Los Angeles and San Diego Counties.), San Bernardino Mountains (San Bernardino County.), western Peninsular Ranges (Orange, Riverside, and San Diego Counties.); between 80 and 2,820 feet above msl.	Suitable habitat, but not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Calochortus catalinae **Catalina mariposa lily**	**–**	**–**	**4.2**	–	**Between March and May.**	**Heavy soil on ridges and slopes in native grassland and openings in coastal sage scrub and chaparral; can be locally common following fire.**	**Southern South Coast, southern Outer South Coast Ranges, western South Coast, Channel Islands, western edge of Western Transverse Ranges, San Gabriel Mountains, and northern Peninsular Ranges; between sea level and 2,300 feet above msl.**	**Suitable habitat; observed during surveys.**
Calochortus weedii **var.** ***intermedius***[a] **intermediate mariposa lily**	**–**	**–**	**1B.2**	–	**Between June and July.**	**Rocky soils on dry, open ridges and slopes in coastal sage scrub and chaparral; can be locally common following fire.**	**South Coast and northern Peninsular Ranges; between sea level and 2,230 feet above msl.**	**Suitable habitat; observed during surveys.**
Ceanothus spinosus var. *nov.* [b] non-spined greenbark ceanothus	–	–	–	LI	Between January and May.	Slopes, canyons, and chaparral.	Southern Outer South Coast Ranges, Western Transverse Ranges, Peninsular Ranges, and northern Baja California, Mexico; between sea level and 3,940 feet above msl.	Suitable habitat, but not observed during surveys.
Centromadia parryi ssp. *australis*[a] southern tarplant	–	–	1B.1	–	Between June and October.	Salt marshes, grassland, vernal pools, and coastal scrub.	South Coast to northwestern Baja California, Mexico; between sea level and 655 feet above msl.	Suitable habitat, but not observed during surveys.
Cercocarpus minutiflorus San Diego mountain mahogany	–	–	–	ND	Between March and May.	Chaparral.	Peninsular Ranges (Riverside, San Diego Counties) and northern Baja California, Mexico; between sea level and 4,595 feet above msl.	Suitable habitat, but not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Chaenactis glabriuscula var. *orcuttiana* Orcutt's pincushion	–	–	1B.1	–	Between April and July.	Sandy coastal bluffs, dunes, and beaches.	South Coast to northern Baja California, Mexico; between sea level and 330 feet above msl.	No suitable habitat, considered extirpated from Orange County (Roberts 2008), and not observed during surveys; not expected to occur.
***Chorizanthe staticoides* var. *chrysacantha*[c] Orange County Turkish rugging**	**–**	**–**	**–**	**OCE**	**Between April and July.**	**Sand, gravel, or rocks.**	**Central and southern South Coast, Outer South Coast Ranges, Southwestern California (except eastern Peninsular Ranges); between 985 and 5,580 feet above msl.**	**Suitable habitat; full species observed during surveys.**
***Cneoridium dumosum* bushrue**	**–**	**–**	**–**	**NRE**	**Between February and May.**	**Mesas and coastal bluffs.**	**Southern South Coast, southern Channel Islands (San Clemente Island) and Baja California, Mexico; between sea level and 3,280 feet above msl.**	**Suitable habitat; observed during surveys.**
Comarostaphylis diversifolia ssp. *diversifolia* summer holly	–	–	1B.2	–	Between May and June.	On somewhat mesic slopes and occasionally along sandstone ridges in chaparral.	South Coast and Peninsular Ranges to northern Baja California, Mexico; between 330 and1,805 feet above msl.	Suitable habitat, but not observed during surveys.
***Deinandra paniculata* paniculate tarplant**	**–**	**–**	**4.2**	**–**	**Between May and November.**	**Often in sandy soils of grasslands, open chaparral and woodlands, and disturbed areas.**	**Southern Central Coast/Outer South Coast Ranges, southern Outer South Coast Ranges, South Coast, Western Transverse Ranges (eastern Santa Ynez Mountains), Peninsular Ranges, and northern Baja California, Mexico; between sea level and 4,330 feet above msl.**	**Suitable habitat; observed during surveys.**

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Dichondra occidentalis **western dichondra**	**–**	**–**	**4.2**	**–**	**Between March and June.**	**Among rocks and shrubs in coastal scrub, chaparral, and oak woodland.**	**Southern Central Coast, South Coast, Channel Islands, Peninsular Ranges, and Baja California, Mexico; between sea level and 1,705 feet above msl.**	**Suitable habitat; observed during surveys.**
Dudleya edulis ladies fingers dudleya	–	–	–	LI	Between May and July.	On soil, rocky slopes, and ledges.	South Coast, Peninsular Ranges, and northern Baja California, Mexico; between sea level and 4,265 feet above msl.	Suitable habitat, but not observed during surveys.
Dudleya lanceolata **lance-leaved dudleya**	**–**	**–**	**–**	**RUGF (octoploid segregate)**	**Between April and July.**	**On soil or slopes with broken rocks.**	**Central Coast (southern Santa Cruz County), San Francisco Bay Area, South Coast Ranges, Transverse Ranges, Peninsular Ranges, Desert Mountains, and northern Baja California, Mexico; between 100 and 4,100 feet above msl.**	**Suitable habitat; undetermined genetic form observed during surveys.**
Dudleya multicaulis[a] **many-stemmed dudleya**	**–**	**–**	**1B.2**	**–**	**Between May and June.**	**In heavy, often clayey or cobbly soils or on sandstone outcrops in coastal plains, coastal sage scrub, or native grassland.**	**South Coast; between sea level and 1,970 feet above msl.**	**Suitable habitat; observed during surveys.**
Dudleya stolonifera Laguna Beach dudleya	FT	ST	1B.1	–	Between May and July	On rocky, northern-facing cliffs and outcrops. May hybridize with *Dudleya edulis*.	Central South Coast (San Joaquin Hills, Orange County.); between sea level and 820 feet above msl.	Suitable habitat, but not observed during surveys. Observed in immediate vicinity during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Euphorbia misera cliff spurge	–	–	2B.1	–	Between January and August.	Rocky slopes and coastal bluffs in coastal bluff scrub and Mojavean desert scrub.	South Coast, southern Channel Islands, western Sonoran Desert; and Baja California, Mexico; sea level to 1,640 feet above msl.	Suitable habitat, but not observed during surveys.
Ferocactus viridescens San Diego barrel cactus	–	–	2B.1	–	Between May and June.	Sandy to rocky areas.	South Coast (San Diego County) and Baja California, Mexico; between 35 and 490 feet above msl.	Suitable habitat, but not observed during surveys.
Harpagonella palmeri Palmer's grappling hook	–	–	4.2	–	Between March and April	Dry, semi-barren sites in chaparral, coastal scrub, and grassland.	South Coast, Peninsular Ranges, southwestern Sonoran Desert, southwestern Arizona, and northwestern Mexico; between sea level and 3,280 feet above msl.	Suitable habitat, but not observed during surveys.
Hordeum intercedens vernal barley	–	–	3.2	–	Between March and June.	Vernal pools; mesic grasslands; dry, saline streambeds; and alkaline flats.	San Joaquin Valley, Outer South Coast Ranges, South Coast, Channel Islands, Peninsular Ranges, and northwestern Baja California, Mexico; between sea level and 1,640 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Horkelia cuneata var. *puberula* mesa horkelia	–	–	1B.1	–	Between March and July.	Dry, sandy, coastal chaparral and openings of oak woodlands.	Outer South Coast Ranges, South Coast (especially foothill edge of Los Angeles Basin), and Peninsular Ranges; between 230 feet and 2,855 feet above msl.	Suitable habitat, but not observed during surveys.
Isocoma menziesii var. *decumbens* decumbent goldenbush	–	–	1B.2	–	Between July and November.	Sandy soil in chaparral, coastal scrub, the landward side of dunes, hillsides, and arroyos.	Southern South Coast, southern Channel Islands, southern Peninsular Ranges, and Baja California, Mexico; between sea level and 655 feet above msl.	Suitable habitat, but not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Juncus textilis basket rush	–	–	–	LI	Between July and November.	Slong stream courses in riparian woodland and rarely on mesic slopes.	Southern Outer South Coast Ranges, southwestern California (except Channel Islands); between sea level and 5,905 feet above msl.	Marginally suitable habitat, but not observed during surveys.
Lasthenia glabrata ssp. *coulteri* Coulter's goldfields	–	–	1B.1	–	Between April and May.	Saline places, vernal pools, coastal salt marshes.	Inner North Coast Ranges, southern Sierra Nevada Foothills, Tehachapi Mountain area, Great Central Valley, Central Western California, South Coast, northern Channel Islands (Santa Rosa Island), Peninsular Ranges, and western Mojave Desert; between sea level and 3,280 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Nama stenocarpum mud nama	–	–	2B.2	–	Between March and October.	Intermittently wet areas such as drying vernal pools and ponds.	San Joaquin Valley, South Coast, southern Channel Islands, western Peninsular Ranges, southeastern Sonoran Desert to Texas, and northern Mexico; between sea level and 2,655 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Navarretia prostrata prostrate vernal pool navarretia	–	–	1B.1	–	Between April and July.	Alkaline floodplains and vernal pools.	Western San Joaquin Valley (Merced County), Central Coast (western Alameda County), San Francisco Bay Area (Alameda County), South Coast Ranges, central South Coast (Los Angeles County), and Peninsular Ranges (Santa Rosa Plateau); between sea level and 2,300 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Nolina cismontana chaparral nolina	–	–	1B.2	–	Between May and July.	Dry chaparral and coastal sage scrub.	South Coast, Western Transverse Ranges, and Peninsular Ranges; between 655 and 4,265 feet above msl.	Suitable habitat, but not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Pentachaeta aurea ssp. *allenii* Allen's pentachaeta	–	–	1B.1	–	Between March and May.	Dry slopes and flats in open, grassy, coastal sage scrub.	Southern South Coast and Peninsular Ranges (Orange County); between sea level and 1,640 feet above msl.	Suitable habitat, but not observed during surveys.
Phacelia ramosissima var. *austrolitoralis*[b] south coast branching phacelia	–	–	3.2	–	Between March and August	Sandy soils near the coast in sand dunes, salt marshes, and coastal bluffs.	Central Coast, South Coast, and northern Channel Islands; between sea level and 985 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Pseudognaphalium leucocephalum white rabbit-tobacco	–	–	2B.2	–	Between July and October.	Sandy and gravelly benches, dry stream bottoms, and canyon bottoms in alluvial scrub and mulefat scrub.	South Coast, San Bernardino Mountains, Peninsular Ranges, Arizona, New Mexico, and Mexico; between sea level and 1,640 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Quercus dumosa Nuttall's scrub oak	–	–	1B.1	–	Between March and May.	Sandy and sandstone-derived soils near the coast in chaparral and coastal sage scrub.	South Coast, Peninsular Ranges, and Baja California, Mexico; between sea level and 655 feet above msl.	Suitable habitat, but not observed during surveys.
Quercus engelmanii Engelmann oak	–	–	4.2	–	Between April and May.	Slopes, foothills, and woodland.	South Coast, southern Channel Islands, San Gabriel Mountains, Peninsular Ranges, and Baja California, Mexico; between sea level and 4,265 feet above msl.	Suitable habitat, but not observed during surveys.

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				
Rhamnus crocea **spiny redberry**	**–**	**–**	**–**	**RR**	**Between January and April.**	**Coastal sage scrub, chaparral, and woodland.**	**Klamath Ranges, Outer North Coast Ranges, High Sierra Nevada, Central Western California, Southwestern California, and Baja California, Mexico; between sea level and 3,775 feet above msl.**	**Suitable habitat; observed during surveys.**
Suaeda esteroa estuary seablite	–	–	1B.2	–	Between May and October.	Mid-level coastal salt marshes.	South Coast and northern Mexico; between sea level and 15 feet above msl.	No suitable habitat and not observed during surveys; not expected to occur.
Symphoricarpos mollis creeping snowberry	–	–	–	LI	Between April and May.	Ridges, slopes, and open places in woodland.	Northwestern California, Cascade Range, Sierra Nevada, Central Western California, Southwestern California, Modoc Plateau, to British Columbia, Idaho, and New Mexico; between 30 and 9,845 feet above msl.	Suitable habitat, but not observed during surveys.
Verbesina dissita **big-leaved crownbeard**	**FT**	**ST**	**1B.1**	–	**Between May and August.**	**Dry slopes and canyons in southern maritime chaparral and Diegan coastal sage scrub.**	**Southern South Coast (Orange County), naturalized in San Bernardino Mountains, and Baja California, Mexico; between sea level and 655 feet above msl.**	**Suitable habitat; observed during surveys.**

TABLE 3
SPECIAL STATUS PLANT SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status				Blooming Period	Habitat	Range	Potential to Occur on the Property; Results of Survey
	USFWS	CDFW	CRPR	Local Concern				

USFWS: U.S. Fish and Wildlife Service; CDFW: California Department of Fish and Wildlife; CRPR: California Rare Plant Rank; msl: mean sea level; –: No status designation.

Species observed on site are denoted in **boldface type.**

Federal (USFWS)		State (CDFW)		Local	
FE	Endangered	SE	Endangered	LI	Local Interest
FT	Threatened	ST	Threatened	OCE	Orange County Endemic
FC	Candidate			RR	Regionally Rare
				RUC	Regionally Unique Cline
				RUGF	Regionally Unique Genetic Form
				ND	Northern Disjunct
				NRE	Northern Range Edge Species

CRPR
1B Plants Rare, Threatened, or Endangered Throughout Their Range
2B Plants Rare, Threatened, or Endangered in California But More Common Elsewhere
3 Plants that require more information before they can be assigned to another rank or rejected
4 Plants of Limited Distribution – A Watch List

CRPR Threat Rank Extensions
None Plants lacking any threat information
.1 Seriously Endangered in California (over 80% of occurrences threatened; high degree and immediacy of threat)
.2 Fairly Endangered in California (20–80% of occurrences threatened; moderate degree and immediacy of threat)
.3 Not very Threatened in California (<20% of occurrences threatened; low degree and immediacy of threat or no current threats known)

[a] A Covered Species
[b] The variety is not recognized in Jepson Herbarium (2014), Hickman (1993) or Munz (1947); information on blooming, habitat, and range is for the full species.
[c] The variety is not recognized in Jepson Herbarium (2014); Hickman (1993) states that the "ssp. *chrysacantha*" is a form apparently environmentally induced. Information on blooming, habitat, and range is for the full species.

Catalina Mariposa Lily

Catalina mariposa lily has a CRPR of 4.2. It typically blooms between March and May. This perennial bulbiferous herb occurs in heavy soil on ridges and slopes in native grasslands and openings in coastal sage scrub and chaparral (Roberts 2008; Baldwin et al. 2012). This species is known from the southern South Coast, southern Outer South Coast Ranges, western South Coast, Channel Islands, western edge of the Western Transverse Ranges, San Gabriel Mountains, and northern Peninsular Ranges at elevations between sea level and approximately 2,300 feet above msl.

A total of 393 Catalina mariposa lily individuals were observed in 4 locations at the center of the property (Table 4; Exhibit 8). Most of these plants (Population 1) were observed in the annual grassland on the property; associated species include wild oat, western blue-eyed-grass, blue dicks, needlegrass, and cardoon. A voucher specimen (ADR11) was collected from this population and deposited at the herbarium at Rancho Santa Ana Botanic Garden. Populations 2 and 3 were observed in openings in southern mixed chaparral; associated species include black sage and dot seed plantain (*Plantago erecta*). Population 4 was observed in openings of mixed sage scrub along the trail; associated species include needlegrass, California sagebrush, and bush monkeyflower.

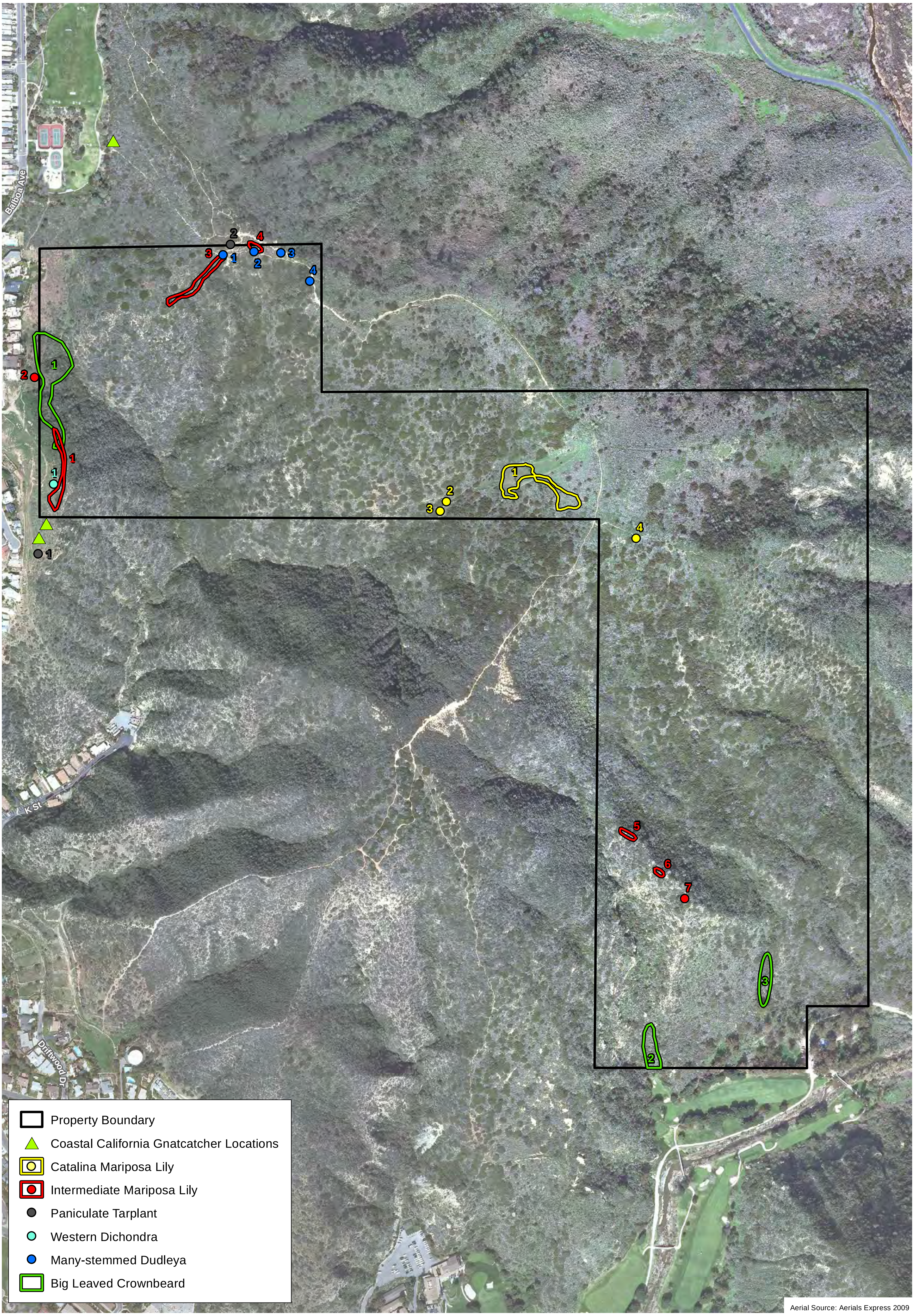
TABLE 4
CATALINA MARIPOSA LILY POPULATIONS OBSERVED ON THE ALISO CANYON PROPERTY

Population	Number of Individuals	Phenology		
		Vegetative	Flowering	Fruiting
1	360	0%	96%	4%
2	1	0%	100%	0%
3	1	0%	100%	0%
4	31	0%	52%	48%
Total/Average	**393**	**0%**	**87%**	**13%**

Intermediate Mariposa Lily

Intermediate mariposa lily has a CRPR of 1B.2. It typically blooms between June and July (Baldwin et al. 2012). This perennial bulbiferous herb occurs on dry, rocky, open slopes in chaparral and coastal sage scrub at elevations between sea level and approximately 2,230 feet above msl (Roberts 2008; Baldwin et al. 2012). This species is known from the South Coast and northern Peninsular Ranges (Baldwin et al. 2012).

A total of 144 intermediate mariposa lily individuals were observed in 7 locations on the property (Table 5; Exhibit 8). These plants were observed primarily on ridgelines and southern-facing slopes in mixed sage scrub and mixed sage–chaparral scrub ecotone. The species generally associated with these populations includes California sagebrush, California buckwheat, black sage, lemonade berry, coastal prickly pear, red brome (*Bromus madritensis* ssp. *rubens*), and needlegrass. A voucher specimen was not collected.



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Special Status Species

Exhibit 8

Measure M2 Acquisition Properties Evaluation - Aliso Canyon Property

N W E S

425 212.5 0 425 Feet

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TABLE 5
INTERMEDIATE MARIPOSA LILY POPULATIONS OBSERVED ON THE ALISO CANYON PROPERTY

Population	Number of Individuals	Phenology		
		Vegetative	Flowering	Fruiting
1	64	12%	52%	36%
2	2	0%	100%	0%
3	27	37%	59%	4%
4	3	0%	100%	0%
5	8	0%	75%	25%
6	12	0%	100%	0%
7	28	57%	39%	4%
Total/Average	**144**	**15%**	**75%**	**10%**

Paniculate Tarplant

Paniculate tarplant (*Deinandra paniculata*) has a CRPR of 4.2. It typically blooms between May and November (Baldwin et al. 2012). This annual herb occurs in sandy soils of grassland, open chaparral, and woodland and disturbed areas at elevations between sea level and approximately 4,330 feet above msl (Baldwin et al. 2012). This species is known from the southern Central Coast/Outer South Coast Ranges, southern Outer South Coast Ranges, South Coast, eastern Santa Ynez Mountains of the Western Transverse Ranges, Peninsular Ranges, and northern Baja California, Mexico (Baldwin et al. 2012).

A total of four paniculate tarplant individuals were observed; one location was immediately south of the property and the other was on a ridgeline on the property (Table 6; Exhibit 8). Population 1 was observed in mixed sage–cactus scrub and associated with California buckwheat, coastal prickly pear, California sagebrush, needlegrass, fascicled tarplant (*Deinandra fasciculata*), and red brome. Population 2 was observed in disturbed mixed sage scrub and associated with California sagebrush, freeway iceplant, osmadenia (*Osmadenia tenella*), soft chess, and French cottonrose. A voucher specimen was not collected due to the small population size.

TABLE 6
PANICULATE TARPLANT POPULATIONS OBSERVED ON THE ALISO CANYON PROPERTY

Population	Number of Individuals	Phenology		
		Vegetative	Flowering	Fruiting
1	1	0%	100%	0%
2	3	66%	34%	0%
Total/Average	**4**	**33%**	**67%**	**0%**

Western Dichondra

Western dichondra has a CRPR of 4.2. It typically blooms between March and June. This perennial, stoloniferous herb occurs among rocks and shrubs in coastal scrub, chaparral, and oak woodland (Baldwin et al. 2012). It is known from the southern Central Coast, South Coast, Channel Islands, Peninsular Ranges, and Baja California, Mexico, at elevations between sea level and approximately 1,705 feet above msl (Baldwin et al. 2012).

One western dichondra individual was observed along the western boundary of the property at the edge of mixed sage–chaparral scrub ecotone. This individual was growing under deerweed and was not in bloom. A voucher specimen was not collected due to the small population size.

Many-Stemmed Dudleya

Many-stemmed dudleya has a CRPR of 1B.2. It typically blooms between May and June (Baldwin et al. 2012). This fleshy, perennial herb occurs in heavy, often clayey or cobbly soils or on sandstone outcrops in coastal plains, coastal sage scrub, or native grassland (Baldwin et al. 2012; Roberts 2008). This species is known from the South Coast at elevations between sea level and approximately 1,970 feet above msl (Baldwin et al. 2012).

A total of 60 many-stemmed dudleya individuals were observed at 4 locations on the property (Table 7, Exhibit 8). These plants occur in disturbed mixed sage scrub immediately adjacent to the trail. The species generally associated with these populations include California buckwheat, California sagebrush, black sage, lemonade berry, coastal prickly pear, needlegrass, red brome, freeway iceplant, and intermediate mariposa lily. A voucher specimen was not collected due to the small population size.

TABLE 7
MANY-STEMMED DUDLEYA POPULATIONS OBSERVED ON THE ALISO CANYON PROPERTY

Population	Number of Individuals	Phenology		
		Vegetative	Flowering	Fruiting
1	1	0%	100%	0%
2	13	8%	92%	0%
3	20	0%	100%	0%
4	26	62%	38%	0%
Total/Average	**60**	**18%**	**82%**	**0%**

Big-Leaved Crownbeard

Big-leaved crownbead is a federally and State-listed Threatened species and has a CRPR of 1B.1. It typically blooms between May and August (Baldwin et al. 2012). This perennial shrub occurs on dry slopes and in canyons in southern maritime chaparral and Diegan coastal sage scrub at elevations between sea level and approximately 656 feet above msl (Baldwin et al. 2012; Roberts 2008). This species is known from the southern South Coast in Orange County and Baja California, Mexico; it is naturalized in the San Bernardino Mountains (Baldwin et al. 2012).

Big-leaved crownbeard was observed at three locations on the property (Exhibit 8). This species may be clonal and spread out over a large area (Marsh 1992); therefore, an accurate population count could not be made. However, almost 1,000 individual shrub stems were observed, and the populations are each estimated to contain 100s of individuals. These plants occur on steep slopes in mixed sage scrub, mixed sage–chaparral scrub ecotone, and southern mixed chaparral. The species generally associated with these populations include black sage, California buckwheat, toyon, and lemonade berry. A voucher specimen was not collected due to the listed status of the species.

Species of Local Concern

Two species of local concern were observed on the property: bushrue (*Cneoridium dumosum*) and spiny redberry. Turkish rugging (*Chorizanthe staticoides*) was observed on the property and is assumed to be Orange County Turkish rugging (*Chorizanthe staticoides* var. *chrysacantha*) based on range. Lance-leaved dudleya (*Dudleya lanceolata*) was observed on the property, but it is undetermined whether it is the octoploid segregate (i.e., having twice the number of typical chromosomes).

3.3.4 Special Status Wildlife

Based on the results of the literature review, 42 special status wildlife species have been reported in the vicinity of the Aliso Canyon property. These species and their potential for occurrence (which is based on the presence of suitable habitat) are summarized in Table 8. Note that these species are listed taxonomically. Three special status wildlife species were observed on the property; two species of local concern were also observed on the property. These species are discussed after the table. Note that detailed information and mapping of special status wildlife species populations were only recorded for those considered special status by the USFWS and/or the CDFW; species of local concern are discussed generally below.

TABLE 8
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	Local Concern			
Invertebrates						
Danaus plexippus pop. 1 monarch (California overwintering population)	–	SA	–	Primarily occurs in coastal, lowland, and foothill areas with milkweed (*Ascelpias* spp.), though also in deserts and mountains; overwinters in large numbers on trees.	South Argentina and the Bahamas and Antilles; established in Bermuda, Hawaii, the Solomon's, New Caledonia, New Zealand, Australia, New Guinea, Ceylon, India, the Azores, and the Canary Islands.	Limited suitable wintering habitat; limited potential to occur.
Branchinecta sandiegonensis San Diego fairy shrimp	FE	–	–	Vernal pools and ephemeral ponds in San Diego Mesa hardpan and claypan basins, typically in chamise chaparral but also coastal sage scrub and annual grassland.	Coastal Orange County and San Diego County; a disjunct population reported from Santa Barbara.	No suitable habitat; not expected to occur.
Streptocephalus woottoni Riverside fairy shrimp	FE	–	–	Deep vernal pools and ephemeral ponds.	Coastal Ventura County south to Baja California, Mexico.	No suitable habitat; not expected to occur.
Fish						
Oncorhynchus mykiss irideus southern steelhead (southern California DPS)	FE	SSC	–	Cool water streams; spawns in areas of gravelly substrate in riffles or pool tails.	From the Santa Maria River, San Luis Obispo County to U.S./Mexico border.	No suitable habitat; not expected to occur.
Oncorhynchus mykiss irideus steelhead (Central Valley DPS)	FT	–	–	Cool water streams; spawns in areas of gravelly substrate in riffles or pool tails.	The Sacramento and San Joaquin Rivers and their tributaries, excluding the San Francisco and San Pablo Bays and their tributaries. Also included are artificial propagation programs in the Coleman National Fish Hatchery and the Feather River Hatchery.	No suitable habitat; not expected to occur.
Gila orcuttii[a] arroyo chub	–	SSC	–	Coastal freshwater streams and rivers with steady current and emergent vegetation.	Currently found at three native locations: Santa Margarita and De Luz Creeks in San Diego County, Trabuco and San Juan Creeks in Orange County, and Malibu Creek in Los Angeles County; introduced elsewhere.	No suitable habitat; not expected to occur.

TABLE 8
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	Local Concern			
Eucyclogobius newberryi tidewater goby	FE	SSC	–	Brackish, fairly still but not stagnant water primarily in shallow coastal lagoons, estuaries, marshes, and lower stream reaches.	From Tillas Slough (mouth of the Smith River, Del Norte County) to Agua Hedionda Lagoon (northern San Diego County).	No suitable habitat; not expected to occur.
Amphibians						
Spea hammondii western spadefoot	–	SSC	–	Quiet streams, vernal pools, and temporary ponds.	Great Valley and bordering foothills and Coast Ranges from Monterey Bay south to Baja California, Mexico.	No suitable habitat; not expected to occur.
Anaxyrus californicus arroyo toad	FE	SSC	–	Semi-arid regions near washes or intermittent streams; requires suitable breeding pools.	Southern California and northwestern Baja California, Mexico.	No suitable habitat; not expected to occur.
Reptiles						
Emys marmorata[a] western pond turtle	–	SSC	–	In ponds, lakes, marshes, rivers, streams, and irrigation ditches with a rocky or muddy bottom and aquatic vegetation.	Pacific slope drainages from Washington south to northern Baja California, Mexico.	No suitable habitat; not expected to occur.
Phrynosoma blainvillii[a] coast horned lizard	–	SSC	–	Scrubland, grassland, coniferous forests, and broadleaf woodland with friable soil for burrowing.	Northern California south to northern Baja California, Mexico.	Suitable habitat; may occur.
Aspidoscelis hyperytha[a] orange-throated whiptail	–	SSC	–	Washes and open areas of sage scrub and chaparral in friable, gravelly soil.	Western Peninsular Ranges from Orange and San Bernardino Counties south to Baja California, Mexico.	Suitable habitat; may occur.
Aspidoscelis tigris stejnegeri San Diegan tiger whiptail	–	SA	–	Hot and dry open areas with sparse foliage (e.g., chaparral, woodland).	Coastal Southern California, mostly west of the Peninsular Ranges, south of the Transverse Ranges, and north into Ventura County.	Suitable habitat; may occur.
Anniella pulchra pulchra silvery legless lizard	–	SSC	LI	In loose sandy soil of chaparral, pine-oak woodland, beach, and riparian areas.	Coast, Transverse, and Peninsular Ranges from Contra Costa County south to Baja California, Mexico.	Suitable habitat; may occur.

TABLE 8
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	Local Concern			
Thamnophis hammondii two-striped garter snake	–	SSC	–	Perennial or intermittent freshwater streams with rocky beds bordered by willows or other dense vegetation.	From Monterey County south to El Rosario in Baja California, Mexico.	No suitable habitat; not expected to occur.
Crotalus ruber red-diamond rattlesnake	–	SSC	–	Open scrub, chaparral, woodland, and grassland.	Orange County and San Bernardino County south to Baja California, Mexico.	Suitable habitat; may occur.
Birds						
Accipiter cooperii **Cooper's hawk (nesting)**	**–**	**WL**	–	**Prefers to nest in oak woodlands and riparian woodlands; forages primarily in forest habitats.**	**Breeds from southern Canada into northwestern and north-central Mexico; wintering range extends south.**	**Suitable foraging and nesting habitat; observed foraging and may occur for nesting.**
Accipiter striatus sharp-shinned hawk (nesting)	–	WL	–	Nests and forages in forest habitats.	Breeds in Alaska and Canada, portions of the U.S., in the West Indies, and south through Mexico, Central America, and South America. Migrant and winter visitor in Orange County.	Suitable foraging habitat; may occur for foraging. Outside the breeding range of the species; not expected to occur for nesting.
Buteo jamaicensis **red-tailed hawk**	–	–	**LI**	**Open country with high perches, including woodlands, prairie groves, mountains, plains, and roadsides. Nests in trees, on cliff ledges, among arms of giant cactus, or on artificial structures such as towers and buildings.**	**Widespread throughout North America; northern populations migrate south.**	**Suitable foraging and nesting habitat; observed foraging and may occur for nesting.**
Aquila chrysaetos golden eagle (nesting and wintering)	–	FP, WL	–	Breeds in open and semi-open habitats, such as tundra, shrublands, grasslands, woodland-brushlands, coniferous forests, farmland, and riparian habitats. Broad expanses of open country required for foraging; nesting primarily in mountainous areas with large trees or cliffs.	Resident throughout Southern California, except in the Colorado Desert and Colorado River, where it is a casual winter visitor.	Suitable foraging habitat; may occur for foraging. No suitable nesting habitat; not expected to occur for nesting.

TABLE 8
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	Local Concern			
Circus cyaneus **northern harrier (nesting)**	**–**	**SSC**	–	**Occurs in open habitats, nesting on the ground in dense vegetation.**	**Breeds throughout North American from northern Alaska and Canada south to northern Baja California, Mexico. Some populations migrate to Central America.**	**Suitable foraging and nesting habitat; observed foraging and may occur for nesting.**
Elanus leucurus white-tailed kite (nesting)	–	FP	–	Low elevation grassland, agricultural areas, wetlands, oak woodlands, savannahs, and riparian habitat adjacent to open areas.	Resident in coastal Southern California and a visitor and local breeder on the western edge of the deserts.	Suitable foraging and nesting habitat; may occur for foraging and nesting.
Charadrius alexandrines nivosus western snowy plover (nesting)	FT	SSC	–	Breeds primarily above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches and creek and river mouths, and salt pans in at lagoons and estuaries. Winters in breeding habitat and man-made salt ponds and estuarine sand and mud flats.	Breeds from Damon Point, Washington south to Bahia Magdalena, Baja California, Mexico. Winters primarily in coastal areas from southern Washington to Central America.	No suitable foraging or nesting habitat; not expected to occur for foraging or nesting.
Sterna antillarum browni California least tern (nesting colony)	FE	SE, FP	–	Nests on sandy beaches or mud and sand flats near a lagoon or estuary, where they forage. Winters along marine coasts in littoral zone, bays, and estuaries; little is known of their wintering habitat.	Breeds along the Pacific coast primarily from Santa Barbara to San Diego County; however, reported from the San Francisco Bay to southern Baja California, Mexico; winters from Mexico south.	No suitable foraging or nesting habitat; not expected to occur for foraging or nesting.
Geococcyx californianus greater roadrunner	–	–	LI	Deserts and open country with scattered brush, including chaparral. Nests in dense brush, low trees, or cactus.	U.S. southwest.	Suitable habitat; may occur.
Empidonax traillii extimus[a] southwestern willow flycatcher (nesting)	FE	SE	–	Semi-arid regions near washes or intermittent streams; requires suitable breeding pools.	Southern California and northwestern Baja California, Mexico.	No suitable foraging or nesting habitat; not expected to occur for foraging or nesting.

TABLE 8
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	Local Concern			
Lanius ludovicianus loggerhead shrike (nesting)	–	SSC	–	Grasslands and other dry, open habitats.	Throughout North America; a year-round resident in Southern California.	Limited suitable foraging and nesting habitat; limited potential to occur for foraging and nesting.
Vireo bellii pusillus[a] least Bell's vireo (nesting)	FE	SE	–	Riparian habitat dominated by willows with dense understory vegetation.	Breeds throughout the Central Valley and other low-elevation river systems in California and Baja California, Mexico.	No suitable foraging or nesting habitat; not expected to occur for foraging or nesting.
Campylorhynchus brunneicapillus sandiegensis[a] coastal cactus wren (San Diego and Orange Counties)	–	SSC	–	Coastal sage scrub and alluvial sage scrub with prickly pear cactus and/or cholla.	Southern Orange County and San Diego County to northwestern Baja California, Mexico.	Limited suitable habitat; limited potential to occur.
***Polioptila californica californica*[a] coastal California gnatcatcher**	**FT**	**SSC**	–	**Coastal sage scrub vegetation.**	**Los Angeles, Orange, Riverside, and San Diego Counties south to Baja California, Mexico.**	**Suitable habitat; observed during focused surveys.**
Aimophila ruficeps canescens Southern California rufous-crowned sparrow	–	WL	–	Steep, dry, rocky, southern- or western-facing slopes in scrub vegetation interspersed with grasses and forbs or rock outcrops.	Year-round in Southern California.	Suitable habitat; may occur.
Ammodramus savannarum grasshopper sparrow (nesting)	–	SSC	–	Dense, dry, or well-drained grassland.	Across North America from southern Canada south to Ecuador. Summer resident along the coastal slope of Southern California.	No suitable habitat; not expected to occur.
Mammals						
Antrozous pallidus pallid bat	–	SSC	–	Low elevation grasslands, shrublands, woodlands, and forests. Roosts in caves, crevices, mines, bridges, and occasionally in hollow trees.	Throughout California except the high Sierra Nevada from Shasta County to Kern County and in the northwestern portion of the state.	Suitable foraging and roosting habitat; may occur for foraging and roosting.

TABLE 8
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	Local Concern			
Myotis yumanensis Yuma bat	–	SA	–	Open forests and woodlands, closely associated with water bodies. Roosts in buildings, mines, caves, crevices, swallow nests, and under bridges.	Southwestern British Columbia through the western U.S., and into central Mexico.	Suitable foraging habitat adjacent to property; limited potential to occur for foraging. Suitable roosting habitat; may occur for roosting.
Eumops perotis californicus western bonneted bat	–	SSC	–	Open, semi-arid to arid habitats including conifer and deciduous woodland, coastal scrub, grasslands, palm oases, chaparral, desert scrub, and urban. Roosts in crevices in cliffs, high buildings, trees, and tunnels.	Southeastern San Joaquin Valley and Coastal Ranges from Monterey County south through Southern California, and from the coast eastward to the Colorado Desert.	Suitable foraging and roosting habitat; may occur for foraging and roosting.
Nyctinomops femorosaccus pocketed free-tailed bat	–	SSC	–	Pinyon-juniper woodland, desert scrub, desert succulent scrub, desert riparian, desert. Roosts in crevices in cliffs, caverns, or buildings.	Southwestern U.S. to south-central Mexico.	No suitable habitat; not expected to occur for foraging or roosting.
Nyctinomops macrotis big free-tailed bat	–	SSC	–	Rugged, rocky habitats in arid landscapes. Found in a variety of plant associations, including desert shrub, woodlands, and evergreen forests. Roosts in crevices in high cliffs and rocky outcrops.	Most of South America northward to include Mexico, Arizona, New Mexico, southern and western Texas, southern California and southeastern Nevada, southern Utah, and north to central Colorado; near sea level to about 8,500 feet above msl.	Suitable foraging and roosting habitat; may occur for foraging and roosting.
Perognathus longimembris pacificus Pacific pocket mouse	FE	SSC	–	Occurs on fine-grained, sandy substrates in open coastal sage scrub, coastal strand, coastal dune, and river alluvium.	Historically occurred on the coast from Marina del Rey and El Segundo in Los Angeles County to the vicinity of the U.S./Mexican border. Currently known from the Dana Point Headlands in Orange County and two locations at Camp Pendleton in San Diego County.	No suitable habitat; not expected to occur.

TABLE 8
SPECIAL STATUS WILDLIFE SPECIES REPORTED FROM THE PROPERTY VICINITY

Species	Status			Habitat	Range	Potential to Occur on the Property/Results of Focused Surveys
	USFWS	CDFW	Local Concern			
Mustela frenata long-tailed weasel	–	–	LI	Found in most habitats, especially near water.	From southern Canada, throughout most of the U.S. (excluding southwestern deserts), to northern South America.	Suitable habitat; may occur.
Puma concolor[a] mountain lion	–	–	LI	Broad variety of habitats in range except shrubless deserts and agricultural areas.	Latitudinal range of 110 degrees in North and South America.	Suitable habitat; may occur.
Lynx rufus[a] bobcat	–	–	LI	Broad variety of habitats.	Throughout contiguous U.S. and Mexico south to Rio Mescale, and Canada.	Suitable habitat; may occur.
Odocoileus hemionus **southern mule deer**	**–**	**–**	**LI**	**Prefers mixed habitat with both open areas for feeding and forest or brushy areas for protection; common in western mountain forests, deserts, and brushlands.**	**From western Canada and Alaskan panhandle, to the western U.S. to Minnesota, and to Baja California and Sonora to northern Tamaulipas, Mexico.**	**Suitable habitat; observed during surveys.**

USFWS: U.S. Fish and Wildlife Service; CDFW: California Department of Fish and Wildlife; DPS: Distinct Population Segment; –: No status designation.

Species observed on site are denoted in **boldface type.**

LEGEND

Federal (USFWS)		State (CDFW)		Local	
FE	Endangered	SE	Endangered	LI	Local Interest
FT	Threatened	SSC	Species of Special Concern		
		WL	Watch List		
		FP	Fully Protected		
		SA	Special Animal		

[a] Proposed Covered Species in the NCCP/HCP.

Cooper's Hawk

Cooper's hawk is a Watch List species; nesting individuals are protected. Preferred nesting habitats are oak woodlands and riparian woodlands (Hamilton and Willick 1996). This species preys on medium-sized birds and small mammals, foraging primarily in forest habitats (Curtis and Rosenfield 2006). Cooper's hawks breed from southern Canada, throughout the conterminous U.S., and into northwestern and northern-central Mexico (Curtis and Rosenfield 2006). The wintering range is similar to the breeding range except the northernmost populations are migratory or partially migratory, and the winter range extends throughout Mexico and possibly as far south as Panama (Curtis and Rosenfield 2006). Both resident and migratory populations exist in Orange County. Breeding populations have increased in recent years as they have expanded into urban areas (Shuford and Gardali 2008). This species is relatively tolerant of man-altered landscapes; however, threats to this species include the loss of appropriate woodlands for breeding and foraging, collisions with man-made objects, and possibly pesticides (Curtis and Rosenfield 2006).

This species was incidentally observed flying over the property during focused surveys for coastal California gnatcatcher; suitable nesting habitat is also present.

Northern Harrier

Northern harrier is a California Species of Special Concern; nesting individuals are protected. It is a regular winter migrant in marshes and fields throughout Southern California, but is very scarce as a local breeder (Garrett and Dunn 1981). Some breeding populations may be resident, though the species appears to be nomadic, both between years and within the breeding season (Shuford and Gardali 2008). This raptor occurs year-round over open habitats, nesting on the ground within dense vegetation (Shuford and Gardali 2008). While once a relatively common species during fall, winter, and spring in undeveloped areas of the County, the northern harrier population is now greatly reduced and localized in distribution. This species is threatened by loss of habitat, pesticides (Ehrlich et al. 1988), and loss of suitable breeding habitat (MacWhirter and Bildstein 1996).

This species was incidentally observed flying over the property during focused surveys for coastal California gnatcatcher; suitable nesting habitat is also present.

Coastal California Gnatcatcher

Coastal California gnatcatcher is a federally listed Threatened species and a California Species of Special Concern. In California, this subspecies is an obligate resident of coastal sage scrub vegetation types. It occurs in most of Baja California, Mexico's arid regions, but this subspecies is extremely localized in the United States, where it predominantly occurs in coastal regions of highly urbanized Los Angeles, Orange, Riverside, and San Diego Counties (Atwood 1992). Brood parasitism by brown-headed cowbirds (*Molothrus ater*) and loss of habitat to urban development have been cited as causes of coastal California gnatcatcher population decline (Unitt 1984; Atwood 1990).

One male coastal California gnatcatcher was observed on the western edge of the property during focused surveys (Exhibit 8). A pair of gnatcatchers, and later the pair and fledglings, were observed to the north of the property.

Species of Local Concern

Two species of local concern were observed on the property: red-tailed hawk and southern mule deer. Red-tailed hawk was observed flying over the property and may nest on the property. Multiple deer were observed throughout the property.

3.3.5 Critical Habitat

The Federal Endangered Species Act defines critical habitat as follows:

> (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of this [Endangered Species] Act, on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of this [Endangered Species] Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

The Aliso Canyon property is not located in proposed or final critical habitat for any federally listed species.

3.4 COVERED SPECIES SUMMARY

The baseline surveys described in this document were focused towards establishing baseline knowledge of the set of species covered by the OCTA M2 NCCP/HCP. The OCTA M2 NCCP/HCP includes requirements to understand and document the status of Covered Species and their habitats within the Preserves. Table 9 provides the following: (1) a summary of the OCTA M2 NCCP/HCP Covered Species; (2) whether they were observed during the baseline surveys; (3) other information documenting the potential for the Covered Species to occur on site; and (4) a description of the threats and opportunities for management of the Preserve to benefit Covered Species.

Potential threats to Covered Species and their habitats on the property include habitat destruction by hikers and mountain bikers; illegal hunting; the spread of non-native plants and wildlife (e.g., freeway iceplant, Selloa pampas grass, and non-native ants); and wildland fires. An RMP may incorporate restricting unauthorized access on portions of the property; relocating public trails to avoid impacts on special status plant species; restoring native habitat by removing invasive plants; and maintaining movement opportunities through the property. A grant from the Wildlife Conservation Board (WCB), which provides funding for watershed-wide habitat enhancement, may be available to assist with restoration activities.

The disturbed mixed sage scrub, annual grassland, and ruderal vegetation on the property represent the primary candidate areas for habitat restoration to native grassland, scrub, or woodland communities depending on the slope, aspect, and soils present. Control of species such as ripgut brome (*Bromus diandrus*), wild oat, and tocalote (*Centaurea melitensis*) presents a challenge given their prevalence throughout the wildlands of Orange County. However, the African fountain grass (*Pennisetum cetaceum*), fennel (*Foeniculum vulgare*), freeway iceplant, giant reed (*Arundo donax*), Selloa pampas grass, and cardoon observed on the property (see Exhibit 5) should be targeted for removal. Removal of gum trees in the southeastern corner of the property would require coordination with the Aliso Canyon Golf Course.

TABLE 9
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Threats, Opportunities, and Management
Plants			
***Calochortus weedii* var. *intermedius* intermediate mariposa lily**	**Observed on site.**	**Suitable habitat; additional individuals/populations may be present.**	**Potential threats include hikers and mountain bikers.** **Opportunities occur to establish the species in areas with suitable conditions (e.g., soils) that are currently degraded.** **An RMP may restrict unauthorized access on portions of the site, relocate public trails to avoid adjacent populations, and allow for transplantation and/or seeding of this variety in suitable areas on site.**
Centromadia parryi ssp. *australis* southern tarplant	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.
***Dudleya multicaulis* many-stemmed dudleya**	**Observed on site.**	**Suitable habitat; additional individuals/populations may be present.**	**Potential threats include hikers and mountain bikers. Note that observed populations of this species were in close vicinity to actively used trails.** **Opportunities occur to establish the species in areas with suitable conditions (e.g., soils) that are currently degraded.** **An RMP may restrict unauthorized access on portions of the site, relocate public trails to avoid adjacent populations, and allow for transplantation and/or seeding of this variety in suitable areas on site.**
Fish			
Gila orcuttii arroyo chub	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property. Best Management Practices should be utilized to ensure that water quality in nearby habitat (i.e., Aliso Creek) is protected.

TABLE 9
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Threats, Opportunities, and Management
Reptiles			
Emys marmorata western pond turtle	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property. Best Management Practices should be utilized to ensure that water quality in nearby habitat (i.e., Aliso Creek) is protected.
Phrynosoma blainvillii coast horned lizard	Not observed on site.	Suitable habitat present.	**Potential threats include mortality and habitat destruction due to hikers and mountain bikers, intense fire events, and the spread of non-native ant species.** **Habitat restoration opportunities for coastal sage scrub and other suitable habitat occurs on site.** **An RMP may incorporate restoration opportunities for coasal sage scrub and other native habitats utilized by this species and ensure any plant/soil material brought on site is free of non-native ant species.**
Aspidoscelis hyperytha orange-throated whiptail	Not observed on site.	Suitable habitat present.	**Potential threats include mortality and habitat destruction due to hikers and mountain bikers and intense fire events.** **Habitat restoration opportunities for coastal sage scrub and other suitable habitat occurs on site.** **An RMP may incorporate restoration opportunities for coastal sage scrub and other native habitats utilized by this species.**
Birds			
Empidonax traillii extimus southwestern willow flycatcher (nesting)	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.
Vireo bellii pusillus least Bell's vireo (nesting)	Not observed on site.	No suitable habitat; not expected to occur.	No opportunities available because suitable habitat does not occur on the property.

TABLE 9
SUMMARY OF COVERED SPECIES

Species	Observations During Baseline Surveys	Potential to Occur on the Property	Threats, Opportunities, and Management
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren (San Diego and Orange Counties)	Not observed on site.	Limited amounts of marginally suitable habitat present.	Potential threats include mortality and habitat destruction due to hikers and mountain bikers and intense fire events. Protection of coastal sage scrub habitat that contains cactus is crucial for the preservation of this subspecies. Habitat restoration opportunities for coastal sage scrub with cactus species occur on site.
Polioptila californica californica **coastal California gnatcatcher**	**Observed on site.**	**Suitable habitat; additional individuals/populations may be present.**	**Potential threats include mortality and habitat destruction due to hikers and mountain bikers and intense fire events.** **Protection of coastal sage scrub habitat is crucial for the preservation of this subspecies.** **There are limited opportunities to provide habitat for this subspecies on site because coastal sage scrub is a component of the chaparral vegetation. However, areas of disturbed mixed sage scrub may be enhanced and sage scrub may be established in suitable semi-natural herbaceous stands on site.**
Mammals			
Puma concolor mountain lion	Not observed on site.	Suitable habitat present.	Potential threats include illegal hunting and intense fire events. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintenance of movement opportunities through the site.
Lynx rufus bobcat	Not observed on site.	Suitable habitat present.	Potential threats include illegal hunting and intense fire events. Opportunities are available for on-site native habitat restoration and enhancement, which would benefit this species. Management should include maintenance of movement opportunities through the site.
Species observed on site are denoted in **boldface type.**			

4.0 REFERENCES

Allen, E.B, S.A. Eliason, V.J. Marquez, G.P. Schultz, N.K. Storms, C.D. Stylinski, T.A. Zink, and M.F. Allen. 2000. What are the Limits to Restoration of Coastal Sage Scrub in Southern California (pp. 253–262). *2nd Interface Between Ecology and Land Development in California* (J.E. Keeley, M. Baer-Keeley, and C.J. Fotheringham, Eds.). Sacramento, CA: U.S. Geological Survey.

American Ornithologists' Union (AOU). 2013 (September). *Check-list of North American Birds* (7th ed., as revised through 54th Supplement). Washington, D.C.: AOU. http://www.aou.org/checklist/north/index.php.

Atwood, J.L. 1992. Rare, Local, Little-Known, and Declining North American Breeders – A Closer Look. *Birding* 25: 228–233. Colorado Springs, CO: American Birding Association.

———. 1990. *Status Review of the California Gnatcatcher (*Polioptila californica*)*. Manomet, MA: Manomet Bird Observatory.

Baldwin, B.G., D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken (Eds.). 2012. *The Jepson Manual: Vascular Plants of California* (Second ed.). Berkeley, CA: University of California Press.

Barry, W.J. 1972. *California Prairie Ecosystems*. *Vol. 1: The Central Valley Prairie.* Sacramento, CA: State of California Resources Agency, Department of Parks and Recreation.

Bennett, A.F. 1990. Habitat Corridors and the Conservation of Small Mammals in the Fragmented Forest Environment. *Landscape Ecology* 4(2–3):109–122. New York, NY: International Association for Landscape Ecology.

California Department of Fish and Game (CDFG). 2010 (September). *List of Vegetation Alliances and Associations, Vegetation Classification and Mapping Program.* Sacramento, CA: CDFG.

———. 2009 (November 24). *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. Sacramento, CA: CDFG.

California Department of Fish and Wildlife (CDFW). 2015a. California Natural Diversity Database. Records of Occurrence for the USGS Laguna Beach and San Juan Capistrano 7.5-minute quadrangles. Sacramento, CA: CDFW, Natural Heritage Division.

———. 2015b (July). *Special Animals.* Sacramento, CA: CDFW, Natural Heritage Division.

———. 2015c (July). *Special Vascular Plants, Bryophytes, and Lichens List.* Sacramento, CA: CDFW, Natural Heritage Division.

California Department of Fish and Wildlife, Biogeographic Data Branch (CDFW BDB). 2014. Wildlife Habitats — California Wildlife Habitat Relationships System. Sacramento, CA: CDFW BDB. http://www.dfg.ca.gov/bdb/html/wildlife_habitats.html.

California Native Plant Society (CNPS). 2015a. Locational Inventory of Rare and Endangered Vascular Plants of California (online edition, v8-02). Records of Occurrence for the USGS Laguna Beach and San Juan Capistrano 7.5-minute quadrangles. Sacramento, CA: CNPS. http://www.rareplants.cnps.org/advanced.html.

California Native Plant Society (CNPS). 2015b. Taxonomic and Status Inventory of Rare and Endangered Vascular Plants of California (online edition, v8-02). Sacramento, CA: CNPS. http://www.rareplants.cnps.org/.

———. 2014. *The CNPS Ranking System*. Sacramento, CA: CNPS. http://www.cnps.org/cnps/rareplants/ranking.php.

California Wetlands Monitoring Workgroup (CWMW). 2013 (April). *California Rapid Assessment Method (CRAM) for Wetlands User's Manual* (Version 6.1). http://www.cramwetlands.org/ sites/default/files/2013-04-22_CRAM_manual_6.1%20all.pdf.

Crother, B.I. 2012. *Scientific and Standard English Names of Amphibians and Reptiles of North American North of Mexico, with Comments Regarding Confidence in our Understanding* (Seventh ed.). Shoreview, MN: Society for the Study of Amphibians and Reptiles. http://ssarherps.org/wp-content/uploads/2014/07/HC_39_7thEd.pdf.

Curtis, K.E. and R.W. Lichvar. 2010 (July). *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States*. Hanover, NH: USACE, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory.

Curtis, O.E. and R.N. Rosenfield. 2006. Cooper's Hawk (Accipiter cooperii). *The Birds of North America, No. 75* (A. Poole, Ed.). Ithaca, NY: Cornell Lab of Ornithology.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds*. New York, NY: Simon and Schuster.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual* (Technical Report Y-87-1). Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Faber-Langendoen, D., L. Master, J. Nichols, K. Snow, A. Tomaino, R. Bittman, G. Hammerson, B. Heidel, L. Ramsay, and B. Young. 2009. *NatureServe Conservation Status Assessments: Methodology for Assigning Ranks.* Arlington, VA: NatureServe. http://www.natureserve.org/publications/ConsStatusAssess_RankMethodology.pdf.

Fahrig, L. and G. Merriam. 1985. Habitat Patch Connectivity and Population Survival. *Ecology* 66(6): 1762–1768. Tempe, AZ: Ecological Society of America.

Garrett, K. and J. Dunn. 1981. *Birds of Southern California: Status and Distribution*. Los Angeles, CA: Audubon Press.

Gray, J. and D. Bramlet. 1992. *Habitat Classification System Natural Resources Geographic Information System (GIS) Project* (Prepared for the County of Orange Environmental Management Agency). Santa Ana, CA: Gray and Bramlet.

Halsey, R.W. 2007. Chaparral: Pure California. *Fremontia* 35(4): 2–7. Sacramento, CA: CNPS.

———. 2005. *Fire, Chaparral, and Survival in Southern California*. San Diego, CA: Sunbelt Publications, Inc.

Hamilton, R.A. and D.R. Willick. 1996. *The Birds of Orange County, California: Status and Distribution*. Irvine, CA: Sea and Sage Audubon Society.

Harris, L.D. and P.B. Gallagher. 1989. New Initiatives for Wildlife Conservation: The Need for Movement Corridors (pp. 11–34). *Preserving Communities and Corridors* (G. Mackintosh, Ed.). Washington, D.C.: Defenders of Wildlife.

Hickman, J.C., Ed. 1993. *The Jepson Manual of Higher Plants of California*. Berkeley, CA: University of California Press.

Howard, J.L. 1992. Malomsa laurina. In: Fire Effects Information System, [Online]. Golden, CO: U.S., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/.

Jepson Herbarium. 2014 (December 19, Revision 2). Jepson eFlora. Berkeley, CA: Jepson Herbarium. http://ucjeps.berkeley.edu/IJM.html.

Keeley, J.E. and P.H. Zedler. 2009. Large, High-intensity Fire Events in Southern California Shrublands: Debunking the Fine-grain Age Patch Model. *Ecological Applications* 19(1): 69-94. Tempe, AZ: Ecological Society of America.

Laguna Beach, City of. 2006. *Laguna Beach General Plan Open Space/Conservation Element*. Laguna Beach, CA: the City. http://www.lagunabeachcity.net/civicax/filebank/blobdload.aspx?BlobID=2688.

Laguna Beach Historical Society (LBHS). 2015 (August 7, last accessed). Chronology of Laguna Beach. Laguna Beach, CA: LBHS. http://www.lagunabeachhistory.org/chronology/.

Lichvar, R.W. and S.M. McColley. 2008 (August). *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States, A Delineation Manual*. Hanover, NH: USACE, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory.

MacArthur, R.H. and E.O. Wilson. 1967. *The Theory of Island Biogeography*. Princeton, NJ: Princeton University Press.

Marsh, K.G. 1992 (January 20). *South Laguna Biological Resources Inventory* (prepared for the City of Laguna Beach). Silverado, CA: Marsh.

MacWhirter, R.B., and K.L. Bildstein. 1996. Northern Harrier (*Circus cyaneus*). *The Birds of North America, No. 210* (A. Poole and F. Gill, Eds.). Philadelphia, PA and Washington, D.C.: The Academy of Natural Sciences and the AOU (respectively).

McCreary, D.D. 2004. *Fire in California's Oak Woodlands*. University of California Integrated Hardwood Range Management Program. Davis, CA: University of California, Agricultural Issues Center, Integrated Hardwood Range Management Program. http://ucanr.org/faqs/filegroups/faqs14-sep-09-1109/16808.pdf.

Minnich, R.A. and R.J. Dezzani. 1998. Historic Decline of Coastal Sage Scrub in the Riverside – Perris Plain, California. *Western Birds.* 29(4): 366–391. San Diego, CA: Western Field Ornithologists.

Munz, P.A. 1974. *A Flora of Southern California*. Berkeley, CA: University of California Press.

Noss, R.F. 1983. A Regional Landscape Approach to Maintain Diversity. *BioScience.* 33(11): 700–706. Washington, D.C.: American Institute of Biological Sciences.

Noss, R.F. and R.L. Peters. 1995. *Endangered Ecosystems: a Status Report on America's Vanishing Habitat and Wildlife.* Washington, D.C.: Defenders of Wildlife.

O'Leary, J. 1995. Coastal Sage Scrub: Threats and Current Status. *Fremontia.* 23(4): 27–31. Sacramento, CA: California Native Plant Society.

Orange County Fire Authority (OCFA). 2008 (November 15). *After Action Report: Freeway Complex Fire*. Irvine, CA: OCFA.

———. 2007 (October). *After Action Report: Santiago Fire*. Irvine, CA: OCFA.

Orange County Transportation Authority (OCTA). 2010 (December 3). Notice of Preparation to Prepare an Environmental Impact Report. Orange, CA: OCTA.

Ritter, M.E. 2006. The Physical Environment: Mediterranean or Dry Summer Subtropical Climate. Stevens Point, WI: University of Wisconsin. http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/climate_systems/mediterranean.html.

Roberts, F.M. 2008. *The Vascular Plants of Orange County, California: An Annotated Checklist*. San Luis Rey, CA: F.M. Roberts Publications.

Ruben, J.A. and W.J. Hillenius. 2005 (May). Cold Blooded. *Natural History*. New York, NY: American Museum of Natural History.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation* (2nd ed.). Sacramento, CA: CNPS.

Schoenherr, A.A. 1992. *A Natural History of California.* Berkeley, CA: University of California Press.

Shuford, W.D. and T. Gardali (Eds.). 2008. California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California. *Studies of Western Birds 1*. Camarillo, CA and Sacramento, CA: Western Field Ornithologists and CDFG (respectively).

Simberloff, D. and J. Cox. 1987. Consequences and Costs of Conservation Corridors. *Conservation Biology* 1(1): 63–71. Boston, MA: Blackwell Scientific Publications.

Smithsonian National Museum of Natural History (SNMNH). 2011. Mammal Species of the World (3rd ed.) (a database based on Wilson, D.E. and D.M. Reeder's 2005 publication entitled *Mammal Species of the World, A Taxonomic and Geographic Reference, 3rd ed*). Washington, D.C.: SNMNH. http://www.vertebrates.si.edu/msw/mswcfapp/msw/index.cfm.

Soule, M.E. 1987. *Viable Populations for Conservation*. New York, NY: Cambridge University Press.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).* (J.S. Wakeley, R.W. Lichvar, and C.V. Noble, Eds.). Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Fish and Wildlife Service (USFWS). 2006 (March 24). Wetland Mapper [Information for the Aliso Canyon Property]. Washington D.C.: USFWS, National Wetlands Inventory. http://www.fws.gov/wetlands/Data/Mapper.html.

———. 1997 (February 28). *Coastal California Gnatcatcher (*Polioptila californica californica*). Presence/Absence Survey Guidelines.* Washington, D.C.: USFWS.

Unitt, P. 1984. *The Birds of San Diego County* (Memoir 13). San Diego, CA: San Diego Society of Natural History.

Western Regional Climate Center (WRCC). 2015. Monthly Climate Summary for Laguna Beach Station No. 044647. Reno, NV: WRCC.

APPENDIX A

PLANT AND WILDLIFE COMPENDIA

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
Scientific Name	**Common Name**
LYCOPHYTES	
SELAGINELLACEAE - SPIKE-MOSS FAMILY	
Selaginella bigelovii	bushy spike-moss
FERNS	
PTERIDACEAE - BRAKE FAMILY	
Pentagramma triangularis	goldback fern
GYMNOSPERMS	
PINACEAE - PINE FAMILY	
Pinus sp.	pine
EUDICOTS	
ADOXACEAE - MUSKROOT FAMILY	
Sambucus nigra ssp. *caerulea*	blue elderberry
AIZOACEAE - FIG-MARIGOLD FAMILY	
*Carpobrotus edulis**	freeway iceplant
*Mesembryanthemum crystallinum**	crystalline iceplant
AMARANTHACEAE - AMARANTH FAMILY	
Amaranthus sp.	amaranth
ANACARDIACEAE - SUMAC FAMILY	
Malosma laurina	laurel sumac
Rhus integrifolia	lemonade berry
Toxicodendron diversilobum	western poison oak
APIACEAE - CARROT FAMILY	
*Conium maculatum**	poison hemlock
*Foeniculum vulgare**	fennel
Sanicula crassicaulis	Pacific sanicle
ASTERACEAE - SUNFLOWER FAMILY	
Ambrosia psilostachya	western ragweed
Artemisia californica	California sagebrush
Artemisia dracunculus	tarragon sagebrush
Baccharis pilularis ssp. *consanguinea*	coyote brush
Brickellia californica	California brickellbush
*Centaurea melitensis**	tocalote
Corethrogyne filaginifolia	common sand aster
*Cynara cardunculus**	cardoon
Deinandra fasciculata	fascicled tarplant
Deinandra paniculata	paniculate tarplant
Encelia californica	California brittlebush
Grindelia camporum	field gumplant
Hazardia squarrosa	saw toothed goldenbush
Isocoma menziesii var. *menziesii*	coastal goldenbush
*Lactuca serriola**	prickly lettuce
Logfia filaginoides	California cottonrose
*Logfia gallica**	french cottonrose
Osmadenia tenella	osmadenia

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
Scientific Name	**Common Name**
Pseudognaphalium californicum	California everlasting
Sonchus asper ssp. *asper**	prickly sow thistle
Stylocline gnaphaloides	everlasting neststraw
Uropappus lindleyi	silver puffs
Verbesina dissita	big-leaved crownbeard
BORAGINACEAE - BORAGE FAMILY	
Cryptantha sp.	cryptantha
*Echium candicans**	pride of madeira
Eucrypta chrysanthemifolia	spotted hideseed
Phacelia cicutaria	caterpillar phacelia
Phacelia parryi	Parry's phacelia
BRASSICACEAE - MUSTARD FAMILY	
*Raphanus sativus**	radish
CACTACEAE - CACTUS FAMILY	
Cylindropuntia prolifera	coast cholla
Opuntia littoralis	coastal prickly pear
CARYOPHYLLACEAE - PINK FAMILY	
Silene laciniata	cardinal catchfly
CHENOPODIACEAE - GOOSEFOOT FAMILY	
Chenopodium californicum	California goosefoot
*Salsola tragus**	prickly Russian thistle
CLEOMACEAE - SPIDERFLOWER FAMILY	
Peritoma arborea	bladderpod
CONVOLVULACEAE - MORNING-GLORY FAMILY	
Calystegia macrostegia	coast morning-glory
Dichondra occidentalis	western dichondra
CRASSULACEAE - STONECROP FAMILY	
Crassula connata	pygmyweed
Dudleya lanceolata	lance-leaved dudleya
Dudleya multicaulis	many-stemmed dudleya
Dudleya pulverulenta	chalk dudleya
CUCURBITACEAE - GOURD FAMILY	
Marah macrocarpa	large fruit wild cucumber
FABACEAE - LEGUME FAMILY	
Acmispon glaber	deerweed
Lupinus sp.	lupine
*Melilotus indicus**	indian sweetclover
GERANIACEAE - GERANIUM FAMILY	
*Erodium cicutarium**	redstem filaree
GROSSULARIACEAE - GOOSEBERRY FAMILY	
Ribes speciosum	fuchsia-flowered gooseberry
LAMIACEAE - MINT FAMILY	
Salvia mellifera	black sage
Stachys ajugoides	bugle hedgenettle

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
Scientific Name	**Common Name**
MALVACEAE - MALLOW FAMILY	
*Malva parviflora**	cheeseweed
MYRSINACEAE - MYRSINE FAMILY	
*Lysimachia arvensis**	scarlet pimpernel
MYRTACEAE - MYRTLE FAMILY	
Eucalyptus sp.*	gum
NYCTAGINACEAE - FOUR O'CLOCK FAMILY	
Mirabilis laevis var. *crassifolia*	coastal wishbone plant
ONAGRACEAE - EVENING PRIMROSE FAMILY	
Camissoniopsis cheiranthifolia	beach evening-primrose
OROBANCHACEAE - BROOM-RAPE FAMILY	
Castilleja cf. *affinis* ssp. *affinis*	coast indian paintbrush
PHRYMACEAE - LOPSEED FAMILY	
Mimulus aurantiacus	bush monkeyflower
PLANTAGINACEAE - PLANTAIN FAMILY	
Antirrhinum nuttallianum	Nuttall's snapdragon
Plantago erecta	dot seed plantain
POLEMONIACEAE - PHLOX FAMILY	
Eriastrum sapphirinum	sapphire woollystar
POLYGONACEAE - BUCKWHEAT FAMILY	
Chorizanthe staticoides	Turkish rugging
Eriogonum fasciculatum	California buckwheat
PRIMULACEAE - PRIMROSE FAMILY	
Primula clevelandii ssp. *clevelandii*	padre's shooting star
RANUNCULACEAE - BUTTERCUP FAMILY	
Ranunculus californicus	California buttercup
RHAMNACEAE - BUCKTHORN FAMILY	
Ceanothus megacarpus	bigpod ceanothus
Rhamnus crocea	spiny redberry
ROSACEAE - ROSE FAMILY	
Heteromeles arbutifolia	toyon
RUBIACEAE - COFFEE FAMILY	
Galium angustifolium ssp. *angustifolium*	narrow leaved bedstraw
Galium aparine	common bedstraw
RUTACEAE - CITRUS FAMILY	
Cneoridium dumosum	bushrue
SOLANACEAE - NIGHTSHADE FAMILY	
Solanum douglasii	Douglas' nightshade
MONOCOTS	
AGAVACEAE - AGAVE FAMILY	
Chlorogalum pomeridianum	wavyleaf soap plant
IRIDACEAE - IRIS FAMILY	
Sisyrinchium bellum	western blue-eyed-grass

A-1
PLANT SPECIES OBSERVED DURING SURVEYS

Species	
Scientific Name	**Common Name**
JUNCACEAE - RUSH FAMILY	
Juncus cf. *effusus*	soft rush
Juncus sp.	rush
LILIACEAE - LILY FAMILY	
Calochortus catalinae	Catalina mariposa lily
Calochortus splendens	splendid mariposa lily
Calochortus weedii var. *intermedius*	intermediate mariposa lily
POACEAE - GRASS FAMILY	
*Arundo donax**	giant reed
*Avena barbata**	slender wild oat
*Avena fatua**	wild oat
Bothriochloa barbinodis	cane bluestem
*Bromus diandrus**	ripgut brome
*Bromus hordeaceus**	soft chess
Bromus madritensis ssp. *rubens**	red brome
*Cortaderia selloana**	Selloa pampas grass
*Cynodon dactylon**	Bermuda grass
Distichlis spicata	salt grass
Elymus condensatus	giant wildrye
*Festuca myuros**	rattail fescue
*Hordeum murinum**	wall barley
*Lamarckia aurea**	goldentop grass
*Pennisetum setaceum**	African fountain grass
*Schismus barbatus**	Mediterranean schismus
Stipa cernua	nodding needle grass
Stipa sp.	needle grass
THEMIDACEAE - BRODIAEA FAMILY	
Bloomeria crocea	common goldenstar
Dichelostemma capitatum	blue dicks
* Non-native species cf. = appears similar to, species can not be confirmed 100% due to phenological condition	

A-2
WILDLIFE SPECIES OBSERVED DURING SURVEYS

Species	
Scientific Name	**Common Name**
LIZARDS	
PHRYNOSOMATIDAE - SPINY LIZARD FAMILY	
Sceloporus occidentalis	western fence lizard
BIRDS	
ODONTOPHORIDAE - NEW WORLD QUAIL FAMILY	
Callipepla californica	California quail
ACCIPITRIDAE - HAWK FAMILY	
Circus cyaneus	northern harrier
Accipiter cooperii	Cooper's hawk
Buteo jamaicensis	red-tailed hawk
COLUMBIDAE - PIGEON AND DOVE FAMILY	
Zenaida macroura	mourning dove
TROCHILIDAE - HUMMINGBIRD FAMILY	
Calypte anna	Anna's hummingbird
Selasphorus sasin	Allen's hummingbird
TYRANNIDAE - TYRANT FLYCATCHER FAMILY	
Sayornis nigricans	black phoebe
Sayornis saya	Say's phoebe
Tyrannus vociferans	Cassin's kingbird
CORVIDAE - JAY AND CROW FAMILY	
Aphelocoma californica	western scrub-jay
HIRUNDINIDAE - SWALLOW FAMILY	
Petrochelidon pyrrhonota	cliff swallow
AEGITHALIDAE - BUSHTIT FAMILY	
Psaltriparus minimus	bushtit
TROGLODYTIDAE - WREN FAMILY	
Thryomanes bewickii	Bewick's wren
POLIOPTILIDAE - GNATCATCHER FAMILY	
Polioptila californica californica	coastal California gnatcatcher
SYLVIIDAE - SILVIID WARBLERS FAMILY	
Chamaea fasciata	wrentit
MIMIDAE - MOCKINGBIRD AND THRASHER FAMILY	
Toxostoma redivivum	California thrasher
Mimus polyglottos	northern mockingbird
PARULIDAE - WOOD-WARBLER FAMILY	
Oreothypis celata	orange-crowned warbler
Geothlypis trichas	common yellowthroat
Setophaga townsendi	Townsend's warbler
EMBERIZIDAE - SPARROW FAMILY	
Pipilo maculatus	spotted towhee
Melozone crissalis	California towhee
FRINGILLIDAE - FINCH FAMILY	
Haemorhous mexicanus	house finch
Carduelis psaltria	lesser goldfinch

A-2
WILDLIFE SPECIES OBSERVED DURING SURVEYS

Species	
Scientific Name	**Common Name**
MAMMALS	
SCIURIDAE - SQUIRREL FAMILY	
Otospermophilus beecheyi	California ground squirrel
CERVIDAE - CERVID FAMILY	
Odocoileus hemionus	southern mule deer

APPENDIX B

SITE PHOTOGRAPHS

Overlooking the upper reaches of Hobo Canyon from the northwest portion of the property, facing east.

Southern mixed chaparral (background) and annual grassland (foreground) in the center of the property.

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Mixed sage scrub and cliff/rock in the southern portion of the property.

Mixed sage – chaparral scrub ecotone in the western portion of the property.

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Mixed sage – cactus scrub on the property.

Disturbed mixed sage scrub at the north end of the property.

Annual grassland in the center of the property.

Ruderal vegetation (i.e. cardoon) in the center of the property.

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Site Photographs

Appendix B-4

Measure M2 Acquisition Properties Evaluation – Aliso Canyon Property

Appendix C.7

Additional Species Occurrence Maps

Appendix C.7
Additional Species Occurrence Maps

This appendix includes hard copy maps of species occurrence information from other sources that could not be shared in electronic format due to data sharing limitations and agreements.

Irvine Ranch Conservancy (IRC) Managed Lands

IRC maintains a database of species occurrences information based on surveys completed on lands managed by the IRC. Because there are multiple owners of the data, this information could not be shared electronically in GIS format. Additional information on population was not available. Hard copy maps and a tabular summary are included below:

Table C.7-1 – Covered Species Occurrences on IRC Managed Lands

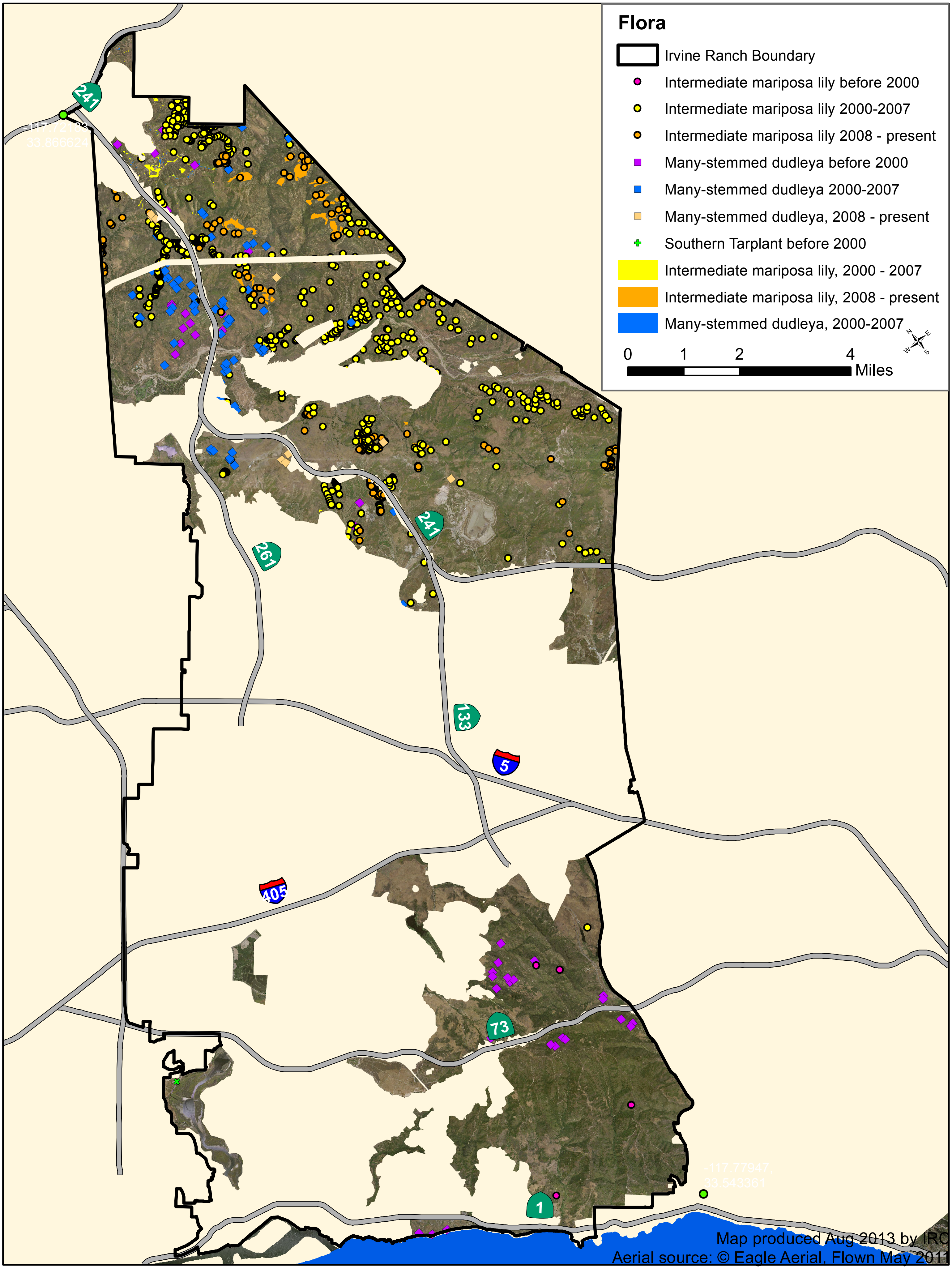
Common Name	Number of Occurrences
Plants	
Intermediate mariposa lily	870
Many-stemmed dudleya	176
Southern tarplant	31
Fish	
Arroyo chub	3
Reptiles	
Coast horned lizard	14
Orangethroat whiptail	9
Western pond turtle	25
Birds	
Cactus wren	1,306
Coastal California gnatcatcher	815
Least Bell's vireo	74
Southwestern willow flycatcher	4
Mammals	
Bobcat	32
Mountain lion	23

County of Orange – Aliso Creek

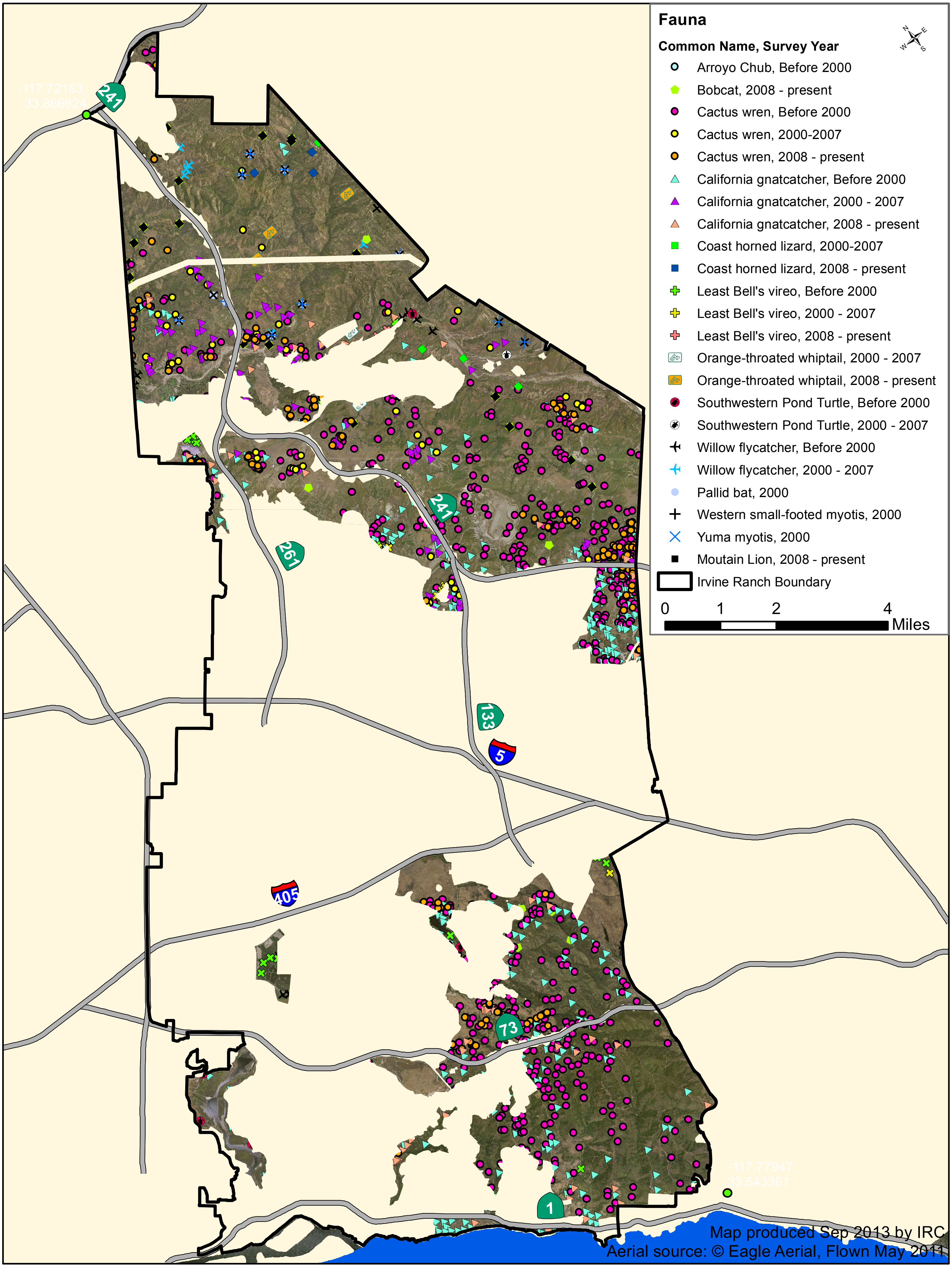
For the Aliso Creek restoration project, the County of Orange provided a map species occurrences in the project vicinity generated from a GIS database of species occurrences maintained by the County. Additional information on data sources, population, or date recorded was not available. A summary of the Covered Species that are shown on the map is included in the table below:

Table C.7-2 – Covered Species Occurrences for Aliso Creek Restoration Project

Common Name	Number of Occurrences	Inside Aliso Creek Project	Adjacent to Aliso Creek Project
Western pond turtle	3	3	
Coastal California gnatcatcher	1	1	
Least Bell's vireo	18	11	7
Southwestern willow flycatcher	3	3	



Flora
Irvine Ranch Boundary
Intermediate mariposa lily before 2000
Intermediate mariposa lily 2000-2007
Intermediate mariposa lily 2008 - present
Many-stemmed dudleya before 2000
Many-stemmed dudleya 2000-2007
Many-stemmed dudleya, 2008 - present
Southern Tarplant before 2000
Intermediate mariposa lily, 2000 - 2007
Intermediate mariposa lily, 2008 - present
Many-stemmed dudleya, 2000-2007
0 1 2 4
Miles
N E S W
-117.72183,
33.866624
241
261
133
5
405
73
1
-117.77947,
33.543361
Map produced Aug 2013 by IRC
Aerial source: © Eagle Aerial, Flown May 2011



Fauna
Common Name, Survey Year
Arroyo Chub, Before 2000
Bobcat, 2008 - present
Cactus wren, Before 2000
Cactus wren, 2000-2007
Cactus wren, 2008 - present
California gnatcatcher, Before 2000
California gnatcatcher, 2000 - 2007
California gnatcatcher, 2008 - present
Coast horned lizard, 2000-2007
Coast horned lizard, 2008 - present
Least Bell's vireo, Before 2000
Least Bell's vireo, 2000 - 2007
Least Bell's vireo, 2008 - present
Orange-throated whiptail, 2000 - 2007
Orange-throated whiptail, 2008 - present
Southwestern Pond Turtle, Before 2000
Southwestern Pond Turtle, 2000 - 2007
Willow flycatcher, Before 2000
Willow flycatcher, 2000 - 2007
Pallid bat, 2000
Western small-footed myotis, 2000
Yuma myotis, 2000
Moutain Lion, 2008 - present
Irvine Ranch Boundary
0 1 2 4 Miles
241
261
133
5
405
73
1
Map produced Sep 2013 by IRC
Aerial source: © Eagle Aerial, Flown May 2011

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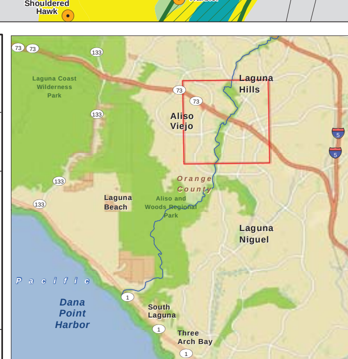
PREPARED BY:
OCCR - OC Parks GIS
Albert Lucero

DATA SOURCE:
- Geomatics Land Information Systems Division

The County of Orange and OCCR/OC Parks/Survey/GIS/LIS make no representations or warranties regarding the registration or accuracy of the data from which this map was derived. Neither the County nor OCCR/OC Park/Survey/GIS/LIS shall be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.

DATE: December 19, 2012



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0 600 1,200 Feet

OCTA Project

Appendix D

Evaluation Criteria for Selection of Preserves and Restoration Projects

Appendix D
Evaluation Criteria for Selection of Preserves and Restoration Projects

The selection of Preserves and Restoration Projects to be included in the Plan conservation strategy was designed to meet the biological goals and objectives of the Plan and contribute to the collective goals of the existing regional network of protected areas within the Plan Area. OCTA, through the work of the Environmental Oversight Committee (EOC) and Board of Directors (Board), developed a set of criteria to evaluate and prioritize property acquisitions from willing sellers and restoration projects from proposals submitted. The EOC/Board selection criteria considered a number of biological questions pertaining to the degree to which the preservation and restoration of habitat will mitigate for species impacted by covered freeway improvement projects and contribute to the biological goals and objectives of the NCCP/HCP and the collective goals of the regional network of protected areas. These criteria also include a number of non-biological questions that take into consideration other costs/benefits and feasibility factors. The complete set of criteria for the selection of Preserves and restoration projects are included in the following pages:

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Property Acquisition Criteria: Biological Factors

These acquisition criteria represent the biological factors (those that relate directly to species/habitat issues and the impacts of the M2 freeway projects).
Each criterion includes a brief definition to clarify any potential misunderstandings and guide evaluators.

	Biological Criteria (Tier I)	Biological Criteria (Tier II)	TOTAL	Overall Result
High				
Medium				
Low				

CONSISTENCY WITH CONSERVATION ASSESSMENT	Y/N	Comments
In Core or Linkage Areas?		

BIOLOGICAL CRITERIA (Tier I)	Y/N	OCTA HIGH MEDIUM LOW	CALTRANS HIGH MEDIUM LOW	CDFG HIGH MEDIUM LOW	USFWS HIGH MEDIUM LOW	Criteria Score	Comments
Aligns with Impacted Habitats An inventory of the property shows it includes the same vegetative communities as those habitats lost to freeway projects, including habitats such as: coastal sage scrub, riparian woodlands, grasslands, etc.							
Conserves Sensitive Habitats The property's habitat includes the conservation and possible restoration of species, sub-species, and natural communities ranked as sensitive under California Natural Diversity Database (CNDDB).							
Contains Habitat for Covered Species The potential property supports the presence of endangered, threatened, species of special concern, and other sensitive species impacted by freeway projects.							
Enhances Natural Lands Connectivity, including significant Wildlife Corridors Acquisition of this property would connect to existing protected areas, examine the effects on multiple taxa (such as birds, large mammals) and is identified as an essential habitat linkage in regional or local plans.							
Considers Property Acreage Generally larger properties are better.							
Enhances Natural Lands Contiguity The property borders existing open spaces and acquisition increases the amount of core habitat or reduces edge effects.							

BIOLOGICAL CRITERIA (Tier II)	Y/N	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	Criteria Score	Comments
Includes Habitat Diversity The property includes a wide variety of habitat types. Special emphasis would be provided for properties with examples of various stages of vegetative structural diversity and functional ecosystem diversity present (e.g., habitat with a natural flood regime).							
Provides for Quality Habitat or Potential for Quality Habitat The property includes mature habitats or property constraints are minimal and property has a high potential to support high-quality habitat after acquisition.							
Considers the Extent of Isolation or Habitat Fragmentation The property may be fragmented or isolated from other valuable habitats that may impede its long-term biological value. Fragmented or isolated habitats would make it challenging to have a variety of flora and fauna.							

Property Acquisition Criteria: Non-Biological Factors

These acquisition criteria represent the non-biological factors (those that do not relate directly to species/habitat issues) that will be considered in the evaluation process.
Each criterion includes a brief definition to clarify any potential misunderstandings and guide evaluators.

	Non-Biological Criteria	Overall Result
High		
Medium		
Low		

CONSISTENCY WITH CONSERVATION ASSESSMENT	Y/N	Comments
In Core or Linkage Areas?		

		OCTA	CALTRANS	CDFG	USFWS		
TIMING AND COOPERATION These criteria assess the degree of urgency that should be given to a potential acquisition and whether a transaction is likely to be voluntary and therefore a cooperative process.	Y/N	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	Criteria Score	Comments
Potential of Development The evaluation considers where the landowner is in CEQA and other permitting processes, quantifies the degree of the development threat, and determines if this acquisition creates an opportunity for leveraging expiring conservation funding.							
Cooperative Landowner The landowner is interested in selling property for conservation and will effectively coordinate to complete tasks required for acquisition.							
Future Property Owner							
Future Property Management							

FUNDING The following criteria are potential funding consideration for property acquisition. Detailed information regarding some of the funding information may not be available until later in the evaluation process.	Y/N	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	Criteria Score	Comments
Considers Total Cost In addition to streamlining OCTA's regulatory process, the intent of the comprehensive environmental mitigation program is to provide the greatest possible biological benefit for the region with the available funding. Consequently, the cost of potential acquisitions will be an important factor in selecting mitigation sites. Cost also considers the potential need for restoration, ongoing maintenance and management responsibilities and costs and whether these factors are addressed by the seller.							
- Property Analysis Record (PAR)							
- Potential Need for Restoration							
- Price Per Acre							
- Dedicated Funding Source(s)							
- Landowner Donation							
- Appraisal Value							
Utilizes Partnership & Leveraging Opportunities Working on this acquisition would be enhanced by existing conservation efforts, partnerships and/or includes existing funding.							

MANAGEMENT/COST CONSTRAINTS The following criteria are potential constraints to property acquisition. Detailed information regarding some of these constraints may not be available until later in the evaluation process.	Y/N	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	Criteria Score	Comments
Conflicting Easements or In-holdings The property may have restrictive deeds, easements, other agreements, and/or in-holdings that would limit management/public use options.							
Neighboring Land Uses Neighboring land uses may decrease the habitat mitigation value of the mitigation property.							
Encroachments/Unauthorized Uses The property may have unauthorized users; there are adopted plans for future infrastructure that may be inconsistent with habitat mitigation; or the type and quantity of public use inside or adjacent to the property. (e.g. vegetative fuel modification zones are adjacent)							
Determines Hazardous Material Conditions Through a Phase I – Environmental Site Assessment, determine the property's historical use and any potential or known hazardous materials on-site.							
Other Complications The property may have unidentified complications associated with acquisition and management including, vector control, vandalism, inadequate access, significant obstacles to restoring water quality (toxics, pesticides, salts), etc.							

CO-BENEFITS The evaluation considers the presence of the following factors as benefits that can distinguish properties that may have otherwise equal conservation values.	Y/N	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	Criteria Score	Comments
· Public Access							
· Trail Connectors							
· Watershed Protection							
· Proximity to Underserved Area							
· Archaeological Sites							
· Cultural and Historical Sites							
· Paleontological Site							
· Scenic/View shed							
· Economic Benefits (supports local businesses)							

SUPPORT These criteria require a simpler evaluation (such as yes, no, maybe) and the answers may play an informational role or serve to distinguish when all other factors are equal.	Y/N	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	HIGH MEDIUM LOW	Criteria Score	Comments
Includes Support from Local and State Governments The acquisition is supported by local cities, appropriate JPA's, the county or other governmental entities.							
Includes Support from the Community The public, environmental and community organizations support the acquisition.							

AGENCY________________

PROPERTY ALLEY PROPERTY

Property Restoration Criteria: Biological Factors

These restoration criteria represent the biological factors (those that relate directly to species/habitat issues and the impacts of the M2 freeway projects).
Each criterion includes a brief definition to clarify any potential misunderstandings and guide evaluators.

	Biological Criteria	Overall Result
High	0	0
Medium	0	0
Low	0	0

CONSISTENCY WITH CONSERVATION ASSESSMENT	Y/N	Comments
In Core or Linkage Areas?		

BIOLOGICAL CRITERIA	Y/N	High	Medium	Low	Criteria Score	Comments
Restores Impacted Habitats An inventory of the property shows it includes the same vegetative communities as those habitats lost to freeway projects, including habitats such as: coastal sage scrub, riparian woodlands, grasslands, etc. and possibly includes ties to historical land coverage, *and considers project impacts within watersheds (HUC10/HUC8)*						
Restores Sensitive Habitats The property's habitat restoration includes the restoration of species, sub-species, and natural communities ranked as sensitive under California Natural Diversity Database (CNDDB). *Also includes the restoration of wetlands, and waters of the U.S. with high functions and values.*						
Benefits Habitat for Covered Species The potential restoration site includes a net benefit (both immediate and long term) in the ecological value for target species through increased breeding/foraging habitat and increases connectivity between areas of suitable habitat.						
Restoration of this site will limit edge effect, supplement existing open space and improve the quantity and quality of core habitat. *Restoration would also enhance the contiguity of riparian areas.*						
Enhances of Already Conserved Lands for Habitat and Wildlife Connectivity Allows funding of restoration and management endowments on previously conserved lands to benefit species and wildlife connectivity in situations deemed appropriate by the permitting/resource agencies.						

Property Restoration Criteria: Non-Biological Factors

These restoration criteria represent the non-biological factors (those that do not relate directly to species/habitat issues) that will be considered in the evaluation process. Each criterion includes a brief definition to clarify any potential misunderstandings and guide evaluators.

	Non-Biological Criteria	Overall Result
High	0	0
Medium	0	0
Low	0	0

TIMING/URGENCY These criteria assess the degree of urgency that should be given to a potential restoration project.	Y/N	High	Medium	Low	Criteria Score	Comments
Considers the Potential of Habitat Degradation and Urgency The threat of increasing the amount and coverage of non-native species determines restoration urgency, and there may be unique opportunities for restoration, such as burn areas.						
Future Property Owner						
Future Property Management						

FUNDING The following criteria are potential funding consideration for property acquisition. Detailed information regarding some of the funding information may not be available until later in the evaluation process.	Y/N	High	Medium	Low	Criteria Score	Comments
Considers Total Cost In addition to streamlining OCTA's regulatory process, the intent of the comprehensive environmental mitigation program is to provide the greatest possible biological benefit for the region with the available funding. Consequently, the cost of potential acquisitions will be an important factor in selecting mitigation sites. Cost also considers the potential need for restoration, ongoing maintenance and management responsibilities and costs and whether these factors are addressed by the seller.						
- Property Analysis Record (PAR)						
- Potential Need for Restoration						
- Price Per Acre						
- Dedicated Funding Source(s)						
- Landowner Donation						
- Appraisal Value						
Utilizes Partnership & Leveraging Opportunities Working on this acquisition would be enhanced by existing conservation efforts, partnerships and/or includes existing funding.						

MANAGEMENT/COST CONSTRAINTS The following criteria are potential constraints to restoration, but detailed information regarding some of these constraints may not be available until later in the evaluation process.	Y/N	High	Medium	Low	Criteria Score	Comments
Determines Hazardous Material Conditions Through a Phase I – Environmental Site Assessment, determine the property's historical use and any potential or known hazardous materials on-site.						
Includes Access to Site The restoration site is accessible for restoration work, maintenance and management.						
Includes Availability and Delivery of Water The water used for the restoration is available, does not increase environmental impacts when delivered to the site and works with local water agencies to ensure groundwater sources are not impacted by water withdrawal.						
Other Complications The property may have unidentified complications associated with restoration and management including, vector control, vandalism, inadequate access, significant obstacles to restoring water quality (toxics, pesticides, salts), etc.						

CO-BENEFITS The evaluation considers the presence of the following factors as benefits that can distinguish properties that may have otherwise equal conservation values.	Y/N	High	Medium	Low	Criteria Score	Comments
· Public Access						
· Trail Connectors						
· Watershed Protection						
· Proximity to Underserved Area						
· Archaeological Sites						
· Cultural and Historical Sites						
· Paleontological Site						
· Scenic/View shed						
· Economic Benefits (supports local businesses)						

SUPPORT These criteria require a simpler evaluation (such as yes, not maybe) and the answers may play an informational role or serve to distinguish when all other factors are equal.	Y/N	High	Medium	Low	Criteria Score	Comments
Includes Support from Local and State Governments This acquisition is supported by local cities, appropriate JPA's, the county or other governmental entities.						
Includes Support from the Community This acquisition is supported by the public, environmental and community organizations.						

Appendix E

Streambed Program Guidelines

Appendix E
Streambed Program Guidelines

I. Introduction

This appendix outlines the process for submittal of project-level Notifications of Lake or Streambed Alteration and the issuance of individual Lake or Streambed Alteration Agreements (LSAAs) for the M2 covered freeway improvement projects pursuant to California Fish and Game Code sections 1600–1616. Approval of this appendix by CDFW provides for compensatory mitigation acreage at nine restoration sites being implemented for the Plan to offset streambed impacts regulated under code sections 1600–1616.

The purpose of code sections 1600–1616 is to protect and conserve fish and wildlife resources that could be substantially adversely affected by a substantial diversion or obstruction of a natural flow or a substantial change in or use of material from the bed, bank, or channel of or deposition or disposal of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. When implementing the code sections, California Department of Fish and Wildlife (CDFW) issue an agreement in the form of a legally binding LSAA to the entity proposing the alteration. The LSAA typically includes conditions of work to avoid or minimize substantial adverse impacts on fish and wildlife resources and compensatory mitigation for unavoidable permanent impacts on those resources and a plan to restore any temporary impacts.

Under the M2 program, either OCTA or Caltrans will function as the Construction Lead. Under the normal design, bid, build process, Caltrans is anticipated to be the Construction Lead. It is anticipated Caltrans will be the Construction Lead for the majority of the M2 freeway improvement projects. In certain instances, OCTA may be the Construction Lead for select M2 freeway improvement projects. OCTA will work closely with Caltrans during the construction phase to ensure that the measures outlined in the Plan are implemented. OCTA/Caltrans will be co-signatories on the LSAA notifications.

OCTA/Caltrans, pursuant to CEQA, must show that impacts to streambed and associated riparian habitats have been avoided and minimized to the greatest extent feasible. For unavoidable permanent impacts to streambed and associated riparian habitat, OCTA/Caltrans will compensate using mitigation acreage associated with restoration projects and if necessary, Preserve acquisitions identified in Tables E-1 and E-2 of this appendix to achieve no-net loss standards. If no-net loss standards are unable to be accomplished for impacts to CDFW jurisdictional streambeds at these locations, additional compensatory mitigation may be required. Restoration plans, as approved by CDFW, United States Fish and Wildlife Service (USFWS), United States Army Corps of Engineers (USACE), and State Water Resources Control Board (SWRCB) (if warranted), will be implemented at the offsite mitigation areas. Additionally, for temporary impacts to streambeds and associated riparian habitat, the Construction Lead will restore the impact site to its pre-project condition, when appropriate, to achieve no-net loss standards.

For USFWS Section 7 consultations with USACE and CDFW LSAAs, USFWS and CDFW mitigation requirements for impacts to streambed and associated riparian habitat from covered freeway improvement projects will be consistent with the commitments in the OCTA M2 Natural Community

Conservation Plan / Habitat Conservation Plan (NCCP/HCP or Plan) to the maximum extent appropriate.

II. Process for Notification submittal and completeness determination, pursuant to FGC Section 1602

This section identifies streamlined procedures for CDFW and OCTA/Caltrans to process covered freeway improvement projects that are subject to California Fish and Game Code sections 1602 and 1603(a), as they existed at the time this Plan was written. Individual projects will be subject to, and will be governed by, the provisions of the Fish and Game Code that are in existence at the time the project-specific Notification is submitted to CDFW.

Where projects are proposed in or near streambeds and associated riparian habitat, OCTA will submit to CDFW a project-level Notification of Lake or Streambed Alteration, including a complete FG2023 form and all required supplemental information. Caltrans is the owner/operator of the freeway system and will be a co-permittee with OCTA for regulatory permits and agreements.

Section 1602(a)(1) requires an entity to submit written notification to CDFW regarding the proposed activity in the manner prescribed by CDFW. At the time this Plan was written, complete Notifications must include, at a minimum: a fully completed form FG2023; diagrams, drawings, plans, and/or maps that provide site-specific construction details, dimensions of structures, overview of project area, etc. (see Item 10 of FG2023 for more details); water diversion plan, if work will be performed in a wetted channel; site-specific biological study; hydrological study; copies of any permits already issued for the project; a copy of any CEQA document prepared for the project; and the appropriate streambed notification fee.

Specifically, Item 12 of FG2023 requires the applicant to identify measures to protect fish, wildlife, and plant resources according to the following: a) describe the techniques that will be used to prevent sediment from entering watercourses during and after construction; b) describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources; and c) describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

The Plan and this appendix provide information responsive to Item 12. The Plan partially addresses Item 12(a) in that it discusses the range of construction and post-construction Best Management Practices (BMPs) that may be employed to prevent sediment from entering watercourses during and after construction (Section 5.6.4, Stormwater and Water Quality BMPs, of the Plan), and the appendix identifies various measures that are to be included in project-specific LSAAs (VI. Lake, Stream, and River Work Conditions, of this appendix). In answering Item 12(a), OCTA/Caltrans will indicate which of the BMPs and measures in the Plan and this appendix are proposed for the project, and provide CDFW with a figure or figures illustrating the locations of construction and post-construction BMPs. References to the Plan and this appendix will be specific, and will include the name of the document and the section or page number where the measure can be found (i.e., not just “see Plan” as the entire answer).

In response to Item 12(b), the Plan and this appendix provide a list of potential avoidance or minimization measures for riparian habitat and areas with sensitive biological resources (Section 5.6, Avoidance, Minimization, Mitigation, of the Plan; Section VII of this appendix) and a list of proposed lake, stream, and river work conditions (Section VI of this appendix). In answering Item 12(b), OCTA/Caltrans will indicate which of the various measures are proposed for the individual project.

The Plan and this appendix address Item 12(c) by including specific restoration sites and provide in-kind replacement-to-impact ratio caps to be used in determining adequate compensatory mitigation for unavoidable impacts to CDFW jurisdictional streambeds (Tables E-1-3 of this appendix). The project-specific Notification will include: the M2 Freeway Program Mitigation Summary Ledger (Section VIII. Table E-4 of this appendix), Restoration Site Tracking Sheet (Section VIII. Table E-5 of this appendix), and Project Impact Reporting and Mitigation Requirements Worksheet (Section VIII. Table E-6 of this appendix), which together will provide information on the riparian vegetation communities and unvegetated channels affected, including acreages and whether the impact is permanent or temporary, and the restoration site identified to provide compensatory mitigation for permanent impacts. The ratio caps in Table E-3 of this appendix, together with the preceding information, will be used to determine the type and amount of compensatory mitigation required. In addition, the notification package will include a restoration plan for any temporary streambed impacts that will be restored onsite. A planting plan including a map identifying areas to be revegetated and a plant palette or seed mix will be included in the notification for restoring temporary impacts, as necessary.

In determining whether the Notification is complete, CDFW will not require re-submittal of the entire Plan or the relevant Plan sections, the Implementing Agreement (IA), or any associated permits already on-file. These documents will be available electronically, either by compact disc, ftp site, or a web link and will be provided in one of these electronic formats with the submittal. Any individual project-specific permits that have been issued at the time of Notification will be submitted, as will any project-specific CEQA document not already on file.

III. Process for issuance of LSAA, pursuant to FGC Section 1603

Within 60 days of determining the Notification complete, CDFW will determine whether the proposed project may substantially adversely affect an existing fish and wildlife resource and if it is determined such an effect is possible, CDFW will provide OCTA/Caltrans with a project-specific draft LSAA. The draft LSAA will follow the CDFW's standard LSAA template that is in use at the time it is drafted. Currently, LSAAs include a unique notification number, recitals, term and effective date, language regarding extension, amendment, suspension and revocation, liability, enforcement of the agreement, and signature blocks for concurrence. Project-specific information in LSAAs includes the project location and description, the fish and wildlife resources that may be affected by the project, the potential adverse effects of the project, the amount and type of habitat affected, avoidance and minimization measures, and the type of mitigation (e.g., number of acres deducted from the restoration plan and mitigation ledgers).

During the term of the IA, when a covered freeway improvement project requires a LSAA, the Plan (including this appendix) and IA shall serve as the starting framework for determining the CDFW jurisdictional streambed avoidance and minimization measures and compensatory mitigation requirements that will be included in the project-specific draft LSAA. After review of the specific details of the proposed project, CDFW will incorporate the protective measures contained in the Plan and this appendix that are applicable to the project. CDFW will also determine whether additional avoidance and/or minimization measures are warranted, as well as additional compensatory mitigation measures in the event that the pre-approved restoration project(s) do not provide "in-kind" mitigation for a specific project's streambed impacts, and will include such measures in the draft LSAA. Additional measures may be required, for example, to reduce or offset effects to non-covered species, or to minimize impacts to hydrology or sediment transport after review of project-specific construction plans. If OCTA/Caltrans finds any of the additional measures proposed by CDFW to be unacceptable, negotiation may be initiated and conducted in accordance with Fish and Game Code Section 1603.

IV. Mitigation for unavoidable impacts

The Plan conservation strategy includes the acquisition of Preserves and funding of restoration projects throughout the Plan Area in core habitat areas and within key habitat linkages and riparian corridors (see Sections 5.4 and 5.5 of the Plan). The restoration projects and if necessary, the Preserves will provide mitigation that can be used to offset unavoidable impacts on CDFW jurisdictional streambed caused by covered freeway improvement projects implemented consistent with the Plan and IA and subject to California Fish and Game Code sections 1600–1616. Through the Early Action Plan (EAP), OCTA has been able to acquire Preserves and fund restoration projects prior to the construction of freeway projects to provide for upfront and comprehensive mitigation.

To date, OCTA has approved for funding 11 restoration projects. Of these 11 restoration projects, nine of the projects provide for the rehabilitation, enhancement, and/or establishment of CDFW jurisdictional streambed. This appendix identifies the mitigation acreage associated with these nine restoration projects that totals approximately 101.50[1] acres (Tables E-1-2 of this appendix). The restoration projects are in varying stages of planning and implementation. The mitigation acreage can be used to offset impacts associated with the covered freeway improvement projects that will be constructed in the future or already constructed. Additional restoration projects may occur in the near future, which may provide for additional mitigation acreage. If a restoration project is going to be considered for the Streambed Program, CDFW NCCP and Streambed Program staff will participate in the selection, review, and approval of the restoration site and plan. Detailed information for any future restoration sites, including the type and amount of acreage debited will be added to the Mitigation Summary Ledger and Restoration Site Tracking Sheet (Section VIII. Tables E-4-5 of this appendix).

OCTA has also acquired five Preserves that will provide for the conservation and management of 80.98 acres of CDFW jurisdictional streambeds and associated riparian habitat within the San Juan Creek and Santa Ana River watersheds (Table E-1 of this appendix). The preservation mitigation acreage associated with the Preserves is not expected to be needed to offset impacts to CDFW jurisdictional streambeds, therefore the established mitigation ratio caps in Table E-3 of this appendix do not take into account preservation as a part of the mitigation ratio and these sites are

[1] This estimate is based on conceptual restoration design plans. The final acreage of restored habitat may be refined during final restoration design and during implementation.

not included in the mitigation tracking ledgers. However, if necessary, mitigation ratios may be negotiated for the Preserves during the project-level LSAA process.

Table E-1 below identifies the restoration site, watershed location, type of resource associated with the restoration activity (rehabilitation and establishment), and type and amount of mitigation available at the site. For the M2 program, CDFW requested the use of the U.S. Army Corps of Engineers (USACE) mitigation definitions found in the Code of Federal Regulations (CFR) Title 33, section 323: *rehabilitation* is "the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area". *Establishment* is defined as "(creation) means the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions". *Enhancement* is defined in CFR Title 33, section 323 as "the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area".

In addition, Table E-1 below provides information for the acquisition properties including watershed location and type and amount of CDFW jurisdiction being preserved and enhanced by land management activities such as fencing, removal of livestock grazing, and removal of weeds. Resource Management Plans (RMPs) detailing the existing biological conditions and intended maintenance activities on each acquisition property are under development and will be approved by CDFW. As indicated above, the preservation area is not expected to be needed to offset impacts to CDFW jurisdictional streambeds; however, if necessary, mitigation ratios may be negotiated for the preservation sites during the project-level LSAA process.

Table E-1. Summary of Streambed Mitigation Acreage at Restoration Project Sites and Preserves[1]

Restoration Site	Preserve	Watershed	Type	Rehabilitation/ Enhancement	Establishment	Preservation	CDFW Approval Date	Project Initiated
Big Bend	-	Aliso-San Onofre	Riparian	0.5	-	-	6/11	02/11
City Parcel	-	Aliso-San Onofre	Riparian	4.48	-	-	1/11	09/10
Fairview Park	-	Santa Ana River	Wetland	-	6.0	-	2/11	9/11
Fairview Park	-	Santa Ana River	Riparian	3.3	-	-	2/11	9/11
Agua Chinon	-	Newport Bay	Riparian	6.69	-	-	TBD	TBD
Aliso Creek	-	Aliso-San Onofre	Riparian	50.98	-	-	TBD	TBD
Lower Silverado Canyon	-	Santa Ana River	Riparian	23.01	-	-	TBD	TBD
West Loma	-	Santa Ana River	Riparian	2.61	-	-	TBD	TBD
Chino Hills State Park	-	San Gabriel River	Riparian	3.58	-	-	TBD	TBD
Harriett Wieder	-	Seal Beach	Riparian	-	0.35	-	TBD	TBD
-	Ferber Ranch	Aliso-San Onofre	Riparian	-	-	53.30	-	-
-	Hafen	Aliso-San Onofre	Riparian	-	-	4.35	-	-
-	Hayashi	Santa Gabriel River	Riparian	-	-	6.35	-	-
-	O'Neill Oaks	Aliso-San Onofre	Riparian	-	-	11.47	-	-
-	Saddle Creek South	Aliso-San Onofre	Riparian	-	-	7.33	-	-
Total Mitigation				**95.15**	**6.35**	**82.81**		

1. This estimate is based on conceptual restoration design plans. The final acreage of restored habitat may be refined during final restoration design and during implementation.

For each restoration site, Table E-2 below identifies the plant community being rehabilitated/enhanced or established and the dominant plant species associated with the community. The top dominant species for each plant community are listed first and are in bold type.

Table E-2. Streambed Restoration Site Plant Community Detail

Restoration Site	Watershed	Plant Community	Dominant Plant Species	Rehabilitation/ Enhancement	Establishment
Big Bend	Aliso-San Onofre	Southern Cottonwood-Willow Riparian Forest	***Platanus racemosa*** ***Mimulus aurantiacus*** ***Elymus condensatus*** *Rosa californica* *Artemisia douglasiana* *Rubus ursinus*	0.10	-
		Mulefat Scrub	***Baccharis salicifolia*** ***Elymus condensatus*** ***Artemisia douglasiana*** *Mimulus aurantiacus* *Artemisia californica* *Rosa californica*	0.37	-
		Southern Willow Scrub	***Salix lasiolepis*** ***Salix laevigata*** ***Baccharis salicifolia*** *Rubus ursinus* *Rosa californica*	0.005	-
		Southern Coast Live Oak Riparian Forest	***Quercus agrifolia*** ***Heteromeles arbutifolia*** ***Sambucus mexicana*** Rhus integrifolia	0.025	-
City Parcel	Aliso-San Onofre	Southern Willow Scrub	***Salix lasiolepis*** ***Salix exigua*** ***Salix goodingii*** *Baccharis salicifolia* *Artemisia douglasiana*	2.23	-
		Mulefat Scrub	***Baccharis salicifolia*** *Salix exigua* *Artemisia douglasiana*	2.25	-
Fairview Park	Santa Ana River	Cattail Marsh	***Typha latifolia*** ***Schoenoplectus californicus*** ***Pluchea odorata***	-	6.0
		Alder Woodland	***Alnus rhombifolia*** ***Artemisia douglasiana*** ***Sambucus mexicana***	3.3	-

Restoration Site	Watershed	Plant Community	Dominant Plant Species	Rehabilitation/ Enhancement	Establishment
Agua Chinon	Newport Bay	Oak Riparian	***Quercus agrifolia*** ***Sambucus nigra*** ***Heteromeles arbutifolia*** *Malosma laurina* *Rhus integrifolia*	0.30	-
		Mulefat Scrub/ Herbaceous Riparian	***Baccharis salicifolia*** ***Artemisia californica*** ***Eriogonum fasciculatum***	2.91	-
		Elderberry Shrubland/ Sage Scrub	***Sambucus nigra*** ***Artemisia californica*** ***Eriogonum fasciculatum*** *Baccharis salicifolia*	3.48	-
Aliso Creek	Aliso-San Onofre	Southern Cottonwood-Willow Riparian Forest	***Salix lasiolepis*** ***Salix gooddingii*** ***Salix laevigata*** *Platanus racemosa* *Populus fremontii*	4.43	-
		Mulefat Scrub	***Baccharis salicifolia*** ***Salix lasiolepis*** ***Artemisia douglasiana*** *Mimulus aurantiacus* *Artemisia californica* *Rosa californica*	9.20	-
		Southern Willow Scrub	***Salix lasiolepis*** ***Salix gooddingii*** ***Salix laevigata*** *Baccharis salicifolia* *Platanus racemosa* *Populus fremontii*	34.49	-
		Freshwater Marsh	***Typha latifolia*** ***Typha domengensis*** ***Schoenoplectus californicus*** *Bolboschoenus maritiums*	1.86	-
		Coyote Scrub	***Baccharis pilularis*** ***Baccharis salicifolia*** *Artemisia douglasiana*	0.29	-
Lower Silverado Canyon	Santa Ana River	Coastal Sage Scrub/ Mulefat Scrub	***Eriogonum fasciculatum*** ***Baccharis salicifolia*** ***Artemisia californica***	0.29	-
		Mulefat Scrub	***Baccharis salicifolia*** *Artemisia douglasiana* *Ambrosia psilostachya*	14.46	-

Restoration Site	Watershed	Plant Community	Dominant Plant Species	Rehabilitation/ Enhancement	Establishment
		Mulefat Scrub/ Willow Riparian	***Salix spp*** ***Baccharis salicifolia*** *Stachys bullata* *Artemisia douglasiana*	4.63	-
		Mulefat Scrub/ Sycamore	***Platanus racemosa*** ***Baccharis salicifolia*** *Stachys bullata* *Artemisia douglasiana*	0.27	-
		Alluvial Scrub	***Lepidospartum squamatum*** ***Eriogonum fasciculatum*** ***Salvia mellifera*** *Bebbia juncea*	3.36	-
West Loma	Santa Ana River	Coastal Sage Scrub	***Artemisia californica*** ***Encelia californica*** ***Eriogonum fasciculatum*** *Salvia apiana* *Phacelia cicutaria* *Malacothrix saxatilis* *Opuntia littoralis* *Leymus condensatus* *Stipa pulchra*	0.05	-
		Mulefat Shrubland	***Baccharis salicifolia*** ***Sambucus nigra*** ***Baccharis pilularis*** ***Stipa pulchra*** *Salix lasiolepis* *Platanus racemosa* *Bromus carinatus* *Asclepias fascicularis*	0.85	-
		Elderberry Shrubland	***Sambucus nigra*** ***Rhus integrifolia*** ***Leymus condensatus*** *Malosma laurina* *Baccharis pilularis* *Stipa pulchra* *Opuntia littoralis*	0.59	-

Restoration Site	Watershed	Plant Community	Dominant Plant Species	Rehabilitation/ Enhancement	Establishment
		Red Willow Woodland	***Salix laevigata*** ***Salix lasiolepis*** ***Platanus racemosa*** ***Juncus spp*** *Salix gooddingii* *Baccharis salicifolia* *Anemopsis californica* *Carex spp* *Typha spp* *Asclepias fascicularis*	1.12	-
Chino Hills State Park	San Gabriel River	Willow Riparian	***Salix lasiolepis*** ***Baccharis salicifolia*** ***Juglans californica***	3.58	-
Harriett Wieder	Seal Beach	Riparian Willow Scrub	***Salix lasiolepis*** ***Salix gooddingii***		0.35
Total Mitigation				**95.15**	**6.35**

Final compensatory mitigation ratios for permanent impacts to CDFW jurisdictional streambeds will be determined at the project-level when impact details will be available and provided to CDFW to adequately assess compensatory mitigation requirements, but will not exceed the established habitat type ratios identified in Table E-3 below. The habitat types listed in Table E-3 below include those expected to occur within the M2 project impact areas, based on baseline studies conducted in 2010-2011. Although not anticipated, if a habitat type not listed in Table E-3 were to develop within an M2 impact area, this would be considered an extraordinary circumstance requiring additional mitigation ratio negotiations not covered by this Streambed Program.

Factors that will be used in determining project-specific mitigation ratios, within the established ratio caps, may include the habitat type being impacted (see Table E-3 below), the habitat type mitigating the impact (i.e., in-kind mitigation), watershed location of the impact site relative to watershed location of the restoration site, amount and quality of buffer area surrounding the restoration site, the existing level of streambed function at the restoration site prior to the mitigation, the resulting level of streambed function expected at the restoration site after the project reaches its success criteria, as well as initiation of the restoration activities prior to impacts associated with the covered freeway improvement projects (i.e., compensating for temporal loss of streambed functions and values). In addition, if a restoration site qualifies for pre-mitigation status, the required compensatory mitigation for a given freeway projects will be reduced by one ratio point. Pre-mitigation means the restoration site has been signed-off by CDFW, or is close to establishment (e.g. Years 4-5 for 5-Year sites or Years 9-10 for 10-Year sites) and is meeting its final year success criteria, including having irrigation shut off for 2 years, subject to prior approval by CDFW.

Table E-3. Streambed Program Wetland Mitigation Ratio Caps for Permanent Impacts

Habitat Type	Mitigation Ratio Caps
Riparian Habitats	
Oak riparian forest	3:1
Riparian forest	3:1
Riparian woodland	3:1
Riparian scrub	2:1
Freshwater Marsh	2:1
Natural Flood Channel	2:1
Disturbed Wetland	2:1

Compensatory mitigation will not be required for unvegetated or herbaceous (non-wetland) ditches if replaced in another location onsite with a similar feature or an environmentally superior feature (i.e., replacement of an unvegetated ditch or herbaceous mixed native and non-native riparian ditch with an herbaceous native riparian vegetated swale). The replacement feature must be installed within 12 months of initial occurrence of project impacts to jurisdictional habitats. Any temporal loss of riparian/ streambed function caused by delays in replacement shall be mitigated offsite at a 0.5:1 replacement-to-impact ratio for every 6 months of delay (i.e., 1:1 for 12 months delay, 1.5:1 for 18 months delay, etc.). If an unvegetated or herbaceous (non-wetland) ditch is permanently filled and not replaced as described above, compensatory mitigation would be required at a 1:1 ratio.

In addition, concrete-lined features, which are previously impacted and mitigated or are man-made features constructed to convey downstream flows consisting mostly of urban and storm runoff, will not require compensatory mitigation contingent upon continued conveyance of baseline flows downstream. Impacts to concrete features are anticipated to include filling and replacing with a similar feature, or an environmentally superior feature, in a different location or converting to an underground pipe. Additional anticipated impacts to concrete-lined features include extending box culverts and adding piers to bridges. If a concrete feature is permanently filled and not replaced with a feature that conveys flows, compensatory mitigation would be required at a 1:1 ratio.

Temporary impacts must be restored to pre-project conditions, in accordance with CDFW-approved restoration plans, with no additional compensatory mitigation required. Implementation of the restoration of temporary impacts shall commence immediately following completion of construction or, with written approval from CDFW, at the beginning of the next growing season after project completion. Restoration of temporary impacts shall be installed within 12 months of initial occurrence of project impacts to jurisdictional habitats. Any temporal loss of riparian/wetland/ streambed function caused by delays in mitigation implementation shall be mitigated in-kind through riparian/wetland/streambed establishment, rehabilitation, and/or enhancement at a 0.5:1 replacement-to-impact ratio for every 6 months of delay (i.e., 1:1 for 12 months delay, 1.5:1 for 18 months delay, etc.). In the event that the Construction Lead is wholly or partly prevented from restoring temporary impacts within the above time frame (causing temporal losses due to delays) because of unforeseeable circumstances or causes beyond reasonable control, and without the fault or negligence of the Construction Lead, including but not limited to natural disasters (e.g., earthquakes, flooding, etc.), labor disputes, or actions by Federal or State agencies, or other governments, OCTA/Caltrans may be excused by such unforeseeable cause(s) from the additional

0.5:1 per 6 months mitigation. Any onsite restoration deemed infeasible as a result of such unforeseeable causes(s) will be considered a permanent impact, and will be mitigated accordingly.

The status of the restoration of temporary impacts will be provided in a memo or as required in project-level LSAAs. Information on impacts will also be included with the NCCP/HCP annual report to CDFW. Mitigation tracking, including the type and amount of acreage debited, will be recorded in the M2 Freeway Program Mitigation Summary Ledger (Section VIII. Table E-4 of this appendix) and Restoration Site Tracking Sheet (Section VIII. Table E-5 of this appendix). As project impacts are initiated, restoration acreage will be deducted from the Mitigation Summary Ledger and Restoration Site Tracking Sheet.

In compliance with the Executive Order on Invasive Species, EO 13112, and subsequent guidance from the Federal Highway Administration, landscaping and erosion control and any other use of plants included in the project will not use species listed as noxious weeds in either the state noxious weed list or the current list(s) from the California Invasive Plant Council (Cal-IPC 2006, 2007) or as updated at the time of project initiation.

In addition, the general and specific conservation policies for Covered Species identified in subsections 5.6 of the Plan will apply to fish, wildlife, and plant resources avoidance, minimization, and mitigation measures for covered freeway improvement projects subject to California Fish and Game Code sections 1600–1616.

Nothing in this Plan alters California Fish and Game Code section 1610. In those circumstances where California Fish and Game Code sections 1600–1616 do not apply, they shall continue to not apply. Nothing in this Plan alters or limits CDFW's authority under California Fish and Game Code sections 1600-1616.

This section does not apply to projects or activities not covered by the Plan.

V. Machinery/Equipment

A list of machinery that may be operated within streambeds for freeway construction projects is provided below but will vary based on the project activity. The specific equipment to be used for each project will be provided in the project-level Notification form. Additional equipment may be necessary and will require specific authorization from CDFW.

- Loader
- Water truck
- Cement truck
- Concrete pump
- Slip-form paver
- Vibratory roller
- Asphalt roller
- Crane

- Lift (cherry picker)
- Pile driver
- Support vehicles
- Vactor truck (if any dewatering or sediment removal is required)
- Scrapers
- Backhoes
- Dump trucks
- Paving machines

VI. OCTA Streambed Guidance Measures

When working in or adjacent to the bed, channel, or bank of any river, stream, or lake regulated pursuant to California Fish and Game Code Sections 1600–1616, the Construction Lead will implement the work conditions listed below, as applicable, to avoid or minimize substantial adverse effects. The applicable conditions will be incorporated into the project-level LSAA.

1. Definitions

For the purposes of this LSAA, the following definitions apply to all measures found herein:

1.1. Bat Biologist means a biologist familiar with bat behavior.

1.2. Compensatory mitigation means the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

1.3. Habitat Mitigation and Monitoring Plan means a plan describing in detail the necessary steps and requirements to construct, maintain, monitor, and bring to completion (i.e. meet performance standards) a compensatory mitigation project. A final mitigation plan is generally developed from a conceptual mitigation proposal or conceptual mitigation plan. Conceptual mitigation proposals, conceptual mitigation plans, detailed plans, and final mitigation plans should contain increasing detail.

1.4. Condition means the relative ability of a resource to support and maintain a community of organisms having a species composition, diversity, and functional organization comparable to reference resources in the region.

1.5. Designated Biologist means a person who is a qualified biologist and has been identified as the lead biologist for a project or portion of a project.

1.6. Enhancement means the manipulation of the physical, chemical, or biological characteristics of a resource to heighten, intensify, or improve a specific resource function(s). Enhancement results in the gain of selected resource function(s), but may also lead to a decline in other resource function(s). Enhancement does not result in a gain in resource area.

1.7. Establishment (creation) means the manipulation of the physical, chemical, or biological characteristics present to develop a resource that did not previously exist at an upland site. Establishment results in a gain in resource area and functions.

1.8. Environmentally Sensitive Area (ESA) means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments.

1.9. Functions means the physical, chemical, and biological processes that occur in ecosystems.

1.10. Functional/Condition assessment method means any approved, scientifically based method to evaluate current functions and services of a resource. The resource is compared to similar resources that are relatively unaltered. The approach is based on combining variables that are typically structural measures or indicators that are associated with one or more ecosystem functions. Functions normally fall into one of three major categories: (1) hydrologic (e.g., storage of surface water), (2) biogeochemical (e.g., removal of elements and compounds), and (3) physical habitat (e.g., topography, depth of water, number and size of trees).

1.11. Impact means adverse effect.

1.12. In-kind means a resource of a similar structural and functional type to the impacted resource.

1.13. Notify means submit a new Notification of Lake or Streambed Alteration FG 2023 to California Department of Fish and Wildlife (CDFW).

1.14. Out-of-kind means a resource of a different structural and functional type from the impacted resource.

1.15. Performance standards are observable or measurable physical (including hydrological), chemical and/or biological attributes that are used to determine if a compensatory mitigation project meets its objectives.

1.16. Qualified Biologist means a person with a bachelor's or higher degree in biology, zoology, environmental sciences or related field and significant knowledge and experience with the biology, natural history, monitoring, collecting and/or handling of fish, wildlife and sensitive species.

1.17. Re-establishment means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former resource. Re-establishment results in rebuilding a former resource and results in a gain in resource area and functions.

1.18. Reference site means a resource site within the same watershed, a site up- or downstream along the same river or stream reach or within the same wetland complex, or multiple, within-watershed reference sites, possibly as part of a reference network. A reference site should be similar to the targeted mitigation site condition and generally represents least-disturbed conditions.

1.19. Rehabilitation means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded resource. Rehabilitation results in a gain in resource function, but does not result in a gain in resource area.

1.20. Resource means any natural resource.

1.21. Restoration means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded resource. For the purpose of tracking net gains in resource area, restoration is divided into two categories: reestablishment and rehabilitation.

1.22. Temporal loss is the time lag between the loss of resource functions caused by the permitted impacts and the replacement of resource functions at the compensatory mitigation site. Higher compensation ratios may be required to compensate for temporal loss. When the compensatory mitigation project is initiated prior to, or concurrent with, the permitted impacts, CDFW may determine that compensation for temporal loss is not necessary, unless the resource has a long development time.

1.23. Temporary impacts means the impacted resources are completely restored to pre-construction elevations and contours, conditions and functionality, and will not be impacted in the future by on-going maintenance.

2. General Measures

2.1. Changes in Project. In the event that the project scope, nature, or environmental impact is altered by subsequent permit measures by a local, state or federal regulatory authority, Permittee shall either submit an Amendment request or re-Notify CDFW of any project modification which conflicts with current measures or project description.

2.2. Notification of Conflicting Provisions. Permittee shall notify CDFW if Permittee determines or learns that a provision in the LSAA might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, CDFW and Permittee shall resolve any conflict through agreement or arbitration.

2.3. Biological Monitor. A qualified biologist shall be onsite to monitor all activities that result in the clearing of sensitive habitat as well as grading, excavation, and/or other ground-disturbing activities in jurisdictional areas. The Permittee shall flag the limits of grading and the jurisdictional areas, perform necessary surveys, and take photographs during the construction process, as required by this LSAA. The biological monitor is required to halt construction activities if threatened or endangered species are identified and notify the appropriate agencies immediately.

2.4. Biological Monitor Authority. To ensure compliance with the measures of this LSAA, the Biological Monitor shall have authority to immediately stop any activity that does not comply with this LSAA, and/or to order any reasonable measure to avoid the violation of LSAA measures.

2.5. Protected Species. This LSAA does not authorize take, incidental or otherwise, of any protected species. For the purpose of this LSAA, "protected species" means the following: a species fully protected under state law; a species listed under the California Endangered

Species Act (Fish & G. Code § 2050 et seq.) and/or Endangered Species Act (16 U.S.C. § 1531 et seq.); a species identified by CDFW as a species of special concern; or any other species for which take is prohibited under state or federal law. No direct or indirect impacts shall occur to any protected species, except as may be authorized by a Natural Community Conservation Plan permit or one or more individual permits that authorize such impacts.

2.6. Trash Abatement. Permittee shall initiate a trash abatement program before starting construction and shall continue the program for the duration of the Project. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed at least once a week to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.

2.7. Educational Program. Permittee shall conduct an education program for all persons employed or otherwise working in the project area before performing any work. The program shall consist of a presentation from the Designated Biologist that includes a discussion of ESA, of the biology and general behavior of any species listed under the California Endangered Species Act (CESA) known to utilize project ESA, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this LSAA. Permittee shall provide interpretation for non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the project area. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry in the project area. Upon completion of the program, employees shall sign a form stating they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees that will be conducting work in the project area.

2.8. CDFW Access. Permittee shall provide CDFW staff with reasonable access to the Project and mitigation lands under Permittee control, and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this LSAA.

3. Work Period and Time Limits Measures

3.1. Seasonal Restrictions. Permittee shall take all reasonable and practicable precautions to prevent disruption of the nesting and/or reproductive behavior of birds and other animals. To the extent practicable, vegetation removal should only be conducted between September 16 and February 28 (or February 29). Any vegetation removal or other potentially disruptive project activities occurring between January 16 and March 1 (or as early as January 1 for some birds) shall be conducted in such a way as to avoid disruption of bird/animal nesting and/or reproductive behavior. Appropriate precautions include, but are not limited to, pre-activity nesting surveys, adequate buffer areas around nest sites (e.g., as determined by a qualified biologist and based on the species and tolerance level of the animal, the nature of the activity, and the ambient conditions at the site), onsite biological monitors to observe whether bird/animal behavior is altered by project activities and stop work as necessary, etc. This LSAA does not authorize Permittee to take birds or other animals or to destroy the nest or eggs of any bird.

4. Habitat Protection Measures

4.1. Environmentally Sensitive Areas. All native /sensitive habitat(s) outside the permanent and temporary construction limits shall be designated as Environmentally Sensitive Area(s) (ESA) on project maps and on all project plan sheets, contract specifications, and contracts. ESA shall be temporarily fenced during construction with orange plastic snow fence or similar fencing. No personnel, equipment, or debris will be allowed within an ESA unless otherwise authorized in the final issued LSAA.

4.2. Wildlife Protection. If any wildlife is encountered in the stream or lake zone during the course of construction, said wildlife shall be allowed to leave the construction area unharmed.

4.3. Erosion Control Materials. Permittee shall only use erosion and sediment control measures such as fiber rolls and erosion control blankets that utilize biodegradable materials such as jute instead of plastic mesh, to avoid potential plastics pollution hazards to wildlife, unless otherwise authorized in writing by CDFW.

4.4. Streambed Protection. Rock, gravel, and/or other materials shall not be imported to, taken from, or moved within the bed or banks of the stream except as otherwise specifically identified in the project's Notification of Lake or Streambed Alteration and authorized in the final issued LSAA.

4.5. Domestic Animals. Permittee shall prohibit domestic dogs and other domestic animals from the Project site and site access routes during Project activities and development of the Project, except service dogs in the possession of authorized personnel or local, State, or Federal law enforcement officials.

4.6. Oak Trees. Permittee shall ensure that no equipment shall be operated within the drip-line of oak trees. If work occurs within the vicinity of oak trees then Permittee shall place protective fencing around the drip-line of oaks to prevent compaction of the root zone unless the work zone is within an existing paved areas or shoulder, in which case a modified ESA should be placed on all plans and specifications requiring protection of the tree including its roots, but not requiring fencing be installed.

5. Equipment and Access

5.1. Vehicles. Permittee shall ensure any equipment or vehicles driven and/or operated within or adjacent to the stream/lake shall be checked and maintained daily, to prevent leaks of materials that if introduced to water could be deleterious to aquatic life.

5.2. Equipment Maintenance. Inspection and cleaning of construction equipment shall be performed to minimize the importation of non native plant material, and eradication strategies (i.e., weed abatement programs) shall be employed should an invasion occur. CDFW also encourages removal of highly invasive non native weed species from the project area and adjacent habitat.

5.3. Construction Staging Areas. Staging/storage areas for construction equipment and materials shall be located outside the ordinary high water mark.

5.4. Equipment and Access. Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas) without the prior written approval of CDFW or as authorized by this LSAA.

5.5. Equipment and Access. If operations require moving of equipment across a flowing stream, Permittee shall conduct such operations without significantly increasing stream turbidity. For repeated crossings, Permittee shall install a bridge, culvert, or rock-fill crossing as specified in this LSAA, and approved by CDFW prior to placement.

5.6. Equipment and Access. Permittee shall not drive or operate vehicles or equipment in water covered portions of a stream or lake, or where wetland vegetation, riparian vegetation, or aquatic organisms may be impacted, except as otherwise provided for in the LSAA and as necessary to complete authorized work.

5.7. Equipment and Access. Permittee may operate construction equipment in wet portions of a stream or lake to accomplish the work authorized by this LSAA. This work is only authorized when the equipment is completely clean of petroleum residue and water levels are below the gear boxes of the equipment in use or lubricants and fuels are sealed such that inundation by water shall not result in leaks.

5.8. Equipment and Access. Access to the work site shall be via existing roads and access ramps when legally available to Permittee and its contractors for such use.

5.9. Equipment and Access. Vehicles may be driven on a stream or lake bed to traverse the distance to the work site from available access point(s), and within [XX][2] feet of the work area, and only as necessary to accomplish authorized work.

5.10. Equipment and Access. Water containing mud, silt, or other pollutants from equipment washing or other activities shall not be allowed to enter a lake or flowing stream or placed in locations that may be subjected to high storm flows.

5.11. Stationary Equipment. Permittee shall ensure stationary equipment such as motors, pumps, generators, and welders, located within or adjacent to a stream or lake shall be positioned over drip pans or confined within berms capable of containing any spills. Stationary heavy equipment shall have suitable containment to handle a catastrophic spill/leak. Clean up equipment such as extra boom, absorbent pads, skimmers, shall be on site prior to the start of construction.

5.12. Equipment Maintenance. Permittee shall ensure no equipment maintenance shall be done within or near any stream channel or lake margin where petroleum products or other pollutants from the equipment may enter these areas under any flow.

5.13. Hazardous Waste. Permittee shall immediately stop the activity causing any fuel or hazardous waste leaks or spills and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals at the time of occurrence, or as soon as it is safe to do so. Permittee shall exclude the storage and handling of hazardous materials from the affected area and shall properly contain and dispose of any unused or leftover hazardous products offsite. CDFW shall be notified immediately by Permittee of any spills and shall be consulted regarding clean-up procedures.

[2] Distance to be determined at the project-level.

6. Pollution and Litter

6.1. Pollution and Litter. Permittee and its contractors, subcontractors, and employees shall comply with all litter and pollution laws. It is the responsibility of Permittee to ensure compliance.

6.2. Pollution and Litter. Permittee shall not allow any debris, soil, silt, sand, bark, slash, sawdust, rubbish, construction waste, cement or concrete or washings thereof, asphalt, paint, oil or other petroleum products or any other substances which could be hazardous to aquatic life, or other organic or earthen material from any vegetation clearing, construction, aggregate washing or other associated project-related activity to contaminate the soil and/or enter into, or place where it may be washed by rainfall or runoff into, waters of the State. Permittee shall immediately remove any of these materials, placed within or where they may enter a stream or lake, by Permittee or any party working under contract, with the permission of Permittee. When project operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any stream or lake.

6.3. Pollution and Litter. Spoil sites shall not be located within a stream or where spoil shall be washed back into a stream or where it will cover aquatic or riparian vegetation, unless the site is specifically identified in the project's Notification of Lake or Streambed Alteration application.

6.4. Pollution and Litter. Any materials placed in seasonally dry portions of a stream or lake that could be washed downstream or could be deleterious to aquatic life shall be removed from the project site prior to inundation by flows.

7. Turbidity/Siltation

7.1. Turbidity/Siltation. Preparation shall be made so that runoff from steep, erodible surfaces will be diverted into stable areas with little erosion potential. Frequent water checks shall be placed on dirt roads, cat tracks, or other work trails to control erosion.

7.2. Turbidity/Siltation. Permittee shall not discharge silty/turbid water into a stream. Permittee shall cause such water to be settled, filtered, or otherwise treated prior to discharge. Precautions to minimize turbidity/siltation shall be taken into account during project planning and implementation. This may require that the work site be isolated and /or the construction of silt catchment basins, so that silt, or other deleterious materials are not allowed to pass to downstream reaches. The placement of any structure or materials in the stream for this purpose, not included in the original project description, shall be coordinated with CDFW. Coordination shall include the negotiation of additional LSAA provisions.

7.3. Turbidity/Siltation. Silt settling basins installed during the construction process shall be located away from any stream or lake to prevent discolored, silt-bearing water from reaching any stream or lake during any flow regime.

7.4. Turbidity/Siltation. If an off stream siltation pond/s is/are used to control sediment, pond/s shall be constructed in a location, or shall be designed, such that potential spills into the stream/lake during periods of high water levels/flow are precluded.

7.5. Turbidity/Siltation. If silt catchment basin/s are constructed across the stream, the number and location shall be approved by CDFW. Catchment basins shall be constructed of materials which are free from mud and silt such as silt free gravel or other materials approved by CDFW. Upon completion of the project, all basin materials along with the trapped sediments shall be removed from the associated stream in such a manner that said removal shall not introduce sediment to the stream.

7.6. Turbidity/Siltation. Upon CDFW determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation, shall be halted until effective CDFW approved control devices are installed, or abatement procedures are initiated.

7.7. Erosion Control. Permittee shall actively implement BMPs to prevent erosion and the discharge of sediment into streams and lakes during project activities. BMPs shall be monitored daily and repaired if necessary to ensure maximum erosion and sediment control.

8. Habitat Protection - Structures

8.1. Temporary Structures. Temporary structures and associated materials not designed to withstand high seasonal flows shall be removed to areas above the high water mark before such flows occur.

8.2. Habitat Protection - Structures. Permittee shall ensure that installation of bridges, culverts, or other structures shall be such that water flow necessary to maintain aquatic life and movement is not impaired. Permittee shall place bottoms of temporary culverts at stream channel grade and bottoms of permanent culverts shall be placed at or below stream channel grade. Excavation of the streambed and banks shall be limited to the extent necessary, as determined by the Permittee's project engineer, to install bottoms of culverts below stream grade. Temporary culverts placed on existing streambed grade shall be done so with minimal disturbance.

8.3. Habitat Protection - Structures. Permittee shall have all plans for concrete sills and other features that could potentially impede fish migrations within a stream where fish do/may occur approved in writing by CDFW except as otherwise specifically identified in the project's Notification of Lake or Streambed Alteration and authorized in the final issued LSAA.

8.4. Habitat Protection - Structures. Permittee shall allow sufficient water flow to pass downstream to maintain aquatic life below any dam or other artificial obstruction constructed, maintained, or placed in operation by this project, pursuant to Fish and Game Code section 5937.

8.5. Habitat Protection - Structures. Permittee shall construct any temporary crossing, dam or other artificial obstruction only from materials such as clean gravel which will cause little or no siltation, and shall be approved by CDFW prior to construction except as authorized in the final issued LSAA. Permittee shall ensure that culverts are appropriately sized and constructed to allow fish and wildlife movement. Upon completion of the project and after all flowing water in the area is clear of turbidity, Permittee shall remove the clean gravel or other material along with the trapped sediment from the stream unless otherwise directed in writing by CDFW.

8.6. Habitat Protection - Structures. Permittee shall not construct any temporary or permanent dam, structure, flow restriction or fill except as authorized in this LSAA.

8.7. Habitat Protection - Structures. Permittee shall ensure that all storm drain lines/culverts shall be adequately sized to carry 100 year event storm flows for the associated drainage and provide wildlife passage beyond bank full conditions (approximately 1.5 times the bank full condition). The storm drain lines/culverts and the outfall structure shall be properly aligned within the stream and otherwise engineered, installed and maintained, to assure resistance to washout, and to erosion of the stream bed, stream banks and/or fill. Water velocity shall be dissipated at the outfall where appropriate, to reduce erosion.

8.8. Habitat Protection - Structures. Permittee shall ensure that any structure/culvert placed within a stream where fish do/may occur, shall be designed, constructed and maintained such that it does not constitute a barrier to upstream or downstream movement of aquatic life, or cause an avoidance reaction by fish that impedes their upstream or downstream movement. This includes but is not limited to the supply of water at an appropriate depth, temperature, and velocity to facilitate upstream and downstream fish migration. If any aspect of the proposed project results in a long term reduction in fish movement, Permittee shall be responsible for all remedial or new structures, activities and expenditures necessary (as determined by CDFW) to secure passage of fish across the structure/culvert.

8.9. Habitat Protection - Structures. The inlet and outlet of all permanent culverts shall be protected by the placement of head walls that shall be constructed of rock riprap, gabions, concrete, or other suitable nonerodible material, as determined by the Permittee's project engineer. To prevent undercutting, the head walls shall be keyed in place. To prevent erosion, energy dissipaters will be installed.

8.10. Habitat Protection - Structures. Culverts shall be long enough to extend completely beyond the toe of the fill (unless both the up- and downstream sides of the fill are adequately protected to the maximum high-water mark).

8.11. Habitat Protection - Structures. All in-stream structures shall be designed so that no sudden change in stream velocity shall occur above, below, or in the structure. If a sudden change in stream velocities occurs upon installation of the structure, the structure shall be removed immediately.

9. Habitat Protection – Flow Diversions

9.1. Habitat Protection - Flow Diversions. Permittee shall ensure that pump intakes placed in stream/lake water shall be fitted with (1/8) inch or smaller mesh screens for January 1, through March 30, and (1/4) inch or smaller mesh screens thereafter.

9.2. Habitat Protection - Flow Diversions. All diversion channels shall be designed to maintain velocities at levels acceptable to all native and recreational fish species determined to be in the project impact area and adjacent upstream and downstream reaches.

10. Landscaping, Revegetation and Restoration

10.1. Habitat Restoration – Temporary Impacts. Permittee shall restore all temporary impacts on site at a 1:1 ratio immediately following construction completion or, with written approval from CDFW, at the beginning of the next growing season after project completion.

10.2. Temporary Streambed Fill. Permittee shall submit plans to CDFW for written approval of all temporary streambed fills. Such fill material shall be comprised of non-erodible materials and Permittee shall remove all material immediately upon work completion and restore the streambed to its previous condition (such as elevation and contour lines) or similar function.

10.3. Temporary Stream Channel Alteration Restoration. If a stream channel has been altered during the construction, its low flow channel shall be returned as nearly as practical to pre-Project topographic conditions without creating a possible future bank erosion problem or a flat, wide channel or sluice-like area. The gradient of the streambed shall be returned to pre-Project grade, to the extent practical.

10.4. Habitat Enhancement – Temporary Impacts. Permittee shall ensure that temporary impact areas will have exotic and/or invasive plant control immediately following the impact, utilizing mechanical and/or herbicide controls of appropriate herbicides (see all measures for Habitat Protection (Herbicide Use)). If mechanical means are utilized, plant material will be bagged and disposed of properly, with special attention to containment of any seeds to prevent seed dispersal.

10.5. Temporary Stream Habitat Alteration Restoration. All native riparian trees with a three-inch diameter at breast height (dbh) or greater in temporary impact areas shall be replaced using one- or five-gallon container plants, containered ("boxed") trees, or pole cuttings in the temporary impact areas in the winter following the disturbance. The growth and survival of the replacement trees shall meet the performance standards specified in a CDFW-approved restoration plan. In addition, the growth and survival of the planted trees shall be monitored until they meet the self-sustaining success criteria in accordance with the methods and reporting procedures specified in the restoration plan.

10.6. Habitat Restoration – Mulching. Native vegetation, which is free of invasive species, within temporary maintenance work areas may be mulched and spread, where appropriate, over the temporary impact areas once maintenance work is complete in order to facilitate revegetation. If vegetation is cut to ground level only, with the likelihood of re-growth, then cuttings may be removed from the maintenance site for recycling.

10.7. Landscaping, Revegetation and Restoration. Vegetation removed from the stream shall not be stockpiled in the stream bed or on its bank. The sites selected on which to push this material out of the stream should be selected in compliance with the other provisions of this LSAA. Where possible, brush piles shall be left at a location where they do not pose a risk to obstruct the channel due to storm flows, to provide wildlife habitat.

10.8. Herbicide Application. Permittee shall apply any herbicides in accordance with state and federal law. No herbicides shall be sprayed when wind velocities are above 5 miles per hour.

10.9. Herbicide Application - Selective Trimming. Permittee may perform a small amount of selective trimming of native species (e.g. willow, oak and sycamore) to prevent overspray of herbicide from reaching them, but only as provided here. Native vegetation may only be trimmed; Permittee shall not remove individual plants. Material in excess of three (3) inches DBH shall require specific notice to and consultation with the CDFW prior to commencement of trimming activities. Personnel performing trimming of native species shall be International Society of Arboriculture (ISA) Certified Arborists with training and experience performing the prescribed trimming procedures. Arborists will conduct trimming in such manner to minimize damage to the tree and maximize survival.

10.10. Landscaping, Revegetation and Restoration. CDFW recommends the use of native plants to the greatest extent feasible in the landscape areas adjacent and/or near the wetland/riparian areas. Permittee shall not plant, seed or otherwise introduce invasive exotic plant species to the landscaped areas adjacent and/or near the wetland/riparian areas. Exotic plant species not to be used include those species listed on Lists A & B of the California Invasive Plant Council's list of "Exotic Pest Plants of Greatest Ecological Concern in California as of October 1999." This list includes such species as: pepper trees, pampas grass, fountain grass, ice plant, myoporum, tree of heaven, black locust, capeweed, periwinkle, sweet alyssum, English ivy, French broom, Scotch broom, and Spanish broom. A copy of the complete list can be obtained by contacting the California Invasive Plant Council at 1442-A Walnut Street, #462, Berkeley, CA 94709, or by accessing their web site at http://www.cal-ipc.org.

11. Compensatory Mitigation Measures

11.1. Mitigation for Unauthorized Impacts. Permittee shall provide compensatory mitigation at a minimum 3:1 ratio subject to negotiation as appropriate with CDFW staff for impacts beyond those authorized in this LSAA. In the event that additional mitigation is required, the type of mitigation shall be determined by CDFW, and may include establishment (creation), restoration, enhancement and/or preservation.

11.2. Habitat Restoration – Permanent Impacts – Mitigation Acres. Permanent impacts to X.X[3] acre(s) of riparian/wetland habitat shall be mitigated at a ratio of X:1 (as approved in this appendix, Section IV – Mitigation for Unavoidable Impacts) using establishment (creation) (X.X acre(s)), and/or rehabilitation (X.X. acre(s)), enhancement (X.X acre(s)), and/or preservation (X.X. acre(s)) mitigation acres at an offsite location (name of the OCTA pre-approved restoration project or acquisition property). Permittee will provide documentation of debiting of mitigation acreage to CDFW prior to initiating project impacts. See the Mitigation Summary Ledger and Mitigation Site Credit Tracking Sheet (Section VIII. Tables E-4-5 of this appendix).

11.3. Habitat Restoration – Insect Pests. Permittee or the designated biologist shall inspect all plants to be utilized in onsite restoration, and their associated containers, for insect pests prior to installation, and shall reject for use at the restoration site all plants or containers with non-native or deleterious insect pests unless such plants or containers are treated to eliminate the pest species.

[3] Acreages to be determined at the project-level.

12. Reporting Measures

12.1. Notification Prior to and Following Completion of Work. Permittee shall notify CDFW, in writing, at least five days prior to initiation of construction (project) activities and at least five days prior to completion of construction (project) activities. Notification shall be sent to CDFW's South Coast Office, ATTN: OCTA M2 NCCP/HCP Streambed Alteration Program Staff – SAA # 1600-XXXX-XXXX-R5.

12.2. Post Construction Report. Permittee shall submit a post-construction compliance report to CDFW within thirty (30) days from the date construction is completed. The Report shall include:

a. A comparison including map overlays of and a discussion on the pre- and post-construction conditions (with supporting photo-documentation/video-surveys of areas avoided (streams and associated habitat areas to be avoided)); and

b. A summary of project compliance (including noncompliance and corrective actions taken to achieve compliance).

12.3. Annual Monitoring Reports. Permittee shall submit annual reports by February 1st of each year for the compensatory mitigation site(s),, and continuing until the performance criteria described in the Habitat Mitigation and Monitoring Plan (HMMP) are achieved. Permittee will then request a final review of the site and written confirmation of success from CDFW. Reports will include the following information:

a. Description of the restoration activities, including revegetation and exotic species removal, and when these activities were conducted;

b. Description of natural recruitment of native species on the site;

c. Qualitative and quantitative monitoring data related to required performance standards;

d. Weather conditions and response of restoration areas and/or implementation of restoration activities to changes in weather conditions;

e. Observations of any state or federally listed threatened or endangered species, California species of special concern, or their sign on restoration areas;

f. A table of general wildlife species using the site including reptiles, birds, mammals and invertebrates based on casual observation of those animals, their tracks, scat or other signs.

g. Discussion of any problems encountered during restoration, and the remediation implemented, including weed control, trash removal, etc.

12.4. Submit Documentation, Reports, and Surveys. Permittee shall submit all required documentation, reports and surveys described above to CDFW's South Coast Region office, Attn: OCTA M2 NCCP/HCP Streambed Alteration Staff. Please note the Streambed Alteration Agreement number in the subject line.

VII. NCCP/HCP Section 5.6

Relevant language from Section 5.6 (Avoidance and Mitigation) of the Plan is provided below for guidance and incorporation, as applicable, into the project-specific LSAAs. Note these measures may overlap with the Streambed Conditions provided above.

5.6 Avoidance and Minimization

The Plan includes measures to minimize take of Covered Species. Avoidance and minimization of effects on Covered Species and their habitats will be implemented through a process that verifies that construction activities undertaken as part of Covered Activities adhere to a set of protection measures. These measures include avoidance and minimization of sensitive biological areas, species-specific protection measures and policies, procedures for complying with nesting bird protections, stormwater and water quality BMPs, and other standard avoidance and minimization BMPs.

The avoidance and minimization measures are requirements that will be evaluated and implemented on a project-by-project basis for each Covered Activity. For each individual covered freeway improvement project, OCTA and Caltrans will establish cooperative agreements that define the responsibilities and oversight of each organization. OCTA will be responsible for preparing project-specific environmental documents, meeting Caltrans' standard CEQA/NEPA requirements, in which avoidance and minimization measures will be identified. Under the M2 program, either OCTA or Caltrans will function as the Construction Lead. Under the normal design, bid, build process, Caltrans is anticipated to be the Construction Lead. In certain instances, OCTA may be the Construction Lead for select M2 freeway improvement projects. It is anticipated Caltrans will be the Construction Lead for the majority of the M2 freeway improvement projects. Whichever entity functions as the Construction Lead, that entity will take the responsibility for implementation of avoidance and minimization measures. Any costs associated with implementing avoidance and minimization measures, as described in this section, will be funded through the individual construction budgets and will not rely on funding under the M2 Environmental Mitigation Program (see Section 8.3 of the Plan, "Plan Funding").

OCTA will have a Project Manager overseeing the activities undertaken by the Construction Lead. The OCTA Project Manager will be responsible for ensuring all avoidance and minimization measures are completed and documented by the Construction Lead and its contractors following the requirements as set forth by the Plan. Prior to construction of covered freeway improvement projects, the Construction Lead will submit a project-specific "Biological Resources Avoidance and Minimization Plan" to the Wildlife Agencies for review and approval. This plan will address compliance with each of the policies described below, including potential impacts on the identified resources, specific measures that will be implemented to comply with the policies, and appropriate reporting. If sufficient information on potential impacts and appropriate measures are incorporated into the project-specific CEQA/NEPA document or Natural Environment Study, the Construction Lead may reference the appropriate sections of these documents in their concurrence request to the Wildlife Agencies without preparing a separate plan.

5.6.1 Avoidance and Minimization of Sensitive Biological Resources

Prior to final design, OCTA will complete project-specific biological surveys to identify biologically sensitive areas within each covered freeway improvement project footprint. These surveys are typically completed as part of the preparation of the project environmental compliance documentation (CEQA/NEPA). The biological surveys will include, at a minimum, an initial field survey to map natural communities and determine if potential habitat of Covered Species exists within the project area. These biological surveys will produce a report consistent (Natural Environment Study) with Caltrans standard requirements and will be conducted during the Planning Development phase of each of the projects. Based on the results of the field surveys, the Construction Lead will identify and implement appropriate adjustments to project design and scheduling to avoid and minimize effects on biological resources while taking into consideration the degree of sensitivity of biological resources within the project area. Habitat types with a higher degree of sensitivity, such as rare/limited vegetation types (e.g., native grasslands, California walnut, cactus scrub) and riparian/wetland features will be avoided to the maximum extent possible. Given the nature of the covered freeway improvement projects, there will be limited opportunities to change project footprints; however, temporary staging, access roads, and other flexible project impact components will be located with consideration of biologically sensitive areas.

Standard BMPs that will be implemented to avoid and minimize impacts on biological resources will include, but not limited to:

- **Delineation of Environmentally Sensitive Areas.** Prior to clearing or construction, highly visible barriers (such as orange construction fencing) will be installed around areas adjacent to the project footprint to designate environmentally sensitive areas to be protected. No project activity of any type will be permitted within these environmentally sensitive areas. In addition, heavy equipment, including motor vehicles, will not be allowed to operate within the environmentally sensitive areas. All construction equipment will be operated in a manner so as to prevent accidental damage to environmentally sensitive areas. No structure of any kind, or incidental storage of equipment or supplies, will be allowed within these protected zones. Silt fence barriers will be installed at the environmentally sensitive area boundary to prevent accidental deposition of fill material in areas where vegetation is immediately adjacent to planned grading activities.
- **Restoration of Temporary Impacts.** Areas of natural habitat that are temporarily affected by construction activities will be restored to a natural condition. The restoration effort will emulate surrounding vegetation characteristics and/or return to previous conditions. For freeway construction projects, revegetation plans will be part of the project design following Caltrans' landscape architecture guidelines and requirements. Restoration plans will be reviewed and approved by the Wildlife Agencies.
- **Invasive Species Control.** Invasive species will be removed from the project work area and controlled during construction. The use of known invasive plant species (i.e., plant species listed in California Invasive Plant Council's [Cal-IPC's] California Invasive Plant Inventory with a High or Moderate rating) will be prohibited for construction, revegetation, and landscaping activities. Project measures will be included to ensure invasive plant material is not spread from the project site to other areas by disposal off site or by tracking seed on equipment, clothing, and shoes. Equipment/material imported from an area of invasive plants must be identified and measures implemented to prevent importation and spreading of nonnative plant material

within the project site. All construction equipment will be cleaned with water to remove dirt, seeds, vegetative material, or other debris that could contain or hold seeds of noxious weeds before arriving to and leaving the project site. Eradication strategies (i.e., weed abatement programs) will be employed should an invasion occur during construction.

- **Trash Control**. To avoid attracting predators of Covered Species and other sensitive species, the project site will be kept as clean of debris as possible. All food-related trash items will be enclosed in sealed containers and regularly removed from the site(s).
- **Onsite Training.** When in or near natural habitat areas, all personnel involved in the onsite project construction will be required to participate in a preconstruction training program to understand the avoidance and minimization obligations on the project.
- **Construction Monitoring.** A qualified biologist will monitor construction activities when necessary, as determined during the project-specific environmental review, for the duration of the project to ensure that practicable measures are being employed to avoid and minimize incidental disturbance of habitat and Covered Species inside and outside the project footprint. Opportunities to further avoid and minimize impacts on Covered Species will be explored.

5.6.2 Species-Specific Protection Measures and Policies

Covered freeway improvement projects will primarily affect low value habitats and impacts will be mitigated in advance through implementation of the Conservation Strategy (i.e., Preserve acquisitions and restoration projects). Therefore, OCTA is not required to complete focused species surveys for Covered Species unless there are additional avoidance and minimization measures that are warranted because there is the potential for that species to be present in the area of impact (as determined in the project-level biological report). These situations will need to be addressed in the following circumstances:

- **Aquatic Species.** If the project area includes aquatic resources, such as rivers, creeks, and riparian areas, specific avoidance and minimization measures will be employed to address dewatering and water diversions to maintain fish passage. This will also include an assessment of potential effects on arroyo chub and southwestern pond turtle. See Section 5.6.2.1, "Aquatic Resources and Species Policy."
- **Covered Plants.** If a Covered Activity has potential effects on a covered plant species, OCTA will evaluate effects based on project-specific field surveys. Mitigation of effects will be accomplished using conservation credits determined through field surveys of Preserves and actions taken to enhance, restore, and create populations of covered plant species as part of restoration projects approved for funding by OCTA. See Section 5.6.2.2, "Covered Plant Species Policy."
- **Wildlife Crossing.** If it is determined that an existing structure (culvert, underpass) is functioning as an important wildlife crossing and is potentially affected by a covered freeway improvement project, additional surveys and design requirements will be implemented following Caltrans standards. See Section 5.6.2.4, "Wildlife Crossing Policy."

5.6.2.1 Aquatic Resources and Species Policy

Construction activities in aquatic resources, such as rivers, creeks, and riparian areas, will be restricted during the rainy season (October 15 through June 1) or will be conducted when the resource is dry and/or lacks flowing or standing water. Construction activities in human-made features cannot be restricted to a given season because they are often routinely managed, and, therefore, water may be present regardless of the season. In the event that construction work-window restrictions cannot be followed, or in the case of human-made features, additional avoidance and minimization measures are required.

As part of the additional specific avoidance and minimization measures, dewatering and water diversion will be implemented as described below, and additional BMPs to reduce potential water-quality–related indirect impacts on special aquatic resources will be implemented as determined through consultation with USACE, CDFW's Lake and Streambed Alteration Program, and RWQCB. The additional BMPs may include the placement of additional straw wattles, silt fencing, or protective barriers as necessary.

Dewatering/Water Diversion

Construction activities in special aquatic resources will be restricted to the dry season (June 1 through October 15) when possible. However, open or flowing water may be present during construction. If construction occurs where there is open or flowing water, a strategy that is approved by the resource agencies (e.g., USACE, CDFW's Lake and Streambed Alteration Program, and RWQCB), such as the creation of cofferdams, will be used to dewater or divert water from the work area. If cofferdams are constructed, implementation of the following cofferdam or water diversion measures is recommended to avoid and lessen aquatic resources impacts during construction:

- The cofferdams, filter fabric, and corrugated steel pipe are to be removed from the creek bed after completion of the project.
- The timing of work within all channelized waters is to be coordinated with the regulatory agencies.
- The cofferdam is to be placed upstream of the work area to direct base flows through an appropriately sized diversion pipe. The diversion pipe will extend through the contractor's work area, where possible, and outlet through a sandbag dam at the downstream end.
- Sediment catch basins immediately below the construction site are to be constructed when performing in-channel construction to prevent silt- and sediment-laden water from entering the mainstream flow. Accumulated sediments will be periodically removed from the catch basins.

Arroyo Chub

The Construction Lead will retain a qualified biologist during any project that could impact potential arroyo chub habitat to determine if arroyo chub might be present and subject to potential injury or mortality from construction activities. The minimum qualifications for the fish biologist are described in Table 7-2 of the Plan. The biologist will conduct preconstruction surveys of the project area to determine whether such species are present or likely to be present near the project site. When arroyo chub are present and could be affected by construction activities, the project biologist will identify appropriate methods to capture, handle, exclude, and relocate those individuals. All fish exclusion activities will adhere to accepted NOAA Fisheries Service and CDFW protocols.

Western Pond Turtle

If potential western pond turtle habitat occurs within or adjacent to the construction area, coordination and approval by the Wildlife Agencies is required in order to determine a specific Western Pond Turtle Avoidance and Minimization Plan. This plan will be prepared by the Construction Lead and describe: (1) the methodology for pre-construction surveys based on the planned start of construction (i.e., within or outside of the season when western pond turtles are active); (2) structures that will be installed around the construction impact area to exclude turtles; (3) methodology for relocation of western pond turtles outside of the construction impact area; (4) identification of a relocation site at a nearby location in the same watershed as the covered freeway improvement project; (5) biological monitoring requirements during construction; and (6) avoidance measures to be implemented during construction to avoid and minimize impacts on the western pond turtle. Current required protocols include the following measures:

- **Western Pond Turtle Pre-construction Surveys**. Two weeks prior to ground-disturbing activities (including placement of heavy equipment) in or near aquatic habitats, the Construction Lead will ensure that a pre-construction survey is conducted for western pond turtles as described in the Western Pond Turtle Avoidance and Minimization Plan. The pre-construction surveys will be conducted by a Wildlife Agency-approved/qualified Biologist (i.e., one with pond turtle trapping/handling experience and holding a CDFW Scientific Collecting Permit to carry out these activities) to determine their presence or absence within the construction footprint. The pre-construction survey will include a trapping effort of four consecutive days prior to construction with traps checked daily; the trapping effort will be consistent with USGS trapping protocols. If nonnative species are captured during the trapping effort, they will be removed. The trapping effort will be combined with a visual survey; the Wildlife Agency-approved/qualified Biologist will walk the impact area to search for any potential breeding areas and existing nests. To the extent possible, pre-construction surveys will be conducted under weather conditions when western pond turtles are expected to be active. If construction begins under conditions that would not be conducive to western pond turtle activity, pre-construction surveys may be conducted more than two weeks prior or would use alternative methodology to detect aestivating turtles as described in the Western Pond Turtle Avoidance and Minimization Plan and approved by the Wildlife Agencies.

  A report documenting the pre-construction survey results and measures that will be required during construction as described in the Western Pond Turtle Avoidance and Minimization Plan will be provided to Caltrans/OCTA/Wildlife Agencies prior to commencing construction or within two weeks of completion of field surveys, whichever is earlier. If western pond turtles are found within the construction footprint, the occupied habitat and appropriate buffer, as determined by a qualified Biologist, will be avoided to the maximum extent practicable.

- **Western Pond Turtle Exclusion and Relocation**. If western pond turtles are present in the biological survey area during pre-construction surveys, exclusion and relocation of western pond turtles as described in the Western Pond Turtle Avoidance and Minimization Plan and approved by the Wildlife Agencies will be implemented. The Plan will provide for the erection of turtle barriers/exclusion fencing and surveys of the construction area to capture and relocate turtles from within the project work area. Turtles will be relocated to nearby suitable habitat a minimum of 300 feet downstream from the work area or another appropriate nearby location within the watershed; relocation areas will be described in the Western Pond Turtle Avoidance and Minimization Plan and will be approved by the Wildlife Agencies prior to relocation of turtles. Alternatively, if recommended/approved by the Wildlife Agencies in the Western Pond Turtle Avoidance and Minimization Plan, the turtles may be captured and temporarily held.

Pre-construction surveys will be conducted using a combination of visual, seine, and trap methods to determine the population structure and status. A minimum of two trapping periods, each consisting of four days and three nights, will be conducted during period of peak pond turtle activity (i.e., April to August). Additionally, immediately prior to initiation of construction, the Wildlife Agency-approved Biologist will visually survey the work area and will relocate any western pond turtles to the relocation site as approved by the Wildlife Agencies in the Western Pond Turtle Avoidance and Minimization Plan.

- **Biological Monitoring in Western Pond Turtle Occupied Habitat**. Biological Monitoring will occur as described in the Western Pond Turtle Avoidance and Minimization Plan. In areas where western pond turtle occurrence is assumed, a Biological Monitor will be present on site during vegetation clearing regardless of the outcome of pre-construction surveys and during other construction activities as described in the Plan. If a pond turtle is observed in the impact area (i.e., it was not captured during pre-construction trapping or enters into the construction area following trapping), the Biological Monitor will have the authority to stop construction activities that could harm the turtle until it can be captured and relocated out of the impact area. The Biological Monitor will contact the Construction Lead and the Wildlife Agencies immediately to notify them of the observation. The pre-construction survey methodology will be repeated to capture and relocate the western turtle out of the impact area. If the western pond turtle has not been captured after four days of trapping, the Construction Lead will contact the Wildlife Agencies to determine whether trapping will be extended or for authorization to continue construction activities.

  Exclusionary fencing will be used to ensure western pond turtles are kept out of the construction area as described in the Western Pond Turtle Avoidance and Minimization Plan. Exclusionary fencing will be maintained throughout the duration of construction. The integrity of the exclusion fencing will be checked daily by the Biological Monitor throughout construction. Additionally, the Biological Monitor will check the work area every morning before construction may begin to ensure that no turtles are within the exclusion area. Any western pond turtle found will be relocated immediately to the relocation area approved in the Western Pond Turtle Avoidance and Minimization Plan. If pond turtles are relocated during the pre-construction survey effort or during biological monitoring, the Biological Monitor will conduct follow-up visits to the relocation site to monitor the effectiveness of pond turtle relocation.

- **Avoidance and Minimization of Western Pond Turtle Habitat.** Construction will avoid work in ponded or flowing water within 1,500 feet of known turtle locations unless alternative avoidance and minimization measures described in the Western Pond Turtle Avoidance and Minimization Plan are approved by the Wildlife Agencies.

5.6.2.2 Covered Plant Species Policy

The covered plant species (intermediate Mariposa lily, many-stemmed dudleya, southern tarplant) are narrow endemics that are known only from California (or in the case of southern tarplant, also Baja California). Narrow endemic species are considered to have highly restrictive habitat requirements, localized soil requirements, or other ecological factors that limit their distribution. Due to variability in reproduction and survival that is influenced by physical disturbance as well as seasonal, climatic, and biotic factors, the status and distribution of their populations are particularly difficult to assess and predict using regional data sources. To ensure any actual impacts on covered plant species are properly addressed, OCTA will implement a Covered Plant Species Policy that will involve the evaluation of impacts based on project-specific field surveys. The policy will also set forth mitigation of impacts using conservation credits determined through field surveys of Preserves and actions taken to enhance, restore and create populations of covered plant species as part of restoration projects approved for funding by OCTA. This policy will require OCTA to maintain a ledger-type accounting system to track credits and debits. See the Plan for more information on the conversation strategy that is offsetting project impacts and providing for avoidance and minimization.

5.6.2.3 Wildlife Crossing Policy

As part of the project-specific biological surveys completed prior to final design, OCTA will ensure the project area is evaluated by a qualified biologist (Table 7-2) to determine if existing structures function as important wildlife movement crossings. Covered freeway improvement projects located within or between blocks of natural habitat or adjacent to key habitat linkages (see Figure 4-1) will be the primary focus for this assessment. OCTA will coordinate with the Wildlife Agencies and other entities (i.e., USGS) that are addressing wildlife movement in the Plan Area to take advantage of expert knowledge, existing data, and other sources of information to the degree appropriate. Assessments will be based on current methods and guidance to determine if any existing structures (culverts, underpass, pipes) function as wildlife crossings. The current set of Wildlife Agency-approved methods are in the Caltrans Wildlife Crossing Guidance Manual (Caltrans 2009), which is provided as Appendix G. If a proposed project could substantially alter the function of a potentially important wildlife crossing, then OCTA will evaluate the existing data and information. If OCTA, in collaboration with the Wildlife Agencies, determines that the existing data and information is not available and/or adequate to assess the functionality of the crossing, additional wildlife movement monitoring and surveys (e.g., using motion-activated cameras, track plates, etc. before and after project construction) may be required and would be used to determine what wildlife functional groups (large, medium, small mammals; amphibian/riparian reptiles; upland reptiles) utilize the crossing and to the extent of each group's use. If it is determined in collaboration with Wildlife Agencies that an existing structure functions as an important wildlife crossing and is proposed to be altered by the project in a manner that would have the potential to adversely affect wildlife movement, the Construction Lead will be required to implement appropriate design features to ensure that the wildlife crossing maintains or improves functionality after the freeway construction improvements are completed. Design elements and/or project options may include, but not limited to, steps to maintain the Openness Indices (OI) of existing culverts, protect suitable habitat on either side of the roadway, minimize human activity, reduce noise and lighting, provide funneling/fencing, improve internal habitat, and incorporate ledges or other appropriate structural features. If modifications are warranted, a technical report summarizing the results and recommendations will be prepared and provided to the Wildlife Agencies for approval prior to final design. This information will be included in the Plan's Annual Report.

5.6.3 Nesting Birds Policy

OCTA will implement a Nesting Birds Policy to conform to existing regulations and procedures for protection of nesting birds. Migratory native bird species are protected by international treaty under the MBTA of 1918 (50 CFR 10.13). Sections 3503, 3503.5, and 3513 of the California Fish and

Game Code make it unlawful to: take, possess, or needlessly destroy the nest or eggs of any bird (3503); take, possess or destroy any birds in the orders of Falconiformes or Strigiformes (birds-of-prey) and the nest and eggs of any such bird (3503.5); and take or possess any migratory nongame bird, or any part thereof, as designated in the Migratory Bird Treaty Act. Under State law, take means to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill (Fish and Game Code Section 86), and includes take of eggs and/or young resulting from disturbances that cause abandonment of active nests.

Proposed project activities (including, but not limited to, staging and disturbances to native and nonnative vegetation, structures, and substrates) should occur outside of the avian breeding season, which generally runs from March 1 to September 15 (as early as January 1 for some birds) to avoid disturbance to breeding birds or destruction of the nest or eggs. Depending on the avian species present, a qualified biologist may determine that a change in the breeding season dates is warranted.

If the Construction Lead determines that avoidance of the avian breeding season is not feasible, at least 2 weeks prior to the initiation of project activities, a qualified biologist (Table 7-2 of the Plan) with experience in conducting breeding bird surveys will conduct weekly bird surveys to detect presence/absence of native bird species occurring in suitable nesting habitat that is to be directly or indirectly disturbed and (as access to adjacent areas allows) any other such habitat within an appropriate buffer distance of the disturbance area. Generally the buffer distance should be 300 feet (500 feet for raptors); however, because the covered freeway improvement projects will generally occur along noisy freeways, a buffer distance as low as 100 feet for non-raptors could be appropriate. If a narrow buffer distance is warranted, the Construction Lead will have a qualified biologist identify the appropriate buffer distances for raptors and non-raptors and notify Wildlife Agencies. The surveys should continue on a weekly basis with the last survey being conducted no more than 3 days prior to the initiation of project activities. If a native or nesting bird species is found, the Construction Lead will do one of the following to avoid and minimize impacts on native birds and the nest or eggs of any birds:

a. Implement default 300-foot minimum avoidance buffers for all birds and 500-foot minimum avoidance buffer for all raptor species. The breeding habitat/nest site shall be fenced and/or flagged in all directions, and this area shall not be disturbed until the nest becomes inactive, the young have fledged, the young are no longer being fed by the parents, the young have left the area, and the young will no longer be impacted by the project.

b. If a narrower buffer distance is determined appropriate by the qualified biologist, the Construction Lead will develop a project-specific Nesting Bird Management Plan. The site-specific nest protection plan shall be developed collaboratively with Wildlife Agencies and submitted to the Wildlife Agencies, although the Wildlife Agencies will not be responsible for approving the narrower buffer distance and the Nesting Bird Management Plan. The Plan should include detailed methodologies and definitions to enable a qualified avian biologist to monitor and implement nest-specific buffers based on topography, vegetation, species, and individual bird behavior. This Nesting Bird Management Plan shall be supported by a Nest Log that tracks each nest and its outcome. The Nest Log will be submitted to the Wildlife Agencies at the end of each week.

c. The Construction Lead may propose an alternative plan for avoidance and nesting birds for Wildlife Agencies review and approval.

Flagging, stakes, and/or construction fencing should be used to demarcate the inside boundary of the buffer between the project activities and the nest. The Construction Lead personnel, including all contractors working on site, should be instructed on the sensitivity of the area. The Construction Lead will document the results of the recommended protective measures described above to demonstrate compliance with applicable state and federal laws pertaining to the protection of native birds.

The biological monitor will be present on site during all grubbing and clearing of vegetation to ensure that these activities remain within the project footprint (i.e., outside the demarcated buffer) and that the flagging/stakes/fencing is being maintained, and to minimize the likelihood that active nests are abandoned or fail due to project activities. The biological monitor will send weekly monitoring reports to the OCTA NCCP Administrator during the grubbing and clearing of vegetation, and will notify the OCTA NCCP Administrator immediately if project activities take, possess, or needlessly destroy the nest or eggs of any bird as well as birds-of-prey and their nest or eggs.. Within 48 hours of damage to an active nest or eggs or observed death or injury of birds protected under State law or the MBTA (which includes, but not limited to, the birds on the Covered Species list), OCTA will notify the Wildlife Agencies.

5.6.4 Stormwater and Water Quality Best Management Practices

Potential effects of covered freeway improvement projects on water quality and sedimentation can impact Covered Species (arroyo chub, western pond turtle) dependent upon natural hydrological processes. The Construction Lead will identify structural and nonstructural BMPs to control sediment and non-stormwater discharges from the site to protect water quality. Actions to prevent sediment from entering watercourses during and after construction may include, but are not limited to, the following BMPs: silt fencing, fiber rolls, gravel bag berms, sand bag barriers, tracking controls, stockpile management, dry season scheduling, proper material delivery and storage, solid waste management, concrete waste management, preservation of existing vegetation, temporary soil stabilization, dust and erosion control, soil binders, and straw mulch. All site personnel will not discard solid or liquid materials into jurisdictional water features or any ESA lands. Temporary, construction-related BMPs may include, but will not be limited to, the following:

- **Silt Fence**. A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.
- **Fiber Rolls**. A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll and wrapped by netting, which can be photodegradable or natural. Fiber rolls with plastic netting that poses a wildlife entanglement hazard will not be used. Fiber rolls used for erosion control will be certified as free of noxious weed seed. When fiber rolls are placed at the toe and on the face of slopes along contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

- **Gravel Bag Berms**. A series of gravel-filled bags are placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out and release runoff slowly as sheet flow, preventing erosion.
- **Preservation of Existing Vegetation**. Careful planned preservation of existing vegetation minimizes the potential removal or injury to existing trees, vines, shrubs, and grasses that protect soil from erosion.
- **Stockpile Management**. Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as Portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.
- **Vehicle and Equipment Maintenance**. Contamination of stormwater resulting from vehicle and equipment maintenance can be prevented or reduced by running a "dry and clean site." The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

In addition, permanent treatment BMPs will be included in the project design as part of the upgrading and installation of storm drain system facilities and storm drain controls associated with the project. Permanent BMPs would be implemented for the protection of water quality using Caltrans-approved techniques and would be designed to meet RWQCB and NPDES permit requirements. The probable selection of permanent treatment BMPs includes infiltration devices (infiltration trenches), biofiltration swales, and biofiltration strips. Infiltration trenches are basins or trenches that store runoff and allow it to infiltrate into the ground, thus preventing pollutants in the captured runoff from reaching surface waters. Biofiltration strips are vegetated land areas, over which stormwater flows as sheet flow. Biofiltration swales are vegetated channels, typically configured as trapezoidal or v-shaped channels that receive and convey stormwater flows while meeting water quality criteria and other flow criteria. Pollutants are removed by filtration through the vegetation, sedimentation, adsorption to soil particles, and infiltration through the soil. Strips and swales are effective at trapping litter, total suspended sediment, and particulate metals. Biofiltration strips and swales would be considered wherever site conditions and climate allow vegetation to be established and where flow velocities will not cause scour. The intent of the BMPs that are implemented for the covered freeway improvement projects would be to reduce pollutants in stormwater discharge to the maximum extent practicable (MEP).

Implementation of the covered freeway improvement projects will conform to the Caltrans State Storm Water Management Plan (SWMP) (Caltrans 2003) and will provide guidance for compliance with the NPDES Permit requirement for discharge. As part of the Project Delivery Stormwater Management Program described in the SWMP, selected Construction Site, Design Pollution Prevention, and Treatment BMPs would be incorporated into the proposed project. Compliance with the standard requirements of the SWMP for potential short- (during construction) and long-term (post construction) impacts would avoid or minimize potential substantial impacts on water quality and stormwater runoff. Conformance with the SWMP will include the following:

- Covered freeway improvement projects will comply with the provisions of the Caltrans Statewide NPDES Permit (Order No. 2012-0011-DWQ, NPDES No. CAS00003) and the

NPDES General Permit, WDRs for Discharges of Storm Water Runoff Associated with Construction Activities (Order No. 2009-0009-DWQ, NPDES No. CAS000002) and any subsequent permit in effect at the time of construction.

- A Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented to address all construction-related activities, equipment, and materials that have the potential to affect water quality. The SWPPP will identify the sources of pollutants that may affect the quality of stormwater and include the Construction Site BMPs to control pollutants, such as sediment control, catch basin inlet protection, construction materials management, and non-stormwater BMPs. All Construction Site BMPs will follow the latest edition of the *Storm Water Quality Handbooks, Project Planning and Design Guide* (Caltrans 2007) to control and minimize the impacts of construction and construction-related activities, material, and pollutants on the watershed. These include, but are not limited to temporary sediment control, temporary soil stabilization, scheduling, waste management, materials handling, and other non-stormwater BMPs.
- Caltrans-approved treatment BMPs will be implemented to the MEP consistent with the requirements of the NPDES Permit, Statewide Storm Water Permit, and WDRs for Caltrans Properties, Facilities, and Activities (Order No. 2012-0011-DWQ , NPDES No. CAS000003). Treatment BMPs will include, for example, biofiltration strips/swales, infiltration basins, detention devices, dry weather flow diversion, Gross Solids Removal Devices (GSRDs), media filters, and wet basins. Final determination regarding the selection of treatment BMPs will occur during the design phase.
- Design Pollution Prevention BMPs will be implemented, such as preservation of existing vegetation, slope/surface protection systems (permanent soil stabilization), concentrated flow conveyance systems such as ditches, berms, dikes and swales, oversize drains, flared end sections, and outlet protection/ velocity dissipation devices.
- Construction site dewatering must conform to the General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant (*de minimus*) Threat to Water Quality (Order No R8-2009-0003, National Pollutant Discharge Elimination System No. CAG998001), and any subsequent updates to this permit at the time of construction. Dewatering BMPs must be used to control sediments and pollutants and the discharges must comply with the WDRs issued by the Santa Ana RWQCB.

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VIII. Mitigation Tracking

Table E-4. OCTA Measure M2 Freeway Program Mitigation Summary Ledger

						Restoration Site[4]	**Big Bend**	**City Parcel**	**Fairview Park**	**Fairview Park**	**Agua Chinon**	**Aliso Creek**	**Lower Silverado Canyon**	**West Loma**	**Chino Hills State Park**	**Harriett Wieder**
						Mitigation Type	**Riparian Rehab/ Enhancement**	**Riparian Rehab/ Enhancement**	**Riparian Rehab/ Enhancement**	**Wetland Creation**	**Riparian Rehab/ Enhancement**	**Riparian Rehab/ Enhancement**	**Riparian Rehab/ Enhancement**	**Riparian Rehab/ Enhancement**	**Riparian Rehab/ Enhancement**	**Riparian Establishment**
						Acres[5]	**0.5**	**4.48**	**3.3**	**6**	**6.69**	**50.27**	**23.01**	**2.61**	**3.58**	**0.35**
Project Name	**CDFW Permit #**	**USACE Permit #**	**SWRCB Permit #**	**CDFW Impacts (acres)**	**CDFW Mitigation Required (acres)**											
Sample Project				***1.00***	***2.00***				*-1.00*	*-1.00*						
Sample Balance									*2.30*	*5.00*						
Remaining Balance																

[4] Only Agua Chinon and Aliso Creek are approved compensatory mitigation sites for SWRCB and USACE.

[5] Conservation actions involving restoration projects include an estimate of conserved habitats based on conceptual restoration design plans. The final acreage of restored habitat may be refined during final restoration design and during implementation. Attainment of objectives dependent on restoration actions will be achieved once the restoration project meets the restoration design success criteria.

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Table E-5. Sample Restoration Site Tracking Sheet

Big Bend Restoration Site – San Juan Creek Watershed				
Habitat Type	Southern Cottonwood-Willow Riparian Forest	Mulefat Scrub	Southern Willow Scrub	Southern Coast Live Oak Riparian Forest
Mitigation Activity	Rehabilitation/Enhancement	Rehabilitation/Enhancement	Rehabilitation/Enhancement	Rehabilitation/Enhancement
Beginning Balance	0.10	0.37	0.005	0.025
Remaining Balance				

Table E-6. Project Impact Reporting and Mitigation Requirements Worksheet[6]

Habitat Type	Permanent Impacts (acres)	Watershed	Date of Impacts	Mitigation Habitat Type	Mitigation Ratio	Required Mitigation (acres)	Mitigation Site
Summaries							

[6] To be completed for each individual project

Appendix F

Impact Tracking Template

Appendix F
Impact Tracking Template

As described in Section 5.8.1, "Tracking Impacts", OCTA will be responsible for tracking impacts on natural resources resulting from Covered Activities to ensure that the amount of impacts that ultimately occur under the Plan stays below the impact caps established in the Plan. OCTA will track impacts for the following areas:

- Impact tracking of habitat types resulting from covered freeway improvement projects
- Impact tracking of covered plant species resulting from Covered Activities
- Impact tracking of habitat types resulting from Covered Activities within Preserves

The following tables provide a template for how the impact tracking will occur. The tables will include:

1. Covered Freeway Improvement Project Input Sheet: For each covered freeway improvement project, OCTA will record the following information:
    - Impacts to natural communities – OCTA will record the acres of direct and temporary impacts to natural communities using detailed vegetation mapping completed as part of pre-construction field surveys. The detailed vegetation mapping will be cross-walked and aggregated into the major vegetation types using the Plan. Impacts to natural communities from covered freeway improvement projects will be measured against caps on impacts to individual habitat types and overall habitat.
    - Impacts to covered plant species – OCTA will record impacts to covered plant species determined through pre-construction field surveys, as necessary. If onsite measures are being taken to restore covered plant species, any credits that are determined to be appropriate (in consultation with Wildlife Agencies) will also be recorded and the net impacts calculated.
    - Avoidance and Minimization Measures Checklist – OCTA will document how the design and implementation of covered freeway improvement projects comply with the avoidance and minimization requirements set forth in the Plan. This checklist will be used in conjunction with the preparation of the "Biological Resources Avoidance and Minimization Plan" that will be submitted to the Wildlife Agencies for each freeway project.
2. Covered Activities Within Preserves Input Sheet: For any Covered Activity within a Preserve associated with Preserve management that results in an impact (positive or negative) of 0.1 acre of more, Preserve Managers, in coordination with OCTA, will be responsible to documenting and completing this table that is similar to the Covered Freeway Improvement Project Input Sheet. Impacts from Covered Activities Within Preserves will be measured against a cap of a total of 13 acres of impact to natural habitat within all Preserves combined.

3. Covered Freeway Improvement Project Impact Tracking Sheet: This table links information included in the individual Covered Freeway Improvement Project Input Sheets and calculates the balance of remaining impacts against the Plan caps on individual habitat types and overall habitat.
4. Covered Activities Impact Tracking Sheet: This table links information included in the individual Covered Activity Within Preserves Input Sheets and calculates the balance of remaining impacts against the Plan cap of 13 acres of impact on all Preserves combined.
5. Covered Plant Species Credit Tracking Sheet: This table will keep track of covered plant species conservation credits OCTA is able to take credit for through field surveys of Preserves and actions taken to enhance, restore and create populations of covered plant species as part of restoration projects approved for funding by OCTA. OCTA will provide documentation to the Wildlife Agencies (during submission of the Annual Report) for review and approval of plant species credits. OCTA will keep track of the date of each observation and make sure surveys are not double-counting previous observations.
6. Covered Plant Species Impact Tracking and Accounting Ledger: This table links in information on the covered plant species impacts recorded on the individual input sheets and calculates the amount of debits required (using a 3:1 ratio) and compared with available credits from the Covered Plant Species Credit Tracking Sheet.

Note: the colors of the numbers on the tables mean the following:

Black = to be entered

Green = linked to another table

Red = calculated

Covered Freeway Project Input Sheet

Project ID:	<enter ID with 10 char>
Project Title:	<enter project title>
Segment:	<select segments>
Location Description:	<enter description of location>
Within Permit Area:	<yes/no>
if no, minor amendment:	<yes/no/N/A>
Project Dates:	
CEQA/NEPA approved:	<mo-year>
Final design approved:	<mo-year>
Construction start date:	<mo-year>
Construction finish date:	<mo-year>

Habitat Type Impacts:

Detailed Vegetation Types	Plan Vegetation Types	Impact Type	Revegetated	Acres
<enter vegetation type>	<cross-walk to Plan veg types>	<select impact type>	<revegetated, y/n>	<acres to .01>

habitat mapping completed by:

date:

Covered Plant Species Impacts

Covered Plant Species	Number Impacted (count)	Number Offset (count)	Net Impacted
<select Covered Plant Species>	<enter count>	<enter count>	
			0
			0
			0

Avoidance and Minimization Measures Checklist

Covered Freeway Project Input Sheet

Project ID: <enter ID with 10 char>

Project Title: <enter project title>

A&M of Sensitive Biological Areas: ☐ Yes ☐ No ☐ N/A

Prior to final design, project specific biological surveys will be completed to identify biologically sensitive areas. Based on the field surveys, the project design and scheduling will be adjusted as appropriate to avoid and/or minimize impacts to sensitive biological resources. ***See Section 5.6.1.***

comments:

Delineation of ES Areas: ☐ Yes ☐ No ☐ N/A

Prior to clearing or construction, highly visible barriers will be installed around areas adjacent to the project footprint to designate environmentally sensitive areas to be protected. ***See Section 5.6.1, bullet #1.***

comments:

Restoration of Temporary Impacts: ☐ Yes ☐ No ☐ N/A

Areas of natural habitat that are temporarily affected by construction activities will be restored to a natural condition. Revegetation plans will be part of the project design and will be reviewed and approved by wildlife agencies. ***See Section 5.6.1, bullet #2.***

comments:

Invasive Species Control: ☐ Yes ☐ No ☐ N/A

Invasive species will be removed from the project work area and controlled during construction. ***See Section 5.6.1, bullet #3.***

comments:

Trash Control: ☐ Yes ☐ No ☐ N/A

To avoid attracting predators of covered species and other sensitive species, the project site will be kept as clean of debris as possible. ***See Section 5.6.1, bullet #4.***

comments:

Onsite Training: ☐ Yes ☐ No ☐ N/A

When in or near natural habitat areas, all personnel involved in the onsite project construction will be required to participate in a preconstruction training program to understand the avoidance and minimization obligations on the project. ***See Section 5.6.1, bullet #5.***

comments:

Covered Freeway Project Input Sheet

Project ID: <enter ID with 10 char>

Project Title: <enter project title>

Construction Monitoring: ☐ Yes ☐ No ☐ N/A

A qualified biologist will monitor construction activities when necessary. ***See Section 5.6.1, bullet #6.***

comments:

Aquatic Resource and Species Policy: ☐ Yes ☐ No ☐ N/A

If construction activities occur within or will impact aquatic resources, such as rivers, creeks, and riparian areas, specific avoidance and minimization measures for aquatic species, dewatering and water diversion, and BMPs to reduce potential water quality-related indirect impacts will be followed. ***See Section 5.6.2.1***

comments:

Covered Plant Species Policy: ☐ Yes ☐ No ☐ N/A

If there is the potential for covered plant species to occur within the project footprint for the covered freeway improvement project area, focused rare plant surveys will be completed during the appropriate seasonal window to identify the distribution of covered plant species. If avoidance is not feasible, impacts will be quantified and mitigated using credits at 3:1 ratio or through a biologically superior alternative determined in consultation with the wildlife agencies. ***See Section 5.6.2.2***

comments:

Wildlife Crossing Policy: ☐ Yes ☐ No ☐ N/A

If a covered freeway improvement project has the potential to impact an existing and important wildlife crossing as determined through project-specific biological surveys, appropriate design features will be included in the project design to ensure the wildlife crossing experiences no decrease in functionality after freeway construction improvements are completed. A Technical Report will be prepared summarizing the results and design recommendations and receive wildlife agency approval prior to final design. ***See Section 5.6.2.3***

comments:

Nesting Birds Policy: ☐ Yes ☐ No ☐ N/A

Covered freeway improvement projects will conform with existing regulations and procedures for protection of nesting birds. ***See Section 5.6.3***

comments:

Covered Freeway Project Input Sheet

Project ID: <enter ID with 10 char>

Project Title: <enter project title>

Stormwater/Water Quality BMPs: ☐ Yes ☐ No ☐ N/A

The Construction Lead of covered freeway improvement projects is required to implement structural and nonstructural BMPs to control sediment and non-stormwater discharges from the site to protect water quality. ***See Section 5.6.4***

comments:

Wildfire Protection Techniques: ☐ Yes ☐ No ☐ N/A

Wildfires can be ignited along the edge of freeways from car fires, flares, sparks, discarded cigarettes, and other various freeway sources/activities. To minimize the potential for wildfires, covered freeway improvement projects will be designed to adequately maintain a safe distance between the road edge and flammable natural habitat. ***See Section 5.6.5***

comments:

Covered Activity Within Preserves Input Sheet

Activity ID:	<enter ID up to 10 char>
Activity Title:	<enter activity title>
Preserve:	<select preserve>
Location Description:	<enter description of location>
Activity Start Date:	<mo-year>

Habitat Type Impacts:

Detailed Vegetation Types	Plan Vegetation Types	Impacts	Restoration / Enhancement	Net Acres
<enter vegetation type>	<cross-walk to Plan veg types>	<enter acres>	<enter acres>	
				0.00
				0.00
				0.00
				0.00
				0.00
				0.00
				0.00
				0.00
				0.00

habitat mapping completed by:

date:

Covered Plant Species Impacts

Covered Plant Species	Number Impacted (count)	Number Offset (count)	Net Impacted
<select Covered Plant Species>	<enter count>	<enter count>	
			0
			0
			0

Covered Activity Within Preserves Input Sheet

Activity ID: <enter ID up to 10 char>

Activity Title: <enter activity title>

Avoidance and Minimization Measures Checklist

A&M of Sensitive Biological Areas: ☐ Yes ☐ No ☐ N/A

Prior to final design, project specific biological surveys will be completed to identify biologically sensitive areas. Based on the field surveys, the project design and scheduling will be adjusted as appropriate to avoid and/or minimize impacts to sensitive biological resources. ***See Section 5.6.1.***

comments:

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comments:

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comments:

Invasive Species Control: ☐ Yes ☐ No ☐ N/A

Invasive species will be removed from the project work area and controlled during construction. ***See Section 5.6.1, bullet #3.***

comments:

Trash Control: ☐ Yes ☐ No ☐ N/A

To avoid attracting predators of covered species and other sensitive species, the project site will be kept as clean of debris as possible. ***See Section 5.6.1, bullet #4.***

comments:

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When in or near natural habitat areas, all personnel involved in the onsite project construction will be required to participate in a preconstruction training program to understand the avoidance and minimization obligations on the project. ***See Section 5.6.1, bullet #5.***

comments:

Covered Activity Within Preserves Input Sheet

Activity ID: <enter ID up to 10 char>

Activity Title: <enter activity title>

Construction Monitoring: ☐ Yes ☐ No ☐ N/A

A qualified biologist will monitor construction activities when necessary. ***See Section 5.6.1, bullet #6.***

comments:

Aquatic Resource and Species Policy: ☐ Yes ☐ No ☐ N/A

If construction activities occur within or will impact aquatic resources, such as rivers, creeks, and riparian areas, specific avoidance and minimization measures for aquatic species, dewatering and water diversion, and BMPs to reduce potential water quality-related indirect impacts will be followed. ***See Section 5.6.2.1***

comments:

Covered Plant Species Policy: ☐ Yes ☐ No ☐ N/A

If there is the potential for covered plant species to occur within the project footprint for the covered freeway improvement project area, focused rare plant surveys will be completed during the appropriate seasonal window to identify the distribution of covered plant species. If avoidance is not feasible, impacts will be quantified and mitigated using credits at 3:1 ratio or through a biologically superior alternative determined in consultation with the wildlife agencies. ***See Section 5.6.2.2***

comments:

Wildlife Crossing Policy: ☐ Yes ☐ No ☐ N/A

If a covered freeway improvement project has the potential to impact an existing and important wildlife crossing as determined through project-specific biological surveys, appropriate design features will be included in the project design to ensure the wildlife crossing experiences no decrease in functionality after freeway construction improvements are completed. A Technical Report will be prepared summarizing the results and design recommendations and receive wildlife agency approval prior to final design. ***See Section 5.6.2.3***

comments:

Nesting Birds Policy: ☐ Yes ☐ No ☐ N/A

Covered freeway improvement projects will conform with existing regulations and procedures for protection of nesting birds. ***See Section 5.6.3***

comments:

Covered Activity Within Preserves Input Sheet

Activity ID: <enter ID up to 10 char>

Activity Title: <enter activity title>

Stormwater/Water Quality BMPs: ☐ Yes ☐ No ☐ N/A

The Construction Lead of covered freeway improvement projects is required to implement structural and nonstructural BMPs to control sediment and non-stormwater discharges from the site to protect water quality. ***See Section 5.6.4***

comments:

Wildfire Protection Techniques: ☐ Yes ☐ No ☐ N/A

Wildfires can be ignited along the edge of freeways from car fires, flares, sparks, discarded cigarettes, and other various freeway sources/activities. To minimize the potential for wildfires, covered freeway improvement projects will be designed to adequately maintain a safe distance between the road edge and flammable natural habitat. ***See Section 5.6.5***

comments:

Covered Freeway Projects Impact Tracking Sheet

Program - to - Date Tracker

Plan Vegetation Types	Plan Caps	Impacts	Balance
Chaparral	5.00	0.90	4.10
Coniferous Forest	-	-	-
Grassland	108.10	4.87	103.23
Riparian	5.00	0.04	4.96
Scrub	10.00	1.20	8.80
Water	0.40	-	0.40
Wet Meadow/Marsh	2.50	0.10	2.40
Woodland	10.00	0.20	9.80
TOTALS	**141.00**	**7.31**	**133.69**

Summary of Impacts from covered freeway improvement projects

Project ID	Segment	Date - Start	Date - Finish	Total	Chaparral	C. Forest	Grassland	Riparian	Scrub	Water	Wet Meadows/ Marsh	Woodland
			Total Impacts:	**7.31**	**0.90**	**0.00**	**4.87**	**0.04**	**1.20**	**0.00**	**0.10**	**0.20**
F1-1	F1	Aug-12	Jun-15	1.90	0.60		1.10					0.20
M-A2	M	Aug-12	Jun-15	0.07			0.07					
C-XFR	C	Apr-11	Apr-13	5.34	0.30		3.70	0.04	1.20		0.10	
				0.00								
				0.00								

Covered Activities within Preserves Impact Tracking Sheet

Program - to - Date Tracker

Plan Vegetation Types	Plan Caps	Impacts	Balance
Chaparral		0.53	
Coniferous Forest		-	
Grassland		2.38	
Riparian		(2.29)	
Scrub		0.50	
Water		-	
Wet Meadow/Marsh		-	
Woodland		1.00	
TOTALS	**11.00**	**2.12**	**8.88**

Summary of Impacts from Covered Activities with Preserves

Activity ID	Preserve	Date - Start	Date - Finish	Total	Chaparral	C. Forest	Grassland	Riparian	Scrub	Water	Wet Meadows/ Marsh	Woodland
			Total Credits:	**2.12**	**0.53**	**0.00**	**2.38**	**-2.29**	**0.50**	**0.00**	**0.00**	**1.00**
FR-trail-12	Ferber Ranch	Aug-12	Jun-15	0.25			0.04	0.01				0.20
H-creek-restor	Hayashi	Aug-12	Jun-15	0.00			2.30	-2.30				
FR-AccessRoad	Ferber Ranch	Apr-11	Apr-13	1.66	0.32		0.04		0.50			0.80
HF-fence	Hafen	Sep-14	Dec-04	0.21	0.21							
				0.00								

Covered Plant Species Credits Tracking Sheet

Action	Date	WLA Approval	Location	Intermediate Mariposa Lily	Many-Stemmed Dudleya	Southern Tarplant
<enter description of action>	<mo-yr>	<yes/no/pending/ estimated>	<select Preserve or Restoration Project>	<enter # of credits>	<enter # of credits>	<enter # of credits>
			Total Credits:	**428**	**2**	**201**
Baseline Surveys 2012 Ferber Ranch	Aug-12	pending	Ferber Ranch	69		
Baseline Surveys 2012 Hafen	Aug-12	pending	Hafen	74		
Baseline Surveys 2012 O'Neill Oaks	Aug-12	pending	O'Neill Oaks	283		
Baseline Surveys 2012 Saddle Creek South	Aug-12	pending	Saddle Creek South	2		
CNDDB Occurrence within Big Bend Restoration Project	?	pending	Big Bend		1	
Revegetation Efforts at Fairview Park	?	estimated	Fairview Park			1
Southern tarplant within seed mix of restoration at Harriett Weider Regional Park	?	estimated	Harriett Weider Regional Park			200
CNDDB Occurrence within West Loma restoration project area	?	pending	West Loma		1	

Covered Plant Species Impact Tracking and Accounting Ledger

Program - to - Date Tracker

Covered Plant Species	Credits	Debits (impacts)	Mitigation (3:1 ratio)	Balance
Intermediate Mariposa Lily	428	44	132	296
Many-Stemmed Dudleya	2	-	-	2
Southern Tarplant	201	5	15	186

Summary of Impacts to Covered Plant Species

Project ID or Activity ID	Covered Freeway Project Segment or Preserve	Date - Start	Date - Finish	Intermediate Mariposa Lily	Many-Stemmed Dudleya	Southern Tarplant
			Total Debits:	**44**	**0**	**5**
FR-trail-12	Ferber Ranch	Aug-12	Jun-15			
H-creek-restor	Hayashi	Aug-12	Jun-15			
FR-AccessRoad	Ferber Ranch	Apr-11	Apr-13	24		
HF-fence	Hafen	Sep-14	Dec-04	12		
F1-1	F	Aug-12	Jun-15			1
M-A2	M	Aug-12	Jun-15			4
C-XFR	C	Apr-11	Apr-13	8		

Appendix G

Caltrans Wildlife Crossings Guidance Manual

Appendix G
Caltrans Wildlife Crossings Guidance Manual

Introduction

The Caltrans Wildlife Crossings Guidance Manual is currently available online (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/)in the form of an interactive website which allows participants to comment, edit, revise or add additional information regarding wildlife crossing projects, guidance, publications, and case studies. The website provides agencies, stakeholders, and interested parties with the ability to participate in an interactive information environment to help promote a common understanding of available information and strategies for considering wildlife crossing in relation to transportation facilities.

This represents the most current guidance provided by Caltrans on wildlife crossings, but OCTA will continue to use the most up-to-date information available in the future.

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Wildlife Crossings Guidance Manual

California Department of Transportation

Caltrans®

http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/

Prepared by:

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Table of Contents

1 What You Need to Know 1
1.1. Introduction 1
1.1.1 Why Use This Manual 2
1.1.2 Who Should Use this Manual 2
1.1.3 How to Use This Manual 3
1.2. Federal and State Wildlife Protection Laws 7
1.3. Wildlife: Functional, Taxonomic, and Special Status Groups 12
1.3.1 Wildlife: Functional Groups 13
1.3.2 Wildlife: Taxonomic Groups 14
1.3.3 Wildlife: Special Status Species 14
1.4. Special Habitats 15
1.5. Sources of Species-Level Information 16
1.5.1 Internet Resources 16
1.5.2 Books 17
1.6. Identifying Wildlife Crossings 18
1.6.1 Case Studies: Existing Efforts to Enhance Wildlife Crossing 19
Existing Efforts in California 19
Examples of Wildlife Crossing Projects Outside California 20
2 Baseline Assessment 21
2.1. Basic Steps to Establish Your Baseline 21
2.1.1 Understanding Landscape-level Connectivity: Bioregional Perspective 22
2.1.2 Understanding Project-level Crossing Issues 24
2.2. Developing Your Baseline for Wildlife Movement 25
2.2.1 Identify, Acquire, and Review Data Sources 25
2.2.2 Identify the Need for Additional Field Surveys and Assessments 26
Establish Intended Outcome or Application of Survey Data 26
Survey Site Selection 29
Survey Sample Size 30
2.2.3 Survey and Detection Methods 31
Visual (= Field) Observations 34
Track-count Surveys 35
Track Plates 35
Raked Soil 36
Live Traps 36
Pitfall Traps 37
Hair Traps 37
Remotely-triggered Cameras 38
GPS and Radio Collars 39
2.2.4 Required Expertise 39
2.2.5 Data Considerations 40
Minimum Observation Data Set 40
2.3 Collaborative Approach 41
2.4 Use of GIS and Models to Predict Wildlife Passage 41

2.4.1 Large-scale Prioritization of Wildlife Crossing Corridors 42
2.5 Analyze and Interpret Data to Evaluate Crossing Potential 45
2.5.1 Areas of High Connectedness 45
2.5.2 Adjacent important conservation areas 45
2.5.3 Separation of seasonally-used habitats...45
2.6 Existing Connectivity Attributes/Infrastructure..46
2.7 Road-side Vegetation..47
2.8 Traffic Characteristics...47
2.8.1 Daily and Seasonal Rates of Crossing..48
2.8.2 Relative Visibility/Compromised Line of Sight 48
2.9 Identify Limitations of Baseline Data 49
3 Project Impact Assessment 50
3.1 Potential Temporary or Construction-Related Effects 51
3.2 Potential Direct and Indirect Effects 52
3.3 Changes/Effects to Existing and Potential Wildlife Crossing 52
3.3.1 Change in Infrastructure 53
3.3.2 Changes in Traffic Patterns 53
3.3.3 Changes in Visibility 53
3.4 Secondary Effects..54
3.5 Cumulative Effects 54
4 Selecting Avoidance, Minimization, or Compensatory Mitigation Measures 56
4.1 Project Types and Wildlife Crossing Considerations...56
4.2 Infrastructure Improvements to Wildlife Crossing 57
4.2.1 Wildlife Bridges/Overpasses...57
4.2.2 Wildlife Underpasses...58
4.2.3 Culverts 58
4.2.4 Fencing 59
4.2.5 Median Barriers...62
4.2.6 Signs 62
4.2.7 Lighting 63
4.2.8 Reflectors 63
4.2.9 Speed Bumps...63
4.2.10 Vegetation...63
4.2.11 Animal Detection Systems – Advanced Technology 64
4.2.12 Escape Ramps/One-way Gates/Median Barrier Gaps...64
4.3 Modifying Existing Infrastructure to Enhance Wildlife Crossing 65
4.3.1 Bridges and Overpasses 65
4.3.2 Culverts 65
4.3.3 Median Barriers...66
4.4 Choosing a Wildlife Crossing Improvement Measure..67
4.4.1 Which Structure or Action? 67
4.4.2 How to Size a Structure 68
4.4.3 Adjacent Functions and Uses..69
4.4.4 Spacing of Structures..69
4.5 Design Specifications..69
4.6 Identify Maintenance Needs 70

4.7 Costs 71
4.8 Post-project Monitoring and Adaptive Management 72
5 Keeping Informed 75
5.1 Internet Resources 75
5.1.1 Caltrans Resources 75
5.1.2 Federal Highway Administration Resources 75
5.1.3 Academic Institution Resources 75
5.1.4 International Conference on Ecology and Transportation (ICOET) 76
5.1.5 Other Wildlife Crossings-related Websites 76
5.2 Additional Information on Wildlife Survey Methods 77
5.3 Additional Mitigation Design Information...77
5.4 Recommended Reading 78
6 Literature Cited 79
6.1 On-line Resources Cited 88
7 Appendices 89
7.1 Definitions 89
7.2 U.S. Fish & Wildlife Service Recommended Specifications for Desert Tortoise Exclusion Fencing 90
7.3 Deer One-way Gate Design Considerations 95

List of Figures

Figure 1: Wildlife Crossing Assessment Flowchart....................3
Figure 2: Caltrans Wildlife Crossing Process Decision Tree....................5
Figure 3: Caltrans Wildlife Crossing Project Decision Tree....................6
Figure 4: Central Valley Wetland....................14
Figure 5: Riparian corridor. Derived from U.S. Forest Service website....................14
Figure 6: California Bighorn Sheep....................18
Figure 7: Bear Crossing....................20
Figure 8: Bioregions of California....................22
Figure 9: Bear track....................33
Figure 10: Schematic of a track plate box....................33
Figure 11: Installation of raked soil beds adjacent to US-93 in Montana (Montana DOT, 2006).34
Figure 12: Medium Havahart live trap....................35
Figure 13: Pitfall Trap....................35
Figure 14: Barbed wire hair trap for bears....................36
Figure 15: Remotely-triggered Camera....................36
Figure 16: Culvert under rural paved road in the Sierra Nevada....................44
Figure 17: Encourage use of native plants along roadsides (Caltrans photo)....................45
Figure 18: Motorist warning sign....................45
Figure 19: Ecological "road effect" zone for birds....................52
Figure 20: Salamanders exiting culvert....................55
Figure 21: Wildlife Underpass, Sierra County. Photo courtesy Brian Ehler, Calif. DF&G..........56
Figure 22: Riparian culvert with rock ledge (derived from FHWA website)....................57
Figure 23: Desert Tortoise barrier fence (William Boarman photo)....................57
Figure 24: Deer fence with “off-ramp”....................58
Figure 25: Median Barrier with gap. Caltrans photo....................60
Figure 26: Wildlife Warning Sign (derived from http://www.betterroads.com)....................60
Figure 27: Culverts under I-15, San Bernardino county (Caltrans photo)....................63
Figure 28: State Hwy. 163 median barrier....................64

Index of Tables

Table 1: Applicability of major federal and state wildlife regulations to wildlife crossings. 8
Table 2: Project types and potential crossing effects. 20
Table 3: Field assessment methods and most appropriate animal group(s) for each. 31
Table 4: Planning Process Stages and Relevant Questions to Consider 49
Table 5: Fencing attributes and considerations. 59
Table 6: Potential relative permeability of median barrier types to wildlife functional groups. ...65
Table 7: Mitigation goals and wildlife size group-appropriate crossing structures. 66
Table 8: Preferred design specifications appropriate for functional species groups. 68
Table 9: Crossing Structure Materials Costs 69

Preface

An estimated 15-20% of the United States is ecologically impacted by roads, and the many ecological effects of roads have recently been reviewed (Forman and Alexander 1998). Road ecology is an applied science that examines the interactions between roads and ecological systems and seeks both to document and understand the interactions and to reconcile the need for safe and effective transportation systems with the need to conserve the environment.

This Wildlife Crossings Guidance Manual is a literature-based guide on how to identify and assess wildlife crossings and includes a review of best practices. This manual is intended primarily for biologists, but planners and engineers may also find the manual useful. The manual reviews both the scientific and agency literature and uses case studies from within and outside of California to help to guide efforts to evaluate and avoid, minimize, or compensate for wildlife crossing conflicts. The manual also seeks to help Caltrans staff to meet regulatory requirements by integrating regulatory considerations in to the wildlife crossing evaluation process.

This manual is part of a larger Caltrans strategy to 1) catalog sources of information and knowledge about wildlife crossings, 2) generate, accumulate, and disseminate this information, and 3) develop guidelines for best practices and effective strategies to address road/wildlife conflicts.

Manual Goals

- Identify off-the-shelf analyses and best practices from Caltrans projects, literature, experience, and related case-studies.
- Catalog sources of information that can help to avoid, minimize, or mitigate wildlife impacts.
- Provide aid in identifying and assessing effects to wildlife movement.
- Describe a systematic process that fits into the existing project delivery and planning processes.
- Initiate a system that may be used to collect and present Caltrans experiences in addressing wildlife crossing issues.

Manual Map

Section 1: What You Need to Know (pages 1 to 19). A review of what you need to know to identify and assess wildlife crossings, including the regulatory considerations that affect transportation professionals.

Section 2: Baseline Assessment (pages 20 to 47). A review of what is needed to establish pre-construction (or baseline) conditions, including an assessment of wildlife groups, relevant field survey methods, data sources, management considerations, and modeling approaches.

Section 3: Project Effect Assessment (pages 48 to 53). A procedure to enable you to determine whether avoidance, minimization, or compensatory mitigation actions are necessary to facilitate wildlife movement and to meet regulatory requirements and public safety goals.

Section 4: Selecting Avoidance, Minimization, or Compensatory Mitigation Measures (pages 54 to 71). A review of procedures to select the best avoidance, minimization, or compensatory mitigation actions to meet regulatory or public safety requirements, including a review of structures that are most appropriate to facilitate movement by wildlife groups and meet wildlife crossing goals.

Section 5: Keeping Informed (pages 72 to 75). A review of wildlife crossings resources that are continuously updated to provide new strategies and applications, case studies, symposium proceedings, current literature citations, and additional sources of information relevant to transportation professionals.

Section 6: Literature Cited (pages 76 to 85). A listing of the literature and web resources used in the preparation of this document.

Executive Summary

California's roads interact with wildlife in myriad ways, resulting in both public safety and conservation concerns. The Division of Environmental Analysis hopes that this Wildlife Crossings Guidance Manual will provide valuable guidance to biologists, environmental planners, transportation planners and engineers engaged in efforts to reduce the environmental effects of California's highway infrastructure while improving public safety. The manual describes a procedure to identify wildlife crossing conflicts, choose an effective avoidance, minimization, or compensatory mitigation strategy, and evaluate the results of mitigation actions. Steps in this procedure include:

- identifying wildlife crossing conflicts associated with projects
- determining whether special status species or habitats occur within a project's scope
- collecting data to document the occurrences and movements of wildlife species that may be impacted by a project
- interpreting and evaluating data to assess effects
- choosing the most effective avoidance, minimization, or compensation strategy
- evaluating the effectiveness of the mitigation action

This Executive Summary provides a brief overview of information essential to all engaged in transportation projects, including project managers, planners, engineers, biologists, and maintenance staff.

What Are Wildlife Crossings & Why Do They Matter?

Wildlife crossings are areas of concentrated animal movement intercepted by roadways. In most cases, effects are seen because animals are inadvertently hit by drivers as they attempt to cross the road surface, leading to mortality of animals ("road-kill") and safety concerns to the motoring public. In other cases, animals choose to avoid crossing, and the roads present barriers to animal movement, dividing a formerly single population into two or more isolated population segments, causing a range of negative effects. These effects may be less apparent, but are no less significant. Further, environmental regulations compel transportation professionals to reduce or eliminate effects on special status species and habitats. Wildlife crossing considerations are reflected in the California Comprehensive Wildlife Conservation Strategy (California Department of Fish & Game, 2006), which lists wildlife habitat fragmentation as one of the biggest threats to the state's wildlife and suggests as a solution that "*Wildlife considerations need to be incorporated early in the transportation planning process*".

Regulatory Considerations

State and Federal regulations seek to protect wildlife and the habitats upon which it depends, and several of these regulations directly affect transportation professionals. For example, both the California Endangered Species Act (CESA) and Federal Endangered Species Act (ESA) require private and public organizations to limit harm to listed species and to consider and evaluate cumulative effects; creating barriers to movement or increasing mortality to listed species may be considered harm or add to existing effects, thus mandating avoidance, minimization, or compensation. Although these and similar regulations may not explicitly describe roads or wildlife crossing, the avoidance of harm is explicit in these and similar efforts to protect wildlife species and their habitats.

Wildlife Habitat and Connectivity

Habitat is defined as the part of the environment used by an organism and is essential for providing food, cover, and other requirements for survival. Agriculture, urbanization, and other human-caused effects subdivide habitats into habitat patches, and roads present barriers to many animals, impeding or preventing their movements among habitat patches. When considering wildlife movement, it is essential to consider the availability of habitat patches on both sides, and in some cases within the rights-of-way, of roadways and to attempt to reconnect habitat patches that may have been isolated by highway facilities. Considerations of cumulative effects may be especially relevant here, as effects due to transportation facilities may add to those due urbanization, agricultural development, and water management and directly affect special status species and/or their habitats.

Project Managers, Engineers, & Planners

SAFETEA-LU Section 6001 mandates that wildlife crossing and similar environmental considerations be taken into account early in the transportation planning process, thereby incorporating these concerns into project plans to enhance public safety while reducing effects on special status species and reconnecting fragmented habitats. The Section 6001 assessment should be completed during Regional Transportation Plan development and will require good communication between wildlife experts and the Metropolitan Planning Organizations who are tasked with RTP development. Biologists should discuss what is known about wildlife crossing issues with MPOs, Project Managers, Engineers, and Planners as early as possible in the planning process.

Field Surveys Confirm Presence of Wildlife

Wildlife crossing conflicts may be conspicuous, as when animal carcasses confirm mortality or public safety personnel document above-average rates of vehicle-animal collisions, or inconspicuous, as when animals refuse to cross a road bisecting a movement corridor and population segments become isolated. Confirming crossing conflicts requires effective assessment methods employed in a field survey. The methods to detect wildlife are well-developed, but field studies should be conducted by well-qualified individuals. Prior to conducting field work, one must accumulate existing information from agency reports and databases, maintenance personnel, other agency staff, NGO field staff and similar sources.

Project Managers, Engineers, & Planners

Crossing roads is associated with normal daily or seasonal movements for many wildlife species, but for others, roads present physical barriers to movement. Resource agencies and biologists must identify wildlife movement patterns and transportation agency professionals must seek to understand the effects of roadways on these patterns. Public safety is of paramount concern with large-bodied animals on roadways, regulatory considerations compel actions to reduce or eliminate impacts on special status species, and the public may demand actions in regions of especially great animal mortality. Local actions taken to enhance the safe passage of animals help to restore habitat connectivity and benefits populations across a regional landscape.

Traffic

Traffic characteristics (volumes, speeds, and timing) strongly influence wildlife crossings, although the relationships between traffic characteristics and wildlife crossing are complex. The highest volumes of traffic will impede or prevent crossing by many species, and road segments with the highest traffic volumes effectively serve as barriers to animal movement, while lesser volumes may increase rates of collision as animals attempt to cross the roads during intervals when cars are absent. There are daily and seasonal patterns in traffic and in animal movements and these patterns add to the complexity of the traffic/crossing relationship.

Reducing Highway Effects on Wildlife Crossing

The goal of this manual is to describe a procedure for assessing and responding to road/wildlife conflicts that minimizes the "ecological footprint" of roadways by enhancing wildlife crossing, reconnecting habitat fragments, reducing effects on special status species, and increasing public safety. Actions to reduce crossing conflicts take many forms, including project modification to avoid or minimize anticipated conflicts, modification of driver behavior, and the installation of structures to mitigate for effects.

Project Modification

The best time to consider wildlife crossing issues is during initial project planning. If as part of the project planning stage field assessments identify likely wildlife crossing conflicts, it may be most appropriate to consider modifications to the proposed route or other project modifications to avoid or minimize conflicts.

Modifying Driver Behavior

In many cases, driver safety and wildlife crossing can be enhanced by modifying driver behavior, for example, through public outreach, reduced speed limits, or warning signs.

Structures

Some existing structures provide relatively safe passage for wildlife to cross over or under roads. When spaced and sized appropriately, structures such as culverts, underpasses, overpasses, and viaducts, increase permeability and reconnect habitat fragments. In some cases, it may be possible to modify existing structures to enhance their effectiveness and to make them more "wildlife-friendly." Fencing is often incorporated into crossing structure designs to prevent animals from entering road rights-of-way and to direct them to crossing structures to allow safe passage. Vegetation and lighting are often incorporated into designs to enhance their effectiveness.

Project Managers, Engineers, & Planners

Wildlife crossings can often be improved by changing driver behavior, installing fencing, modifying existing structures (e.g., culverts), or providing new crossing structures. These methods for reducing effects of existing or proposed infrastructure should be in line with the effects of these facilities on wildlife crossing. The effectiveness of these actions should be monitored as part of the project to determine whether they achieved the desired results as described in the original mitigation and monitoring plan, environmental documentation and permits. Mitigation and monitoring activities should be developed by the biologist in coordination with the PDT. Resources and funding for mitigation activities and monitoring should be incorporated into project budgets - long term maintenance and monitoring of project outcomes are essential components of transportation related crossing avoidance, minimization or compensatory mitigation measures.

Maintenance

Crossing structures require regular maintenance to ensure long-term access and use by the animals they were intended to benefit. Storms may scour and vegetation may occlude culverts and underpasses, rendering them useless for wildlife passage. Maintenance staff should be involved in project planning, implementation, and post-project monitoring to ensure that designs and materials provide long-term benefits with a minimum of maintenance.

Post-project Assessments/Adaptive Management

It is essential to evaluate the effectiveness of actions taken to improve public safety, reduce effects on listed species and enhance wildlife crossing to assess whether these actions were successful and to respond to situations where original actions or designs did not work as anticipated but were subsequently modified and then found to better meet project objectives. Post-project assessments must adhere to reporting requirements and meet performance standards, should be well documented, and disseminated to feed back into subsequent project planning to help to inform future project delivery processes. Assessments should be added to the case studies on the wildlife crossings website (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/) so that all Department as well as other transportation professionals may benefit from a sharing of experiences.

Project Managers, Engineers, & Planners

The effectiveness of mitigation actions should be monitored as part of the project to ensure that the measures taken to avoid, minimize, or mitigate achieve established success criteria as described in the mitigation and monitoring plan, environmental documentation and permits. Mitigation and monitoring activities should be developed by the biologist in coordination with the PDT. Resources and funding for mitigation activities and monitoring should be considered and refined throughout the project delivery process. Long term monitoring, maintenance and post construction activities will require adequate funding.

1 What You Need to Know

1.1. Introduction

The purpose of this section is to introduce practitioners to the core experiences and literature that have shaped policy on avoiding and mitigating effects of roads on wildlife species of management and legal importance. Awareness of experiences elsewhere is important to effective analysis and design, and is critical to writing environmental documents that will be persuasive to regulators, politicians, and the interested public. This section is intended to provide an overview of the literature assembled and indexed at the end of the printed manual (and in more detail in the accompanying crossings website – http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/).

The environmental effect analysis for any substantial highway project should consider potential effects of both the infrastructure itself and resulting changed traffic operations on wildlife and its habitats. These effects include habitat fragmentation, loss of habitat connectivity, effects on designated critical habitats, and direct or indirect effects to threatened and endangered species (Forman and Alexander 1998). Wildlife crossings, in particular, have recently received much attention due to a variety of conservation, regulatory, and pubic safety concerns (Transportation Research Board 2002). Many organizations, agencies, and academic scientists are addressing concerns for wildlife and habitat connectivity by studying road/wildlife interactions, including the enhancement of crossings, and avoidance or mitigation for impacts to animal movement corridors.

In general, both environmental laws (especially the California Environmental Quality Act or CEQA and the National Environmental Policy Act or NEPA and sometimes ESA or CESA) and agency policy require project planners to avoid significant effects on populations of wildlife species of management concern if possible, and otherwise to minimize the effects and to provide for appropriate mitigation of unavoidable impacts. The CEQA Deskbook (Bass, Herson and Bogdan 2001 – new edition expected soon) provides a useful step by step summary for California projects under CEQA and NEPA. For species listed under either state or federal endangered species laws, the requirements may be more stringent, and may require project components to reduce the likelihood of adversely affecting a listed species, which may include reducing fragmentation or direct mortality effects for a proposed project.

The U.S. Federal Highway Administration report, Wildlife Habitat Connectivity Across European Highways (FHWA, 2002), notes that despite a growing literature on highway crossing issues, there has been a gap in practical guidance for transportation agencies. The goal of this manual is to organize and integrate materials from internal agency documents and the technical literature to describe approaches for: 1) evaluating roadways for potential wildlife crossing conflicts; 2) avoiding, minimizing, or compensating (mitigating) for these conflicts; and 3) assessing the effectiveness of mitigation actions.

1.1.1 Why Use This Manual

This manual surveys the wildlife crossing and related literature both to provide a useful guide to this literature as well as to provide specific, experience-based guidance on assessing and responding to wildlife crossing issues. This manual:

- reviews the federal and state statutes important to transportation professionals that are designed to protect and conserve wildlife and its habitats
- describes a process to evaluate known, predicted, or suspected wildlife crossings conflicts
- links wildlife groups to the crossing structures and actions that transportation professionals have utilized to mitigate conflicts with each group
- provides case studies of the mitigation efforts and experiences of others

This guidance manual is intended to outline current best practices and knowledge. Because the science and policy underlying wildlife crossings is advancing rapidly, the manual seeks to provide assistance in keeping informed of new developments by providing links to on-line resources, including the wildlife crossings website associated with this project (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/), that are updated frequently and that will continue to provide additional, current information.

1.1.2 Who Should Use this Manual

The intended primary audience for this manual is Caltrans biologists and other technical staff at the agency. It may also be useful to other transportation experts involved in planning, program management, or maintenance that need to know how roads may affect wildlife and ecological systems in California. However, readers will note that many of the details of project staging and documentation (for example: Figures 2 and 3) and some of the accompanying acronyms may be fairly specific to the steps mandated for Caltrans project delivery.

Transportation planning decisions have both a regulatory and an ecological context, and the manual seeks to integrate both to provide guidance, in the form of a process illustrated schematically in Figure 1, to those with responsibilities for identifying and mitigating wildlife crossing, listed species, habitat connectivity, and public safety conflicts.

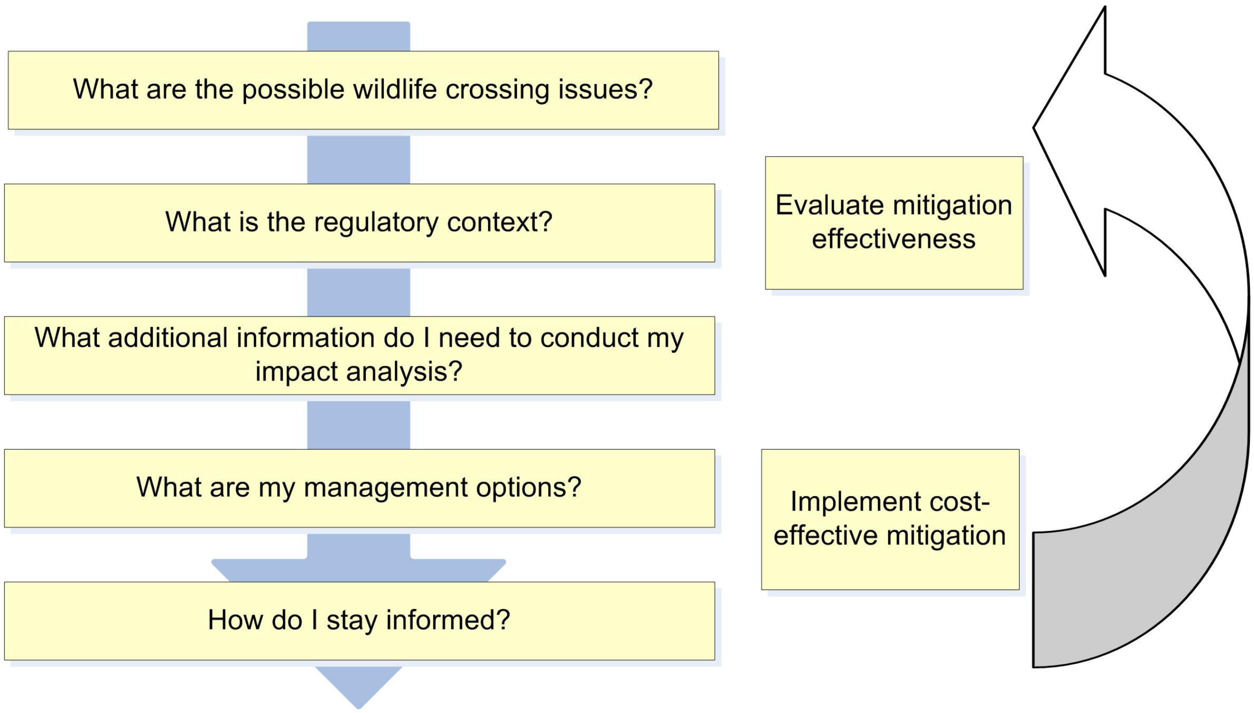


Figure 1: Assessment Flowchart

1.1.3 How to Use This Manual

The manual is structured to enable users to identify wildlife crossing needs throughout the planning process including the identification of sources of information on wildlife in a project area, assessment of potential effects associated with transportation facilities, consideration of avoidance, minimization, or compensatory mitigation strategies, a consideration of the relative costs associated with different strategies, and post-project monitoring and adaptive management.

The sequence of steps in this manual includes:

1. what you need to know, including how to identify wildlife crossings
2. how to assess potential effects associated with transportation facilities
3. what factors to consider in suggesting specific avoidance, minimization, and compensatory mitigation strategies, including their costs, and
4. how to monitor and assess the effectiveness of mitigation strategies, including adaptive management responses to deficiencies.

Because regulations affect many wildlife crossing considerations, the manual begins with a review of applicable major state and federal laws. The accompanying website, http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/, provides other stepwise "views" of the manual sections. You can find "decision trees" on the website and in this manual: the Wildlife Crossings Process Decision Tree (Figure 2) and the Wildlife Crossings Project Decision Tree

(Figure 3) illustrate the Caltrans environmental review process as it relates to wildlife crossing considerations. These decision trees walk the practitioner through a series of steps to assess wildlife crossing in project planning and delivery.

Wherever possible, the manual describes experiences from California, but the wildlife crossings literature is spatially extensive, and most of this literature illustrates examples from outside California, so where California examples are unavailable, the manual describes experiences from elsewhere in the U.S., Canada, and Europe. Caltrans plans to monitor California practices as they are established and tested, and results will be assembled on the manual website and incorporated into future editions of this document.

The manual integrates wildlife considerations with existing Caltrans environmental planning processes to help the user to identify the level of assessment or evaluation that should take place in parallel with other project delivery or engineering milestones (Figures 2 and 3).

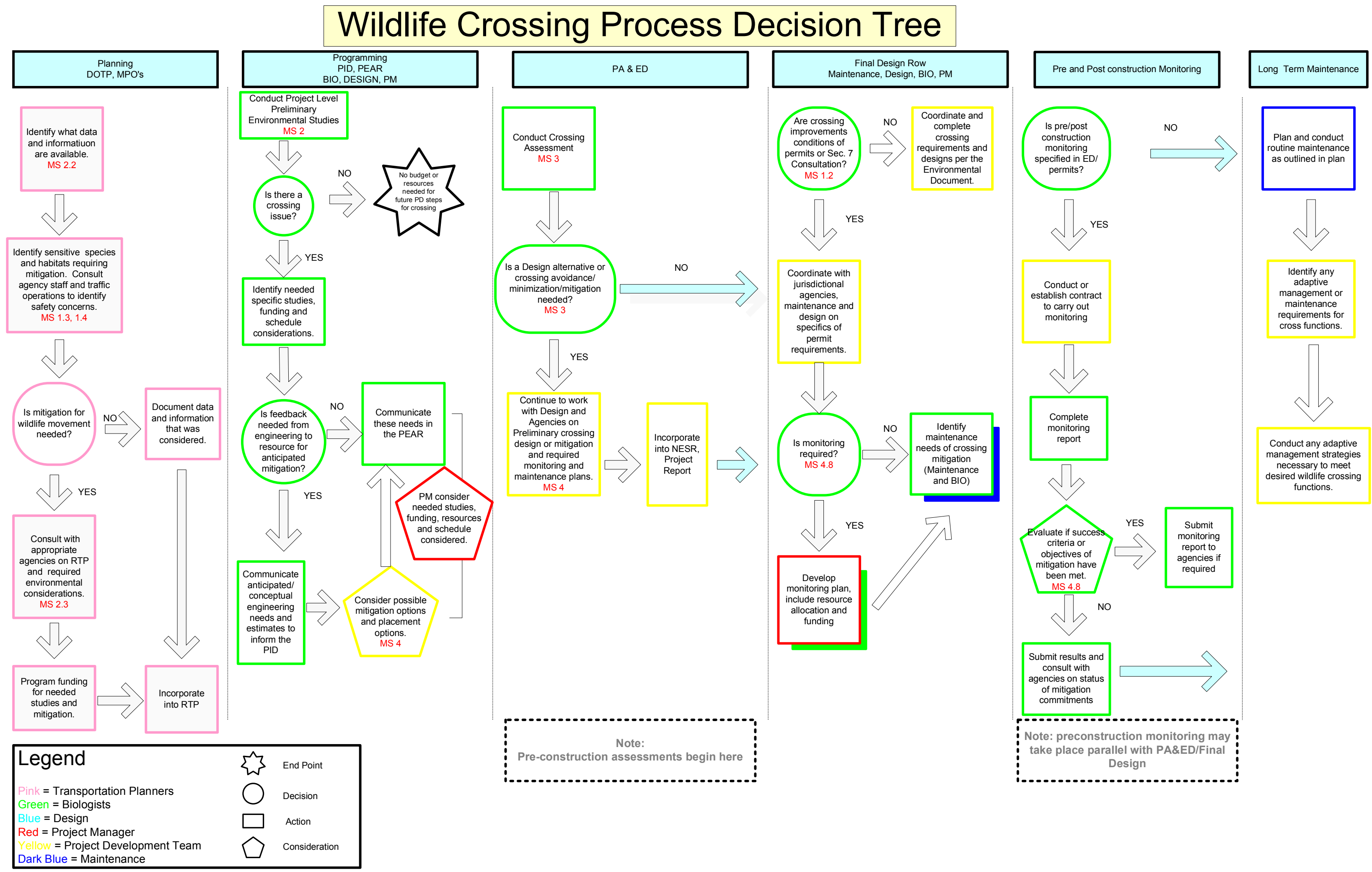


Figure 2: Caltrans Wildlife Crossing Process Decision Tree

Links to relevant sections this manual indicated in red (e.g., MS 2).

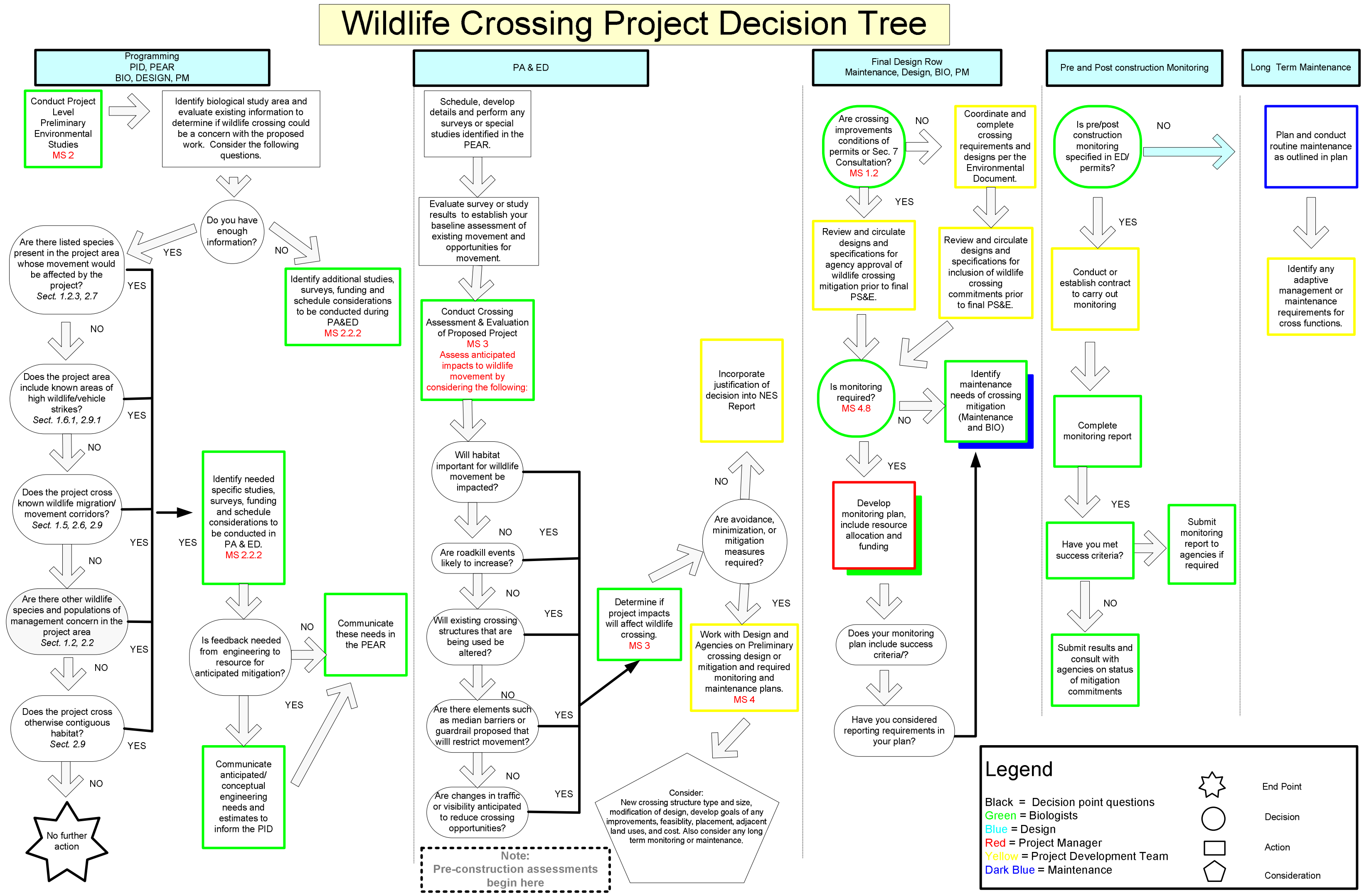


Figure 3: Caltrans Wildlife Crossing Project Decision Tree.

Links to relevant sections of this manual indicated in red (e.g., MS 3).

1.2. Federal and State Wildlife Protection Laws

Many wildlife crossing assessments, decisions, and actions are motivated by federal and state laws designed to protect wildlife and its habitats; here we review the most important wildlife-related legislation of concern to transportation professionals.

Federal Wildlife Laws/Regulations

- National Environmental Policy Act
- Endangered Species Act
- Department of Transportation Act/SAFETEA-LU
- Fish & Wildlife Coordination Act

State Wildlife Laws/Regulations

- California Environmental Quality Act
- California Endangered Species Act
- CDF&G, Fish and Game Code

The development of a Project Study Report (PSR) requires a consideration of relevant regulations and statutes. The primary applicable laws are described in the Guidelines for developing a Preliminary Environmental Analysis Report (PEAR), the Guidance for the Preliminary Environmental Studies (PES), and in Volume III of the Environmental Handbook. This information is available in the Standard Environmental Reference (SER), Chapter 14 – Biological Resources, http://www.dot.ca.gov/ser/vol1/sec3/natural/Ch14Bio/ch14bio.htm#ch14decisiontree.

The California Department of Fish and Game, Habitat Conservation Branch website (http://www.dfg.ca.gov/habcon/index.html) has much useful information related to state regulations covering species and habitats.

Table 1, adapted from the Transportation Research Board (2002) and California Department of Fish & Game website, accessed March, 2007, presents the major federal and state wildlife laws and regulations and a brief description of how each is related to transportation. Several species of animals and some specific habitats are protected under these regulations. Transportation facilities, proposed maintenance and improvements immediately within or adjacent to sensitive habitat types or movement corridors utilized by special status species are especially affected by regulatory considerations. The frequency and magnitude of these effects depend upon the:

- life-cycle needs of the species of concern
- characteristics of the habitats utilized
- distance from the wildlife movement corridor to the transportation corridor
- level and timing of the use of the corridor in relation to highway operation, and
- characteristics of the transportation facilities themselves (Evink 1990, Transportation Research Board 2002).

A thorough review of federal wildlife legislation affecting transportation is available on the Federal Highway Administration website (http://www.fhwa.dot.gov/environment/env_sum.htm).

Table 1: Applicability of major federal and state wildlife regulations to wildlife crossings.

Law	**Section**	**Applicability**
		Federal
National Environmental Policy Act (NEPA)		*Statute*: NEPA requires the consideration of environmental factors including wildlife crossing through a systemic interdisciplinary approach before committing to a course of action. The act applies to all Federally funded actions including FHWA actions. Specifically relating to wildlife crossing concerns, section 102 requires that, for every major Federal action, "a detailed statement by the responsible official on—(i) the environmental impact of the proposed action, (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented, (iii) alternatives to the proposed action, (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Included with NEPA is Executive Order 11990 which requires that all Federal actions "avoid to the extent possible the long and short term adverse effects associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative". Specifically section 5(b) requires consideration of "maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources". *Applicability*: A decrease in connectivity or a potential increase in wildlife vehicle collisions could be considered an adverse environmental effect. In any case where there is an adverse environmental effect, NEPA can be used as justification for mitigation of that action. NEPA specifically focuses on the context and intensity of an effect on the environment. The procedures for implementing NEPA are set forth in Council for Environmental Quality regulations and 23 CFR 771. Coordination with the appropriate federal, state, and local agencies is required. Executive Order 11990 specifically pertains to any projects nearby to wetlands and can be used as justification for wildlife crossing mitigation actions when movement associated with wetland species is impacted.

Law	Section	Applicability
Endangered Species Act (ESA)	7	*Statute*: Section 7 of the Endangered Species Act, 16 U.S.C. Section 1536(a)(2), requires all federal agencies to consult with the National Marine Fisheries Service (NMFS) for marine and anadromous species, or the United States Fish and Wildlife Services (USFWS) for fresh-water fish and wildlife, if they are proposing an "action" that may affect listed species or their designated habitat. Action is defined broadly to include funding, permitting and other regulatory actions. For local governments, any project that requires a federal permit or receives federal funding is subject to Section 7. Transportation projects that may impede movement of listed species or result in their harm are covered under this section. Section 9 of the Act prohibits the take of any federally listed animal species by any person subject to the jurisdiction of the United States. Take is defined as "… to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." Harm has been further defined to include habitat destruction when it injures or kills a listed species by interfering with essential behavior patterns, such as breeding, feeding, foraging, or resting. "Harass" in this definition means "…an intentional or negligent act or omission that creates the significant likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR §17.3). Thus, not only are Federally-listed species protected from such activities as hunting and collecting, but they are also protected from actions that damage or destroy their habitat. The term "person" is defined as "an individual, corporation, partnership, trust, association, or any other private entity; or any officer, employee, agent, department, or instrumentality of the Federal government, of any State, municipality, or political subdivision of a state, or any other entity subject to the jurisdiction of the United States." *Applicability*: The ESA pertains to any project that may affect the feeding, breeding, or sheltering of a Federally listed threatened or endangered species. Thus, if a project will impede migration of such a species to its breeding habitat, foraging habitat, or other such activities, then this act can be used as justification for wildlife crossing mitigation actions. *Other Considerations*: Consider if there are wetlands within or adjacent to the planning or project area. Many listed species use wetlands as breeding and feeding sites but migrate daily or seasonally to other habitat types. In a situation such as this, migratory paths and patterns should be included in the assessment of project effects and should be a consideration for any mitigation design.

Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)	6001	*Statute*: This Act contains several sections that affect wildlife, including wildlife refuges, reductions in vehicle-wildlife collisions, including the development of a best practices manual, and modifications to existing regulations, especially to Section 101(a)(35) of title 23 USC to ``(ii) reduce vehicle-caused wildlife mortality while maintaining habitat connectivity." Section 6001 also requires early consultations with resource agencies and tribes and consideration of applicable plans (recovery plans, wildlife action plans, etc.) so that input regarding environmental effects occurs early in the planning process. *Applicability*: This stature requires an evaluation of environmental effects at the regional scale so that mitigation costs can be considered and funds established early in the RTP process. Wildlife movement should be evaluated at the regional level in order to develop appropriate mitigation opportunities.
Department of Transportation Act	4(f)	*Statute*: This section of the act states that "[i]t is hereby declared to be policy of the United States Government that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites." These public lands may only be used for a transportation program or project if "(1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use." *Applicability*: This Act only relates to the use of the above described public lands. Coordination with the DOI, Department of Agriculture (DOA), Housing and Urban Development (HUD), state, or local agencies having jurisdiction and state historic preservation officer (for historic sites) is required.
Fish and Wildlife Coordination Act	16 U.S.C. §§ 661-667e	*Statute:* This act calls for the conservation, maintenance, and management of wildlife resources for any project that involves impoundment (surface area of 10 acres or more), diversion, channel deepening, or other modification of a stream or other body of water or the transfer of property by federal agencies to state agencies for wildlife conservation purposes. Coordination with the FWS and California Department of Fish & Game is required early in project development. *Applicability*: Any project that includes a modification to a body of water must consult with the FWS and CDFG. A project that would modify a body of water may also have wildlife movement implications associated with it. Coordination may aid in identifying improvements for wildlife movement.

Federal Statute - Economic, social, and environmental effects	23 U.S.C. 109(h), (P.L. 91-605), 23 U.S.C. 128. 23 CFR 771-772	*Statute*: This statute was passed to ensure that possible adverse economic, social, and environmental effects of proposed highway projects and project locations are fully considered and that final decisions on highway projects are made in the best overall public interest. It is applicable to the planning and development of proposed projects on any federal-aid highway system for which the FHWA approves the plans, specifications, and cost estimates or has the responsibility for approving a program. Identification of economic, social, and environmental effects; consideration of alternative courses of action; involvement of other agencies and the public; and a systematic interdisciplinary approach are required. The report required by Section 128 may be used as the NEPA compliance document. Appropriate federal, state, and local agencies have jurisdiction. *Applicability*: Consider this legislation during consultation and mitigation planning to support best decisions for use of funding for wildlife crossing mitigation.
State		
California Environmental Quality Act (CEQA)	15002, 15126	*Statute*: According to Section 15002 of the Act, the basic purposes of CEQA are to: (1) Inform governmental decision-makers and the public about the potential significant environmental effects of proposed activities; (2) identify the ways that environmental damage can be avoided or significantly reduced; (3) prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible; (4) Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects, defined as a substantial adverse change in physical conditions which exist in the area affected by a proposed project are involved. When a public agency undertakes an activity defined by CEQA as a "project" then the agency must comply with CEQA. A project is an activity undertaken by a public agency or a private activity that must receive some discretionary approval (i.e. the agency has the authority to deny the requested permit or approval) from a government agency, which may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment. The environmental review required imposes both procedural and substantive requirements. At a minimum, an initial review of the project and its environmental effects must be conducted. Depending on the potential effects, a further, and more substantial, review may be conducted in the form of an environmental impact report (EIR). *Applicability*: Impeding wildlife crossing and fragmenting wildlife habitat would be considered a direct change in the environment. Most proposals for physical development in California are subject to the provisions of CEQA, as are many governmental decisions that do not immediately result in physical development (such as adoption of a general or community plan). Every development project that requires a discretionary governmental approval requires an environmental review pursuant to CEQA. A project may not be approved as submitted if feasible alternatives or mitigation measures are able to substantially lessen the significant environmental effects of the project. CEQA can be used to justify wildlife crossing mitigation when a proposed project would cause a significant effect to wildlife movement. In such a case, mitigation would be required to reduce the project impact to a less than significant level.

California Endangered Species Act (CESA)	2080, 2081	*Statute*: Section 2080 of the Fish and Game Code prohibits "take" of any species that the commission determines to be an endangered species or a threatened species. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." CESA allows for take incidental to otherwise lawful development projects (section 2081). CESA emphasizes early consultation to avoid potential effects to rare, endangered, and threatened species and to develop appropriate mitigation planning to offset project caused losses of listed species populations and their essential habitats. If take of a state-listed species is likely to occur, an EIR (or an equivalent CEQA document) will be prepared. Through permits or memorandums of understanding, the Department of Fish and Game also may authorize individuals, public agencies, universities, zoological gardens, and scientific or educational institutions, to import, export, take, or possess any endangered species, threatened species, or candidate species of plants and animals for scientific, educational, or management purposes. (See Fish and Game Code Section 2081(a), and Scientific Collecting Permits and Memorandums of Understanding for further explanation of the requirements for plants.) *Applicability*: Under CESA, if a project proposes a "take" of a state threatened or endangered species, then the project would create a significant impact that would require mitigation. If the proposed "take" involves or is related to the impairment of a wildlife crossing corridor or basic wildlife movement then under CEQA mitigation would have to be established for this impairment.
California Department of Fish & Game Code	1600	*Statute*: Section 1600 of the CDFG code requires that a Lake or Streambed Alteration Agreement be obtained prior to any activity associated with the modification of a river, stream, or lake that could adversely affect existing fish or wildlife resources. *Applicability*: This statute can justify design modifications of elements of highway infrastructure or to a project to avoid effects to riparian areas which many species use as migration or movement corridors.

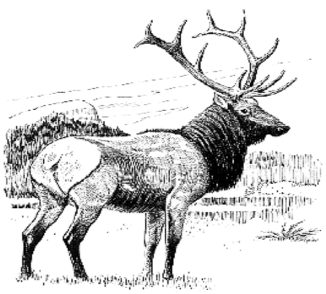
Once we consider a project's regulatory context, we can proceed to additional wildlife crossing considerations.

1.3. Wildlife: Functional, Taxonomic, and Special Status Groups

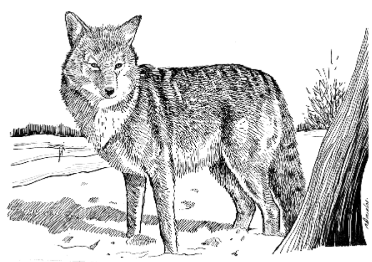
When assessing wildlife crossings, evaluations of issues and techniques for mitigating effects depends upon the species present and expected to be impacted by transportation facilities and associated changes in traffic patterns and volumes. Planning for mitigation actions typically involves dividing all possible wildlife species in the project region into "target" or "focal" groups (Beier and Loe 1992) generally based upon a functional (e.g., animal size class) or a regulatory (e.g., special status species) classification. In practice, only terrestrial vertebrates are considered in most of the wildlife crossing literature, as fishes, equally impacted by crossing considerations and subject to their own set of environmental regulations, are treated independently, as a separate category of considerations, and studied by fisheries biologists. Thus, this manual is devoted solely to terrestrial vertebrates, including birds, although many of the crossing issues examined apply to fishes as well. More information on fish passage field assessment protocols can be found at http://pd.dot.ca.gov/env/bio/html/fish_assessmntplan_index.htm. Design guidelines for fish passage can be found at http://www.dot.ca.gov/hq/oppd/fishPassage/.

1.3.1 Wildlife: Functional Groups

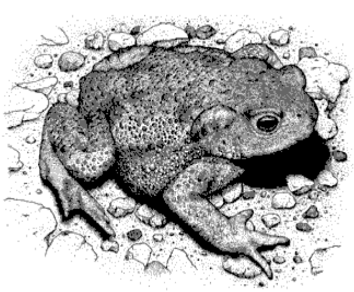
Most transportation professional's group animals into three functional categories based upon body size, as animals of similar body size tend to have similar movement patterns, benefit from the same or similar kinds of crossing enhancements, and present similar types of public safety concerns. Animals are in most studies divided into three functional groups based upon body size: 1) large-bodied animals, including elk, deer, and bears; 2) medium-bodied animals, including coyotes, raccoons, otters, opossums, turkey, and pheasant; and 3) small-bodied animals, a diverse group including rodents, salamanders, toads, frogs, snakes, turtles, and some birds.



Large-bodied animals– include species with large home or dispersal ranges that occur most often in rural areas and require large areas for daily or seasonal movements. Require large crossing structures strategically placed along traditional movement corridors.



Medium-bodied animals – includes species that often live in rural areas, but may also occur in agricultural settings. Require areas of moderate size for movement and smaller, more frequently spaced crossings placed between adjacent habitat areas. Often utilize culverts installed for fish passage and/or drainage.



Small-bodied animals – includes species that live in diverse habitats and may exhibit large-scale seasonal movements between adjacent habitat areas (e.g., salamanders moving between upland and aquatic habitats). Often benefit from smallest crossing structures (e.g., culverts and pipes) with associated fencing and climb-proof walls.

1.3.2 Wildlife: Taxonomic Groups

A classification system less often used for wildlife crossing research is that based upon genetic relatedness - taxonomic groups, and the four taxonomic groups recognized are the four vertebrate Classes: amphibians, reptiles, birds, and mammals. In most cases, all members of a single taxonomic group, such as amphibians, will benefit from the same type of mitigation.

Roads are known to effect bird species (e.g., Case 1978, Loos and Kerlinger 1993), and road mortality may seriously affect some special status bird species (e.g., Florida scrub jay, Dreschel et al. 1990, Mumme et al. 2000), but the effects of roads on bird populations have not been intensively studied in California nor in most other regions of the U.S. The effects of roads on bird populations have been much more extensively studied in Europe (see review of bird mortality on European roads by Erritzoe et al. 2003). Thus, this manual may seem to have a taxonomic bias; however, this apparent bias accurately reflects the history of the study of wildlife crossings in the U.S. and the relatively more extensive literature on mammalian crossings.

Similarly, this manual does not treat the crossing needs of fishes, as fish passage is studied and actions implemented by a functionally separate set of Department employees, although in some cases the crossing needs of fishes and terrestrial vertebrates may be similar, and actions intended to benefit fish passage may also benefit terrestrial species.

1.3.3 Wildlife: Special Status Species

In many cases, the focal species or species group is defined by regulation (e.g., NEPA, CEQA, ESA, and CESA). When regulatory considerations are paramount, avoidance, minimization, or compensatory mitigation actions are specifically targeted to benefit the feeding, breeding, and shelter needs of special status species.

The list of special status species changes frequently and users of the manual are advised to use the most current listing, maintained by the California Department of Fish & Game and available at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEAnimals.pdf.

For a current listing of California species protected under the U.S. Endangered Species Act, see the U.S. Fish & Wildlife Service Threatened and Endangered Species System, or TESS at: http://ecos.fws.gov/tess_public/StateListing.do?state=CA&status=listed.

1.4. *Special Habitats*

In addition to special status species, transportation planners must consider, for regulatory as well as ecological reasons, special habitats, especially wetlands and riparian corridors. Many vertebrate species, and all amphibian species, are seasonally dependent upon wetlands, especially for breeding. Many individuals move from upland to wetland locations when rains commence and return to upland locations when rains cease; thus, if highway facilities obstruct animal movements between wetlands and uplands, mitigation measures may be necessary to facilitate movement. Research has shown that there may be a long lag period following road construction adjacent wetlands and reductions in species abundances (Findlay and Houghlahan 1997; Findlay and Bourdages 2000).

Figure 4: Central Valley Wetland.

The Clean Water Act requires the delineation of wetland boundaries and special consideration of wetland-associated species. The U.S. Fish & Wildlife Service National Wetland Inventory (http://www.fws.gov/nwi/) seeks to map all wetlands in the U.S. and provides downloadable files of all wetland maps for analysis and publication in a GIS. NWI should be consulted for baseline data at any site with wetland habitats. NWI maps almost always list all wetlands appearing on the local USGS quad map, and often have been considerably refined beyond that from aerial imagery. However the age and quality of the data vary considerably with location, and small or seasonal wetlands, such as vernal pools, are often missed or mislabeled. Understanding where wetlands are located is essential for understanding movement needs associated with breeding, feeding, migration and shelter of many species. Review of species life cycle needs in relation to wetlands can help in understanding the need for connectivity in your area of concern.

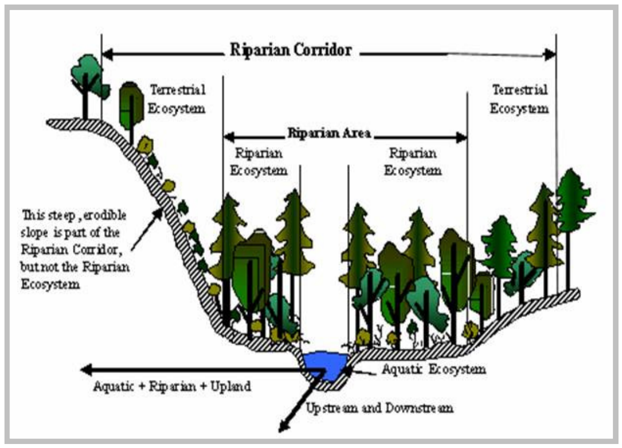


Figure 5: Riparian corridor. Derived from U.S. Forest Service website.

CEQA requires that riparian corridors receive special consideration if a transportation project has potential effects on a riparian zone, and riparian corridors are especially important for wildlife because they provide habitat for many species, are often heavily used by diverse species for movement among habitat patches, and are especially important targets for conservation as riparian corridors have been severely impacted by many types of development (e.g., Warner and Hendrix 1984). At present, there is no good single source of riparian habitat maps for California, although a composite map is under construction by the Riparian Habitat Joint Venture (http://www.prbo.org/calpif/htmldocs/rhjv/) and some of the source data may be viewed through the California Department of Fish & Game's Biogeographic Information and Observation System (BIOS; http://bios.dfg.ca.gov). In some areas, riparian zones can be readily identified from available imagery, including the free National Agriculture Imagery Program (NAIP) 1 meter resolution imagery available everywhere in California (see http://casil.ucdavis.edu), and Caltrans proprietary 1-foot resolution data within 500-100 m. of state highways. However, delimiting wetlands from aerial imagery may take considerable experience with GIS and related technologies.

1.5. Sources of Species-Level Information

If you are insufficiently familiar with the species of concern in a project's scope, the following is a summary of resources that provide much useful information. Note that in addition to the resources cited here, for special status species, recovery plans and five-year review documents may be especially helpful.

1.5.1 Internet Resources

- The California Department of Fish & Game web site, http://www.dfg.ca.gov/, is the best source of official web-based information on California's wildlife.
- The Biogeographic Information & Observation System (BIOS; http://bios.dfg.ca.gov/) provides an on-line map viewer for biological data generated by the Department of Fish and Game (DFG) and its partner organizations and is an excellent tool for a preliminary assessment of species of management concern that may be found withing a project assessment area. Most of the datasets may also be downloaded from BIOS or other California Resource Agency websites (e.g., CaSIL – http://gis.ca.gov) and further analyzed using Geographic Information Systems (GIS) technologies.
- The California Natural Diversity Database (CNDDB) is developed and maintained by the Department of Fish & Game and is included in the BIOS system. The CNDDB contains distribution information, including GIS coverages and maps, for all state and federally listed species in California, plus other "element occurrences" representing species, rare habitats, or other biological elements (for example, bird rookeries) of management importance to Fish & Game. The CNDDB, available at http://www.dfg.ca.gov/biogeodata/cnddb/, contains public as well as restricted information, but Caltrans biologists should have access to the subscription service that provides access to all of the information contained within the CNDDB. Note that CNDDB only records actual well-documented observations of the species involved, so that absence of a CNDDB record at a site may not be used to infer that no species of concern are present.
- The California Wildlife Habitat Relationships system (CWHR; http://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp) is an information resource for California's wildlife and contains life history, geographic range, habitat relationships, and management information on 692 non-marine species of amphibians, reptiles, birds, and mammals known to have breeding populations in the state. The

CWHR effort has as one component a series of printed guides, called California's Wildlife, that provide biological information for each regularly-occurring amphibian, reptile, mammal and bird in California. These species notes are available as downloadable PDF files from http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.asp. This web site provides updated versions of the species accounts in the three-volume set "California's Wildlife" edited by Zeiner, et al. (1988-1990) and contains 46 more accounts than the original publications, bringing the total to 692 vertebrate species. The species range maps are also available as GIS data. Note that these maps are created by experts in the biology of each species, and thus represent expert opinion about where the species might be expected to occur, rather than reporting known occurrences (as in CNDDB). As a result, they should be viewed as predictions, but they may be better predictors than NDDB of local species in areas that have not been well-surveyed (and they cover almost all terrestrial vertebrate species, not just the rare ones). Biologists should be aware that although the CWHR system is used by most state agencies to describe relationships between California's wildlife and land cover types, the CWHR system is not a vegetation classification system *per se*, but rather an expert-based model that provides expected lists of vertebrates based upon knowledge of the land cover class present. The land cover classes in the CWHR are based upon A Guide to Wildlife Habitats of California (Mayer and Laudenslayer, 1988). The formal vegetation classification for California, used by both state and federal agencies, is that described in A Manual of California Vegetation (Sawyer and Keeler-Wolf, 1995). Be aware, however, that other vegetation and land cover classification schemes have been developed; these include the USDA Ecological Subregions of California (http://www.fs.fed.us/r5/projects/ecoregions/), the California Native Plant Society's Vegetation Classification, and the USDA's CalVeg Classification (http://www.fs.fed.us/r5/rsl/projects/classification/). Links to these are also available from the CWHR website (http://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp).

- The U.S. Fish & Wildlife Service website (http://www.fws.gov) contains a wealth of useful information and is an especially good resource for information on endangered species.
- When California-specific data are scarce, it may be worth looking at national or global datasets to search for data types (for example, museum specimens) that may not have been incorporated into official CDFG or other state government compilations. An excellent compilation of on-line datasets has been assembled by the Taxonomic Data Working Group's Biodiversity Information Projects of the World (see http://www.tdwg.org/activities/bioinformatics-projects/)

1.5.2 Books

There are many excellent books on California's wildlife; here, we provide citations for only the most widely-used books on specific taxonomic groups:

- For amphibians and reptiles, the standard reference is the Stebbins field guide (Stebbins 1972).

- For birds, any of the several field guides to the U.S. or to the western U.S. would help with field identification, but for additional information, such as geographic range and preferred habitats, the books by Arnold Small (Small 1994) and Weston and Brown (1979) are more useful.
- For mammals, the standard reference is Jameson and Peeters' Mammals of California (2004).

Books to consider to aid in identifying effects per NEPA and CEQA include:

- Bass, R.E., A.I. Herson, and K.M. Bogdan. 2001. The NEPA Book: A step by step guide on how to comply with the NEPA.
- Remy, M.H., T.A. Thomas, J.G. Moose, and W.F. Manley. 2006. Guide to CEQA.
- Bass, R.E., A.I. Herson, and K.M. Bogdan. 1999. The CEQA Deskbook.

1.6. Identifying Wildlife Crossings

The first step in considering wildlife crossing issues is to confirm that a particular place or region is used as a crossing by wildlife. An extensive review of wildlife crossing and related literature shows that rather than a single, standard methodology for determining areas of wildlife crossing, there are several alternative sets of methods that can be used singly or in combination. These methodologies are used in an attempt to define the locations where assessment of highway facility effects are of greatest need to enhance and maintain wildlife movement and/or to reduce vehicle-animal conflicts and improve public safety.

In most cases, wildlife crossings have been identified by:

- repeated observations of animals crossing a small section of roadway
- a section of roadway showing an unusually high rate of vehicle-animal collisions (e.g., Clarke et al. 1998, Caro et al. 2000)
- professional assessments or judgments of qualified biologists (Clevenger et al. 2002) or highway maintenance staff (Case 1978) with experience in an area
- on-the-ground surveys of obvious wildlife corridors (e.g., documentation of game trails, tracks and other evidence indicating areas of concentrated animal movement (Scheick and Jones 1999), although animals may perceive the roadway as a barrier and refuse to cross (e.g., Riley et al. 2006)
- documenting suspected movement corridors with track plates, raked soil, remotely-triggered cameras or similar methods to confirm regions with disproportionately high use and to identify species present (e.g., Ng et al. 2004)

Additional methods which are appropriate for documenting existing crossings and for predicting locations of potential crossings include:

- modeling of actual or potential wildlife corridors based on road occurrences, wildlife habitat, wildlife occurrences, and habitat connectivity (Penrod et al. 2001, Shilling et al. 2002; Shilling and Girvetz, 2007)
- GIS models that rely upon selected landscape attributes and their interactions with highway facilities (Mladenoff et al. 1999, Clevenger et al. 2002) to predict crossing

locations

- a combination of approaches to try to enhance the detection and delineation of highway crossing areas regularly used by wildlife (e.g., Ng et al. 2004)

When crossing issues are documented or expected, it is essential to:

- design a field assessment of the type and nature of crossing issues involved
- identify the species of animals present
- document how the focal species are or may be impacted by a highway facility or proposed facility or facility improvement
- develop a relative assessment of the frequency and timing of the conflict(s)

Each of the federal and state regulations summarized in Table 1 has its own statutory requirements given an expectation of significant effects:

- ➔ CEQA requires findings of significance and documentation of cumulative effects
- ➔ NEPA requires a consideration of environmental context and intensity, with specific consideration of ecologically critical areas and public controversy
- ➔ when listed species may be affected, ESA requires consultations with the U.S. Fish & Wildlife Service to consider a project's potential for jeopardy as well as its effects on critical habitat
- ➔ CESA also requires a consideration of jeopardy and efforts to minimize and fully mitigate for impacts

1.6.1 Case Studies: Existing Efforts to Enhance Wildlife Crossing

Caltrans practitioners may learn much from the experiences of others; here are provided some case studies of existing projects in California. Please consult the wildlife crossing web site (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/) for additional case studies and/or to add another case study record.

Existing Efforts in California

- U.S. 395 Wildlife Undercrossings. Three undercrossings were installed in 1976-1978 under U.S. 395 in northeastern California primarily in response to elevated rates of vehicle-deer collisions during deer spring and fall deer migrations (Figure 21). This project was well documented by Ford (1976).

- Desert bighorn sheep: several on-going Caltrans studies focus on desert bighorn sheep (*Ovis canadensis*

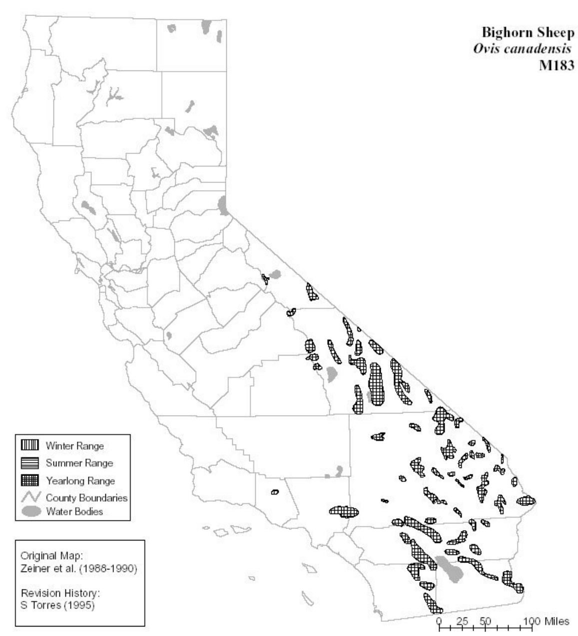


Figure 6: Range of California Bighorn Sheep

nelsoni). Desert bighorns naturally range over approximately 20% of California, in the southeast portion of the state. The range of the desert bighorn includes several isolated mountain populations separated by desert, with movement among habitat patches necessary to ensure population persistence and genetic interchange (Epps et al. 2005).

- Ventura County: Ventura County's "Designing Road Crossings for Safe Wildlife Passage" is a project of the Ventura County Planning Department and the Donald Bren School of Environmental Science & Management at the University of California, Santa Barbara. The final report of this project provides a comprehensive overview of wildlife crossing issues and mitigation strategies and is available at: http://www.bren.ucsb.edu/research/documents/corridors_final.pdf. This project continues as the county works to adopt these measures as part of its CEQA initial study assessment guidelines. In addition, Caltrans has funded an intensive wildlife corridor assessment of SR 118 (report available as a PDF available at: http://www.dot.ca.gov/dist07/resources/envdocs/docs/H118css_WCA.pdf. This work continues as the SR 118 Working Group to address regional wildlife crossing issues along this sate highway.

Examples of Wildlife Crossing Projects Outside California

The following websites provide examples of wildlife crossing projects outside of California:

- Wildlife crossing projects in several states are described in Transportation: Protecting Species, Enhancing Ecosystems, available at: http://www.contextsensitivesolutions.org/content/reading/taking-the/resources/taking-the-high-road/.
- The National Cooperative Highway Research Program published a report in 2002, NCHRP Synthesis 305: Interaction between Roadways and Wildlife Ecology, available at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_305.pdf.
- Summaries of several projects from Washington State, Maine, Montana, and Slovenia are provided in Carr et al. (2003) Appendix I, page 77 (available at: http://www.metro-region.org/library_docs/trans/wc_final.pdf).
- The recently-completed (2006) Arizona DOT effort to locate potential linkage zones is an excellent example of a statewide effort to identify, map, and prioritize wildlife corridors (http://www.azdot.gov/Highways/OES/AZ_WildLife_Linkages/assessment.asp). The Arizona effort uses multiple criteria to prioritize mitigation needs and considers the potential effects of all kinds of development on corridors and does not seek to identify specific areas where highway crossing mitigation actions are required. The Arizona study also seeks to integrate an index of threat, with those corridors with highest biological value and greatest threat (e.g., due to proposed development) receiving the highest priority.

2 Baseline Assessment

Your baseline assessment will document the current conditions on wildlife passage and critical habitats and take into account the 1) project type, 2) regulations that pertain to species and habitats in the project area (Table 1), and 3) presence of species status species and habitats. Table 2, below, lists some project types and some potential wildlife crossing effects associated with each. You will utilize the sources of information described in Section 1 to review what is known about wildlife in the project area and evaluate and summarize this information to place this project into a regional context and characterize existing conditions.

Table 1: Project types and potential crossing effects.

Project Type	**Potential Crossing Effects**
New highway	Bisection of existing habitat, interrupted migration/movement patterns, genetic isolation of populations, introduction of possibility for collision
Highway widening	Increased distance to cross, potentially greater traffic volumes
Installation of median barrier	Reduced permeability, greater risk of animal-vehicle collisions, interrupted migration/movement
New off- or on-ramps	Potentially greater traffic volumes in rural areas, added overall facility footprint
Bridge retrofit	May result in reduced or increased opportunities for crossing
Routine maintenance	Clearing vegetation, and other material may affect the attractiveness and use of a particular structure (e.g., road-side, culvert)

2.1. Basic Steps to Establish Your Baseline

To fully understand wildlife crossing at the project level, it is important to have a landscape level understanding of wildlife movement in your region. At the project level, establishing your baseline for wildlife movement is essential to aid in your project effect analysis.

Figure 7: Bear Crossing

When assessing wildlife crossings, Caltrans biologists may follow a process that consists of the following steps:

1. Establish a basic understanding of wildlife movement needs and corridors in your region. As appropriate, provide information and expertise to Regional Transportation Planners. Also this basic understanding can help you in project level analysis.

2. Understand regional and project level connectivity and crossing functionality.

3. Establish your baseline for your proposed project region and direct project area:
   - Identify, acquire, and review existing data
   - Evaluate existing information to develop an understanding of wildlife movement in your project area
   - Evaluate the need for field surveys

4. Identify the need for and the goals of additional field surveys:
   - Establish goals of additional field surveys
   - Select sites for field surveys
   - Evaluate and select appropriate survey methods
   - Consider sample sizes, survey intensity, and other elements of data collection
   - Conduct field surveys
   - Evaluate data set
   - Use collaborative approach – involve agencies, NGOs

2.1.1 Understanding Landscape-level Connectivity: Bioregional Perspective

To begin your assessment of a project's potential effects on target species, the project must be placed in a bioregional perspective; a regional perspective is required because:

1. local impacts may affect wildlife species, especially those with large home ranges, on larger spatial scales

2. it is necessary to help to define all of the species and potential wildlife/highway conflicts that may exist, and

3. regulatory considerations (CEQA and NEPA) require the assessment of cumulative effects, including local effects on regional issues such as habitat connectivity, linkages, and wildlife corridors.

It may be useful in bioregional assessments to utilize the 10 bioregions recognized by the California Interagency Natural Areas Coordinating Committee (INACC; http://ceres.ca.gov/biodiv/Bioregions/INACC.pdf) as depicted in Figure 8.

Each of California's bioregions, described more fully on the CERES system (http://ceres.ca.gov/geo_area/bioregions/mapindex.html), contains a unique combination of plants and animals and thus a unique set of potential wildlife crossing issues.

Coordination with the Natural Community Conservation Planning group in the California Department of Fish & Game (http://www.dfg.ca.gov/nccp/index.html) may be useful, especially at the bioregional scale, as this group works with numerous private and public partners to take a broad-based ecosystem approach to planning for the conservation of California's biodiversity and may enhance communication and knowledge transfer among Caltrans staff and its collaborators.

Environmental planning documents under NEPA and CEQA are required to address not only effects within the project site, but also the environmental setting of the project and its cumulative effects on a landscape basis (in other words, its interaction with other environmental effects in the surrounding areas). Environmental documents are being found deficient in increasing numbers when cumulative effects are not adequately addressed. Consequently, if projects potentially disrupt habitat connectivity, especially for wide-ranging species (deer, elk, mountain lion), it is wise to discuss potential regional effects in the environmental documents.

When evaluating regional wildlife movements, review all available information, including the results of GIS analyses and models that may have been produced by other state or federal agencies, county planners, or NGOs. There have been several large-scale GIS-based assessments of wildlife corridors and/or movements in California, and these should be examined early in the project planning process. To date, the only statewide effort to identify and map wildlife corridors was the Missing Linkages Project following the statewide Missing Linkages workshop held at San Diego Zoo, November, 2000 (http://www.calwild.org/resources/pubs/linkages/index.htm).

Examples of bioregional assessments from Southern California include:

- The Puente-Chino Hills Wildlife Corridor. Although not explicitly devoted to wildlife crossings, this project examines many of the issues related to connecting wildlife habitats (primarily mountain lion habitats); see http://www.habitatauthority.org/pdf/pg1-12v2b.pdf
- The Coal Canyon Wildlife Corridor. This corridor is critical to the survival of the mountain lion in the Santa Ana Mountains; this project is described at http://www2.for.nau.edu/research/pb1/Service/coal_canyon_address.htm
- The South Coast Missing Linkages Project. An on-going effort involving many agency and NGO collaborators that identified many potential wildlife corridors throughout coastal Southern California (http://www.scwildlands.org/).
- The Conception Coast Project Regional Conservation Guide. This guide provides information, including movement corridors and habitat linkages, on the mountain lion and sensitive species in the Conception Coast region (http://www.conceptioncoast.org/Conception_Coast_Project.html)
- Desert Bighorn Sheep. Several investigators have used radio-collars to study fragmentation issues of desert bighorn sheep in the Peninsular Ranges of California (e.g., Rubin et al. 1998, Butierrez-Espeleta et al.

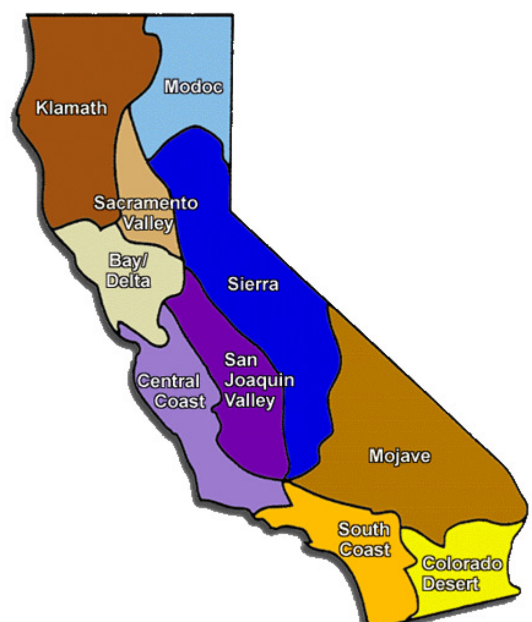


Figure 8: Bioregions of California.

2000)

- The South Coast Wildlands Project. A continuing study in Southern California to identify potential wildlife corridors with a system of ranking by relative threat (http://www.scwildlands.org)

Examples of Central and Northern California assessments include:

- A Guide to Wildlands Conservation in the Central Coast Region of California. This study showed places where wildlife corridors were likely to be present and were threatened by highways and other development (Thorne, Cameron, and Jigour 2002; http://cain.nbii.org/repository/CC.pdf).
- A Guide to Wildlands Conservation in the Greater Sierra Nevada Bioregion. A combination of habitat models, focal species, and threats to habitat quality was used to indicate core and connectivity areas/corridors (Shilling and Girvetz 2007; Shilling et al. 2002; http://cain.nbii.org/repository/Sierra.pdf).
- California Tiger Salamanders. Pyke (2005) looked at the endangered California tiger salamander as a case study for the importance of habitat linkages for population persistence and Barry and Shaffer (1994) looked at the Stanford University population of the species and recommended mitigation measures, since implemented.

Caltrans-sponsored projects in progress are applying similar methods to assess potential wildlife corridors for individual species at the project-to-county scale. These and similar efforts will help practitioners to identify regions with high corridor potential and may be useful on an individual project scale to suggest areas for further investigation. Areas identified as priority wildlife corridors should be assessed to:

1. inventory existing crossing infrastructure to assess whether it is sufficient and effective at connecting wildlife habitats and facilitating crossing
2. identify and prioritize particular crossing points for additional crossing enhancements and mitigation efforts, and
3. identify adjacent land uses to ensure any investments in highway infrastructure match the anticipated land use.

These efforts, and the other studies listed above, suggest useful methodologies that take advantage of existing expertise and which may be adopted by Caltrans as a component of efforts to set wildlife crossing priorities.

2.1.2 Understanding Project-level Crossing Issues

In considering a project's potential effects at the local level, the practitioner seeks to determine what kind of avoidance, minimization or compensatory-mitigation strategy will work best given the project type, habitat, and focal species.

In accordance with the project type and its potential effects, the practitioner must first define the target or focal species by identifying regulatory, management, public safety, and/or public outcry considerations for the species known or suspected to occur in the project area.

2.2. *Developing Your Baseline for Wildlife Movement*

It is important to assess projects for potential wildlife crossing conflicts prior to the construction of infrastructural barriers (Hardy et al. 2003, Van Der Grift and Pouwels 2006; Scheick and Jones 1999). The documentation of pre-construction conditions will provide a project base-line assessment that is unbiased by any construction activity.

Baseline assessments should be conducted for any special status species that may potentially occur within a project's scope as well as species that may present public safety concerns (e.g., deer, elk). Establishing a baseline includes reviewing and documenting existing sources of information that provide insight to wildlife movement as well as possibly generating some field survey data to better define wildlife crossing in your particular project location.

Known Crossing Conflict:

- Road kills
- Documented roadway barrier effects

Suspected Crossing Conflict:

- Reported wildlife crossing
- Appropriate habitat/landscape
- Documented signs of occurrence

Predicted Crossing Conflict:

- Results of GIS analysis
- Professional judgment
- California Wildlife Habitat Relations

2.2.1 Identify, Acquire, and Review Data Sources

The first step in an assessment of a project's potential effects on target species is a review of all existing data sources. Efforts to identify existing information should include:

- consultations with Caltrans biologists, GIS, and maintenance staff
- consultations with other land-management agency biologists and GIS staff, especially to determine whether special status species or critical habitats may be impacted by a project
- consultations with other experts including county planners, NGO, resource conservation district, and local conservation agency field staff
- consultations with sheriff's departments and State Highway Patrol offices as potential sources of road-kill data
- a thorough literature review (Caltrans library, academic libraries, web-based sources such as Google Scholar), including species recovery plans and updates
- a review of California Department of Fish & Game resources (e.g., BIOS, CNDDB, CWHR)
- a review of the results of predictive modeling in the region, if any
- consultations with biological consultants
- review of old reports from the area (BA, NES, etc.)
- conversations with local landowners, farmers, cooperative extension specialists, fishermen, hunters, etc.

- Department of Defense staff, if applicable
- University researchers
- CalFish database

A review of all of these data sources will help to most thoroughly document what is already known about wildlife species and their movements in the project area. This initial review of data sources should be conducted during the PEAR development, and based on this review you should determine whether additional, targeted field surveys and assessments are needed as well as identify any preliminary anticipated needs for wildlife crossing improvements.

2.2.2 Identify the Need for Additional Field Surveys and Assessments

Potential project effects on wildlife crossing should initially be assessed when a highway project is in its early planning stages. When wildlife crossing conflicts have been reported or are suspected or predicted, it may be necessary to conduct field surveys to confirm the presence of, identify, and estimate the abundance of focal species in the project area. It will also be necessary to conduct field surveys in those cases when your review of existing information determines that no wildlife information exists from the project area. Keep in mind that field surveys or assessments must aid in a determination of whether the effects of a project are significant, as a finding of significance is usually what results in the recommendation to incorporate wildlife crossings to reduce effects. A finding of significance may result from an analysis of a project's effects under CEQA and NEPA, and having sufficient data to determine effects relative to populations. Simply documenting whether animals are prevented from crossing or are getting hit while attempting to cross is not usually sufficient to conclude that a project’s effects may be significant – there must be evidence of a project's effects on the species population, available habitat connectivity, ability to fulfill life cycle needs, migration, etc.

Establish Intended Outcome or Application of Survey Data

Once you have established that additional information is needed, it is important to identify what information is needed, why it is needed, and how you will obtain this additional information. In order to choose the right survey strategy, understand what question you are trying to answer. The procedures for analyzing survey data depend upon the detection methods used and the goals of the study. This section reviews the kinds of information one can obtain through field surveys: determining presence/absence, estimating relative or absolute abundance, or identifying use of existing structures or crossing of the existing roadway.

Presence/Absence. The minimum amount of information to be obtained through a field survey is whether focal species do or do not occur in the study area. Presence or absence can be determined with all of the methods described in Table 3, below. Be aware, however, that no method of detection works 100% of the time, and that while the detection of an animal confirms its presence, the lack of detection does not confirm its absence (“absence of evidence isn’t evidence of absence”). For example, Hilty and Merenlender (2000) found on their study site in Sonoma County that baited track plates failed to detect mammal species detected by remotely-triggered cameras. The limit of interpretation of such survey data is not that particular species do or do not occur in the study area, but rather that they were or were not detected given the methods used. Use your knowledge of the focal species habits to conduct your surveys at the time of the year when the species is present and most active (e.g., during migration for ungulates and during breeding movements for amphibians).

Relative abundance. A greater amount of information is obtained, and may be required by regulation, when one estimates the relative frequency of occurrence of focal species in a study area. Relative abundance can be estimated from frequency of movement past defined points, for example by periodic counts of tracks (track plates and raked soil) and remotely-triggered camera data (Mace et al. 1996; Drennan et al., 1998; Clevenger and Waltho, 2004). Here, one would report the numbers (and identities) of animals recorded per unit of time. An advantage of obtaining relative abundance data is that one may then compare the estimate of relative abundance of animal species at one site to those of other sites and get a quantitative estimate of among-site differences in relative abundance. Estimates of relative abundance are usually expressed as numbers of observations per unit of time or effort (e.g., number of observations per hour or per number of track plate stations per unit of time) rather than as numbers of animals per unit of area, because these methods do not generate estimates of numbers of animals per unit of area (absolute estimates of abundance). Keep in mind that the abundance of the focal species may change seasonally.

Absolute abundance. The greatest amount of information on a focal species in a study area is obtained through an estimate of its absolute abundance (animals per unit area), and such estimates may be required to estimate crossing effects on populations. However, the estimates of absolute abundance require the most intensive field investigations, and may be logistically challenging. When one calculates an estimate of absolute abundance, an estimate of the relative importance of the local population to the regional or global population is possible, as may be required under NEPA and CEQA. In the case of special status species, the most important considerations involve estimates of absolute abundance and comparison of the local abundance to the species as a whole (Craighead et al. 2001, Dodd et al. 2004). For conspicuous animals, direct observations may yield absolute estimates of abundance (e.g., pronghorn in low shrub habitats, salamanders moving to breeding ponds), but for less conspicuous animals, remotely-triggered cameras may provide the best method to estimate absolute abundance, as it is necessary to discriminate among individuals to estimate absolute abundance, and remotely-triggered cameras may provide the most reliable method to identify individuals of a species (Mace et al. 1994). For most vertebrates, mark-recapture methods or tracking of individuals are typically required for population estimates that can withstand technical or legal challenges.

Mortality Index. Obtaining an absolute estimate of mortality (expressed as the proportion of the population that dies per year) is difficult for mobile species and often involves intensive field work over an extended period of time. However, for species with a regional population that is restricted to a small area, it may be possible to estimate the rate of annual mortality due to roadkill because the size of the regional population can be estimated. For example, Gibbs and Shriver (2002) found that roadkill may cause regional declines in land and large-bodied pond turtle populations in the eastern and central United States. The same authors (2005) found that rates of mortality of pool-breeding amphibians were strongly positively correlated with traffic volume at their study site in New York. Twitty (1941) and Barry and Shaffer (1994) found that road traffic was a major source of mortality of California tiger salamanders during their seasonal migrations from their upland aestivation sites to their lowland breeding pond on the campus of

Stanford University. Thus, for species with restricted ranges and population sizes (amphibians, some reptiles, small-bodied mammals), and which, coincidentally, are often special status species, it may be possible to estimate absolute rates of mortality.

However, for mobile species such as medium and large-sized mammals and birds, it is more difficult to estimate the size of the population of interest as well as the rate of mortality due roadkill (Romin and Bissoette 1996, Groot Bruinderink and Hazebroek 1996), and thus rates of roadkill are more typically expressed as a mortality index, and the index consists of an estimate of the number of individuals killed per length of road surface per unit of time. Multiple indices derived from several locations can be compared, thus providing a means to evaluate the relative rates of mortality due roadkill, although the underlying factors responsible for differences may not be known (differences in animal abundances, etc.). In many cases, these rates are often expressed in relation to daily or seasonal periods of time, as mortality rates are often highly correlated with traffic volume, and traffic volume, as well as animal movements, fluctuate daily as well as seasonally (Ford 1976, Case 1978, Sullivan et al. 1984).

Habitat Fragmentation. If the goal of your field survey is to document habitat fragmentation, you may need more intensive methods to obtain additional information. Habitat fragmentation may result from extreme levels of mortality caused by vehicle-animal collisions (e.g., Lodé 2000, Dodd et al. 2004) and it may be essential to document high levels of road kill through frequent field surveys to demonstrate that the roadway presents a barrier. In other cases, animals may perceive the roadway as a barrier and will not or only rarely attempt to cross. Riley et al. (2006) studied dispersal patterns of bobcats and coyotes across the Ventura Freeway in southern California and utilized radio-tracking and genetic "fingerprinting" to identify individuals. Their study, conducted over 7 years, demonstrated a very low level of crossing and consequent effects on population isolation, including genetic effects. Similar effects on the movements of desert bighorn sheep were demonstrated by Epps et al. (2005) who used radio-collars to show that roads imposed territory and range constraints on animals that were moving among mountain ranges in southeastern California. Similar intensive field methods may be necessary if you suspect road effects on animal migratory movements through your study area (e.g., Ford 1976). Separation of breeding, feeding, and sheltering habitat may also be a concern that you may want to consider as part of your field assessment.

Once you have determined the intended goal(s) of collecting additional information from the field, a wildlife biologist must spend time in the field to document wildlife presence, abundance, and spatial and temporal patterns of movement. Wildlife biologists have employed a variety of techniques to assess wildlife presence and abundance. Scheick and Jones (1999) provide details of their pre-project survey of large and medium-bodied mammals in North Carolina, and their methods are widely applicable to road crossing-related wildlife surveys. These include track-count surveys, ditch crossing surveys, monitoring of trails using remotely-triggered infra-red cameras, and GIS modeling to predict likely movement corridors at landscape scales. Additional methods commonly employed to detect and document animal movements include track plates and raked soil. In some cases, a combination of techniques such as gypsum on raked soil, may provide enhanced detection (Ng et al., 2004). For surveys designed to document movements of mammals, Sanderson (1966) provides a comprehensive overview of both theory and practical application.

There are five main steps to conduct field assessments of wildlife presence and movements:

1. Select survey site(s)
2. Select detection method(s)
3. Collect data
4. Analyze and interpret data
5. Report results

Survey Site Selection

Field surveys should document signs (game trails, etc.) of concentrated animal movement to best define and characterize wildlife crossing issues (e.g., Scheick and Jones 1999). While in the field, one should consider not only the regions defined by road kills and other direct evidence of crossing conflicts, but should also consider the landscape attributes that tend to favor animal movement, including riparian corridors, ravines or ridgelines, habitat edges, and patches of relatively undisturbed habitat, and seek to document barrier effects, i.e. regions where movement corridors are interrupted by highway infrastructure and where habitat connectivity is lost because animals refuse to cross (e.g., Riley et al. 2006).

Many large and medium-sized mammals follow traditional routes across regions of uneven terrain in order to move most efficiently across the landscape. These movements often result in concentrated animal movements across features such as ditches, and these routes may be surveyed to estimate the numbers and species of animals present and may suggest appropriate locations in which to site additional detection devices (e.g., track plates, raked soil, and remotely-triggered cameras). Ditch crossing surveys will not yield an index of abundance unless the substrate within the ditch crossing is refreshed at frequent intervals.

Beier and Loe's (1992) schema, while not specifically written with highway facilities in mind, provides an excellent functional description of wildlife corridors as well as a checklist for evaluating corridors. According to Beier and Loe, the steps to evaluate a wildlife corridor are to:

- identify the habitat areas the corridor is designed to connect
- select several species of interest from the species present in these areas
- evaluate the relevant needs of each selected species
- for each potential corridor, evaluate how the area will accommodate movement by each species of interest
- draw the corridor(s) on a map
- design a monitoring program to confirm animal use

Although not all wildlife movement occurs within corridors, by utilizing such a schema, a biologist may confirm the locations of corridors required to permit movements of species of interest.

The choice of where to survey for wildlife occurrences depends upon the project scope and the information needed to best characterize the habits and habitats of the focal species or species group. Following expert consultations, literature review, and examination of existing data; seek evidence of occurrence in habitats utilized by the focal species along or across the roadway itself as well as in appropriate habitats more distant from the right-of-way: recall the need for a local as well as a bioregional perspective. Regions where animal signs have been documented may then become the foci for more intensive investigation using the methods described below.

Within a survey area, be sure to survey sites with:

- available natural plant cover
- reported animal-vehicle collisions
- previously reported occurrences of focal species
- constrained opportunities for crossing such as a stream crossing in an agricultural area
- existing structures (e.g., culverts) that may be used by wildlife

Survey Sample Size

While selecting a sample size is a complex issue which requires the consideration of many variables, the following is a brief discussion of the most common considerations. For more formal treatments of sample size considerations, please see Sutherland 2006 and Appendix II, Sample Size Equations, in Elzinga et al. 2001, or the U.S.G.S. Patuxent Wildlife Research Center's Managers' Monitoring Manual treatment of sample size calculations at: http://www.pwrc.usgs.gov/monmanual/cvs/). As a general rule, the more data you are able to obtain, the better, as chance events play disproportionately larger roles in small samples, and if you were to extrapolate patterns from small sample sizes you increase the risk of erroneously characterizing the wildlife in a study site. Where special status species are involved, it may be useful to refer to peer-reviewed scientific or technical studies as well as published recovery plans to determine: 1) how many sampling events (dates and locations) are needed, 2) what were the most effective methods to document effects to populations, and 3) what statistical tests were employed to determine adequate sample sizes and analyze data.

For rare species, it may be a challenge to obtain sufficient sample sizes to be able to detect effects of regulatory importance (e.g., declines of 5% or lowering net reproductive rates below the replacement rate). In such cases, a formal power analysis (e.g., Cochran 1977, Toft and Shea 1983, Hatch 2003, Peery 2004, Zielinski and Stauffer 1996) can guide biologists and regulators in assessing what sample sizes and effect guidelines are practical.

You may wish to consider collaborating with a nearby academic institution as academic scientists and graduate students with experience in statistics and GIS may help to address study design, data analysis and interpretation, and related questions.

Clevenger and Waltho (2004) provide an excellent example of data analysis and interpretation:

- examined the use of crossing structures in Banff National Park, Alberta, Canada
- predicted the use of structures by 13 independent variables

- compared their observations to their predictions
- concluded that attributes of the crossing structures are most important in determining use, and that landscape variables (distance to cover) was of significance only to carnivores (mountain lions – negative correlation) and ungulates and grizzly bears (positive correlation)

Their study is recommended for its emphasis on good study design as well as for its clear and sophisticated data analysis and interpretation of results.

2.2.3 Survey and Detection Methods

Choosing an appropriate detection method is as important as choosing the right place to conduct the survey. Table 3 lists the most commonly used field assessment methods, the most appropriate target group(s) of animals for each method, and the conditions under which each method is most useful. Note that these methods may be used in concert with one another to help provide more conclusive information on how or where wildlife is moving within a given area. In addition to assessing presence or absence of wildlife, these methods may also be used to derive an index of abundance, which may be necessary in cases where relative frequency of use is more important than presence/absence, as in efforts to derive population-level estimates of a project's potential effects. To derive an index of abundance, devices such as track plates must be maintained and checked for tracks or other sign through time. The index of abundance, then, would be reported as the number of tracks observed per unit of time.

It is desirable to utilize enhanced detection methods such as track plates or raked soil for medium and small-bodied animals, as in many cases other evidence of use (e.g., tracks in native soil, scat) will otherwise be easily missed. To enhance the probability of detection, it is important to establish several survey sites, and if possible and appropriate, you may want to consider using remotely-triggered cameras, as these have been found to more thoroughly and reliably document the occurrences of carnivorous mammals on a study site in Sonoma County (Hilty and Merenlender 2000). Similar comparisons in other locations, with other animals would be extremely useful to inform Caltrans biologists of the best, most reliable methods to use.

Table 2: Field assessment methods and most appropriate animal group(s) for each.

Method	Target Group	When and Where Useful	Intended Results	Comments
Visual (=Field) Observation, including spotlighting at night	All sizes and taxa; spotlighting more effective for medium and large nocturnal animals	All locations and circumstances; spotlighting most effective with nocturnal animals.	Presence, behavior, species identification, highway interface, habitat fragmentation	Most widely used method and is often the least expensive. At night, high-intensity hand-held spotlight often used for nocturnal animals. Enables survey of large area relatively quickly.
Track count surveys	Large & medium mammals	For areas where crossing is likely and substrates are available (e.g., mud, snow).	Presence, species identification, relative abundance	May be appropriate for smaller vertebrates if substrate is able to record tracks; inexpensive.
Track plates	Medium & small-bodied vertebrates	Most useful when crossing occurs in a constrained area (e.g., semi-vegetated under-crossing). Requires inexpensive equipment and can be replicated at several locations across a study site.	Presence, possibly species identification, relative abundance	Wood or metal surfaces upon which gypsum, ash, or other materials are placed to enhance detection of tracks. May use boxes, and be baited or unbaited.

Cover Boards	Amphibians and some reptiles	Most useful for hard-to-detect species that often seek shelter under logs or in the soil.	Presence, species identification, relative abundance	Wooden boards of various sizes that are often painted white on top and deployed at several locations to serve as cover for amphibians and some reptiles. May not be suitable in windy environments.
Raked soil	All terrestrial vertebrates	Same as for track plates with presence of appropriate soil substrate. Also used along highway rights-of-way where crossing is more dispersed.	Presence, species identification, relative abundance	Preparation of soil or provided substrate to enhance detection and/or to record number of tracks per unit of time.
Live trap	Primarily for mammals, all size classes	Useful to capture animals for marking or tagging and subsequent release	Capture individuals for tagging and/or marking to distinguish individuals in the field	Intensive, relatively time-consuming method used primarily for mammals. Traps for small-bodied mammals (e.g., Sherman, Tomahawk) easily carried and typically used in multiples over larger spatial scales (as in trapping transects), but larger traps available and most often used to capture special status species
Pitfall trap	Smallest animals	May be used anywhere that animals may be expected to occur. Inexpensive but requires daily maintenance to release trapped animals.	Presence, species identification, relative abundance, capture for possible marking	Widely used for amphibians, some reptiles, and rodents to capture individuals for positive identification. May provide estimates of relative abundance if deployed in several locations. Often used with drift fences to enhance coverage and capture success.

Hair traps	Medium & large-bodied mammals	Useful for structures that are very constrained (e.g., culvert) and identifying species, populations, and individuals; inexpensive but requires expert knowledge and testing (identification of hair samples) may be expensive.	Presence, species identification	Wide range of potential information – from species identification to material for genetic analysis. May constitute "take" for threatened and endangered species. Must check with DF&G and USF&WS prior to use to determine whether a permit is required.
Remotely-triggered camera	Medium and large-bodied mammals, special status species	Useful for constrained crossings (e.g., bridge under-crossing), for monitoring many species, is expensive, logistically challenging (e.g., theft of equipment).	Presence, species identification, relative abundance, identification of attempted or successful crossing, habitat fragmentation	Excellent documentation of species occurrence; may be combined with other methods. Equipment widely available.
GPS and Radio Tracking (collars / tagging)	Large ranging species or non accessible terrain	Useful for characterizing behavior of individuals at roadways and across landscapes roadways.	Behavior, habitat selection and use, movement patterns, delimit territory and home range boundaries	This method requires more variety of expertise, tracking technology, and mapping capabilities. Very expensive.

Visual (= Field) Observations

The most widely-used method to survey for wildlife, visual or field observations may provide the most information on movements and behavior of diurnal and crepuscular animals, and may be essential to understanding animal use or avoidance of crossing structures, including accessory structures such as one-way gates and escape ramps.

Figure 9: Bear track

Track-count Surveys

Perhaps the most widely-used method to document areas of concentrated animal movement:

- counts of animal tracks left in the substrate (soil, sand, snow) along game trails and similar landscape features
- most effective for large and medium-sized mammals (elk, deer, coyotes, and raccoons) as these species are relatively predictable in their daily and seasonal movements and utilize existing trails in order to save energy and move efficiently across the landscape
- counting and identifying the tracks in these traditional movement corridors provides information on the numbers and species of animals present (e.g., Smallwood and Fitzhugh 1995) but unless the substrate is maintained through time (i.e. refreshed to best document fresh tracks), track-count surveys will not allow an index of abundance.

Track Plates

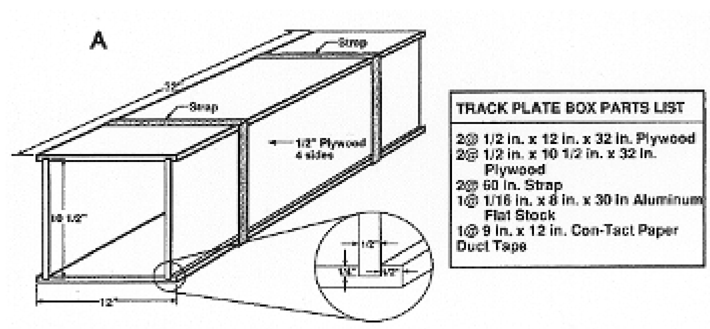


Figure 10: Schematic of a track plate box.

Track plates are surfaces made of wood or metal, open or enclosed within a box, dedicated to detecting the presence of and identifying wildlife, especially medium and smaller-bodied animals, through the enhanced detection of their tracks. These animals are less likely than larger, heavier animals to leave useful tracks in dry and compacted substrates. Track plates vary in size depending upon the focal species, from one foot square plates that target the smallest rodents, amphibians, and reptiles, to three feet or larger squares for larger mammals. Where species identification is difficult but essential, as in some special status species (e.g., kangaroo rats, lizards) or where bait must be used to lure animals across the plate (e.g., mustelids), the track plate is enclosed within a box (Figure 10) to concentrate movement (e.g., Hilty and Merenlender, 2000). Baited boxes are especially well-suited for carnivores generally (Hilty and Merenlender, 2000) and mustelids (weasels, fisher, marten, otters, and wolverine) in particular (Bull et al. 1992).

In most cases, the track plate is covered with soft, loose sand or soil to facilitate the leaving of easily identifiable impressions, while in others, the track plate may be covered with gypsum or similar material to aid in species identification (e.g., Ng et al. 2004). As with other methods, if the substrate inside the box is replenished and made smooth at intervals, an index of use (tracks per unit time), providing an index of abundance, may be derived.

The advantages to this method are its low cost and relative portability, while its disadvantages include the potential to fail to detect species that are present (e.g., Hilty and Merenlender, 2000) and relatively frequent maintenance interval if baits are used to lure animals on to the plates and in cases where multiple passes may obscure tracks left by previous individuals.

Raked Soil

Figure 11: Installation of raked soil beds adjacent to US-93 in Montana (Montana DOT, 2006).

Conceptually, the use of raked soil is similar to track plates, in that a surface is prepared that will facilitate the leaving of identifiable impressions by animals passing over the raked surface; however, unlike with track plates, the use of raked soil may occur wherever it is most convenient and is not confined to surfaces provided by the biologist. With raked soil, a biologist simply enhances the ability of the substrate (soil or sand) to produce impressions left by animals crossing the substrate. Thus, a biologist selects an area of appropriate substrate (or, in some cases, provides a suitable substrate, as in Figure 11) based upon the presence of existing tracks or an expectation of animal use. This substrate is raked or otherwise prepared to enhance its ability to produce impressions and to aid in estimating the numbers, and to identify, animals that pass per unit time (until the next interval of raking). The advantages of this method are its:

- ease of use, as the only piece of equipment is the rake (unless material must initially be provided to create the substrate)
- ability to derive an index of abundance, as the region of raked soil may be checked and prepared at intervals, thus suggesting a rate of use (number of tracks) per unit of time
- ability to detect a wide range of terrestrial vertebrate species, and
- may be widely and repeatedly used, as multiple patches of raked soil may be created and maintained by a single investigator

Live Traps

Figure 12: Medium Havahart live trap

Live traps come in a variety of sizes, from the smallest Sherman or Tomahawk live traps to medium Havahart traps (Figure 12) to traps large enough to capture bears or elk. Live traps are most useful to capture animals for tagging or marking and subsequent release to enable identification of individuals in the field.

Small mammals are typically captured in a "set" of traps, that is, a series of traps set in a line or along some natural feature (e.g., stream bank), whereas medium and large-bodied mammals are more often captured in traps set individually. Traps must be baited with a bait type appropriate to the species of interest, and checked frequently (at least daily) as captured individuals may be easy prey for predators. Food, water, and shelter from the elements may be required.

Pitfall Traps

The pitfall trap consists basically of a glass, plastic or metal container, sunk into the soil so that the mouth is level with the soil surface (Figure 13). Many ground dwelling animals fall into the trap and are unable to escape.

Dry pitfall traps used to collect reptiles, frogs or other amphibians, or rodents are generally jars, tins or drums which are buried in the ground with their lips flush with the ground's surface. The openings are covered by a slightly raised lid or stone, or other object to keep out predators and prevent trapped animals from being overheated (during the day) or drowned (when it rains). Wet pitfall traps contain a solution designed to trap, kill and preserve captured animals. Aqueous solutions used in these traps include alcohol, methylated spirits, trisodium phosphate and picric acid. Pitfall traps are used for sampling animal populations by:


Figure 13: Pitfall Trap

Derived from http://pecanspiders.tamu.edu/pitfall.htm)

a. capturing species which are difficult to obtain by other methods
b. estimating relative abundances and species richness or for catching particular types of animals
c. determining movement patterns of individual animals.

The pitfall trap is a method of estimating relative abundance (e.g., number of animals caught/trap/day) and can produce an index by which several areas can be compared.

To be effective, pitfall traps should be placed along known 'runs', where they are most likely to be encountered by the animals to be trapped, and may be either baited or unbaited. Some use fencing or similar structures to attempt to direct animals into the trap. Pitfall traps must be monitored frequently, as in some cases they may increase the risk of predation for captured animals (e.g., Reading 1989).

Hair Traps

Hair traps are typically baited stations which include a hoop or strand of barbed wire through which animals must pass to access the bait, thereby leaving a sample of hair (Figure 14). The hair sample may be useful in confirming animal presence through examination and may give far greater amounts of information, including gender and individual identification, if analyzed genetically (Woods et al. 1999). Hair traps are not as convenient as are several other methods, require more maintenance, and the hair sample may require considerable expertise to make an accurate identification; therefore, hair traps are typically only used when trying to confirm the presence of special status

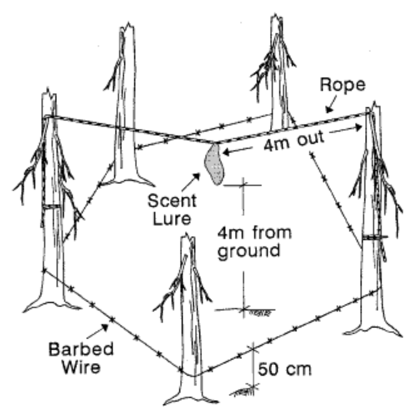


Figure 14: Barbed wire hair trap for bears.

species where other detection methods have failed to provide the desired documentation.

Remotely-triggered Cameras

Remotely-triggered cameras rely on an animal's movement to cause a break in a beam of white or infrared light to take a picture. While either film or digital cameras can be used, digital cameras are more common. The cameras, typically from one to four, are usually deployed to the sides of a potential crossing in areas where crossings occur frequently. The camera placement is determined by the local conditions based upon the crossing location, the species present, and the objectives of the study, and the camera is placed at an oblique angle to the crossing to minimize the chances of detection and to reduce the potential for the camera to deter an animal from entering the crossing. In most cases, it is recommended to shoot three images in a 30 second period, one every 15 seconds, to enhance the probability of obtaining a high-quality image. Remotely-triggered cameras may be used in combination with tracks to verify species presence, behavior, and movement patterns.

Figure 15: Remotely-triggered Camera.

Considerations in the use of remotely-triggered cameras include:

- adjust the camera's flash settings to reduce or eliminate red-eye
- confirm the duration of the delay settings (many cameras take photos after a several-second delay, which may be inappropriate for some species)
- consider the requirement of active-infrared cameras to have the beam match the sender and receiver
- make sure that all vegetation has been pruned or removed so that it will not interfere with your images
- be sure to wash your hands before setting the cameras to remove scents that may repel some species
- confirm that cattle or hikers are not using the trail or structure that you're intending to document with your camera array

The use of remotely-triggered cameras is somewhat controversial because their use has both great advantages and great disadvantages. The advantages of remotely-triggered cameras include:

- the images produced provide a permanent record of both the animal (in some cases, both the individual and the species) and of the time when it was present
- may be used to confirm the presence of a special status species, which may be important

for regulatory reasons, in a non-invasive manner

- multiple images may provide an index of the rate of use through time and/or an index of abundance if image quality allows discrimination among individuals
- good for remote locations that cannot be frequently visited as investigators need not return to the site at frequent intervals
- good to document use of crossing structures when other methods are not appropriate

The great disadvantages of remotely-triggered cameras are their cost and need for maintenance: they are frequently vandalized or stolen, may malfunction, and are relatively more costly than are any of the other detection methods (e.g., York et al. 2001, Ng et al. 2004, Sikich and Riley, 2007).

Hilty and Merenlender (2000) provide a comparison of covered track-plates and remotely-triggered cameras deployed in Sonoma County and find that cameras are more effective than are covered track plates at detecting mammalian carnivores. Ng et al. (2004) provide more information on the use of gypsum track plates and remotely-triggered cameras, including vendor information, in assessing wildlife populations. See also York et al. (2001) for more information on remotely-triggered cameras.

Major suppliers of remotely-triggered digital systems include Trailmaster (http://www.trailmaster.com/), Reconix (http://www.reconix.com/; requires an Internet connection), and the Deer Cam 100 (widely available from on-line vendors), and several models marketed by Bushnell (and available from several on-line vendors) although many investigators fabricate their own (e.g., York et al. 2001).

GPS and Radio Collars

The collection of GPS and radio-collar-based location information is expensive but may be justified in cases of special status species where precise location information is required. This method has been used to study movements of desert bighorn sheep in the Eastern Sierra Nevada (Epps et al. 2005), the San Joaquin kit fox in the San Joaquin Valley (Cypher et al. 2000), and mountain lions in Southern California (http://www.vetmed.ucdavis.edu/whc/scp/mnt_lion.htm). Note that some studies have shown that GPS and radio collars may cause lesions and similar injuries to collared animals (Krausman et al. 2004) and caution is advised in their use. The kinds of data generated by radio-collared animals may be most effectively analyzed in a GIS, and may provide insights into timing and frequency of movements, habitats utilized, and effects of roads on behavior and movement patterns.

2.2.4 Required Expertise

For general wildlife surveys and interpretation of existing literature, a B.Sc. degree and relevant field experience is sufficient to identify vertebrate animals and design and implement wildlife surveys, although the detection of rare or secretive species depends to a large extent upon the experience of the observer. California wildlife species are generally distinctive but technicians/biologists with specialized identification skills should be included for special status species that may be difficult to identify in the field. Where special status species occur or where the only evidence of wildlife consists of tracks or scat, a specialist may be required to consult on identification by sight, sign, and survey methodologies. Coordination with collaborating agencies on planned wildlife surveys is required when determining if you or your office staff has the appropriate expertise to complete necessary surveys. A biologist may be required to have a protocol-level survey permit to conduct surveys for federally-listed species.

For most modeling approaches, and for the mapping of wildlife observations, movement corridors, and the like, the assistance of a GIS technician is likely to be required, and depending upon the rigor of the model, a statistical or mathematical background may be required. Typically, where off-the-shelf approaches are used, a biologist with a bachelor's degree and three or equivalent years of relevant experience, working in collaboration with a GIS technician should be able to identify and map species locations. Where novel approaches are implemented to predict species occurrences or model best minimization or mitigation strategies (e.g., Clevenger et al. 2002), an advanced degree and several years of GIS and statistical training is typically expected.

2.2.5 Data Considerations

Minimum Observation Data Set

In order to best document and communicate crossing conflicts, a minimum of set of information for each observation is essential. These minimum data are needed for data reporting, analysis, and interpretation. For reporting, all data sets must answer the who, what, when, and where questions. The core data elements must consist of (*at a minimum*):

1. observer name
2. observer contact information (phone numbers, email address)
3. Caltrans district number
4. county name
5. site location description (county, route, and post mile)
6. site location geographic coordinates (e.g., latitude/longitude)
7. species common name
8. event type (e.g., vehicle-wildlife collision, dead animal, animal crossing road)
9. time of observation
10. date of observation
11. comments (for free-form additional information)

It is worth noting that both federal government (e.g., the National Biological Information Infrastructure, NBII – http://nbii.gov) and professional organizations (e.g., Biodiversity Information Standards, formerly known as the Taxonomic Database Working Group, or TDWG – http://tdwg.org; and the National Center for Ecological Analysis and Synthesis, or NCEAS – http://nceas.uscb.edu) have working groups, which are somewhat coordinated, working on data standards for species observations, and their recommendations are likely to evolve into state and federal government standards for managing biodiversity data. Data managers should track those efforts as they progress.

2.3 Collaborative Approach

Previous wildlife crossing efforts have demonstrated the value of enlisting the assistance of county and state highway maintenance and public safety (sheriff departments, Highway Patrol) professionals as well as field staff from state and federal agencies (California Department of Fish & Game, U.S. Fish & Wildlife Service, National Park Service, Natural Resources Conservation Service) and NGOs such as Audubon California and The Nature Conservancy as early as possible in the planning process to provide information on areas of concern. The work in Ventura County, cited in Section 1.6.1, is an especially good example of a highly collaborative approach taken to study and enhance road crossings across an entire, largely urban California county and illustrates the value in consulting with agencies and individuals with a wealth of field experience, and how this experience may effectively inform decisions to enhance wildlife crossings.

As approaches to studying wildlife crossing issues are not standardized, frequent, on-going consultations with agency collaborators should begin at the earliest stages of project planning and continue through post-project assessment to help to:

- identify occurrences of species of management concern within the project area
- provide local knowledge of wildlife mortality, effects on habitat connectivity, cumulative effects, and other concerns
- provide assistance in long-term maintenance and monitoring of crossing sites and structures

Where listed species are involved, remember that standards for maintaining sustainable connectivity, gene flow, and sustainable genetic structures of populations are not well established, though connectivity is an increasing concern of many regulators. Consequently, it is important to consult with U.S. Fish & Wildlife Service and California Department of Fish & Game biologists on connectivity requirements (perhaps as a part of Section 7 consultation or HCP/NCCP planning) early and often. Please consult the associated website (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/) for examples of collaborative approaches to wildlife crossing assessments.

2.4 Use of GIS and Models to Predict Wildlife Passage

Field studies are often required to assess wildlife populations in a study area; however, many transportation agencies have taken a different approach in an attempt to *predict* where road-wildlife conflicts might occur. Such efforts may be particularly appropriate in areas where new highway construction is planned and where there is scant history of field investigations. Predictive efforts have taken a variety of forms, but most rely upon various modeling approaches to simulate highway crossings. Most models involve the use of Geographic Information System

(GIS) technology, and several studies have assessed the efficacy of a modeling approach (e.g., Clevenger et al. 2002, Frank et al. 2005, Gontier et al. 2006, Malo et al. 2004, and Roe et al. 2006). Model types include:

- GIS using physical environmental attributes including land cover and riparian zones (e.g., Smith 1999, Clevenger et al. 2002)
- GIS using expert opinion – the opinions of agency staff with extensive field experience in a region (e.g., Clevenger et al. 2002)
- GIS using expert literature – analyses based upon published, peer-reviewed scientific studies (e.g., Clevenger et al. 2002)
- GIS using population viability analysis (PVA; van der Grift and Pouwels 2006)
- Statistical models using existing collision data and highway attributes (e.g., Malo et al. 2004)
- GIS least cost path analysis (see http://www.geog.ucsb.edu/~gallo/mountain_lion/ for Conception Coast mountain lions and http://www.wildlands.org/corridor/lcpcor.html for wildlife movement through corridors in Montana)

In one of the few studies to examine which source(s) of information may provide the best predictions of actual species movement patterns, Clevenger et al. 2002 compared the results of three black bear (*Ursus americanus*) habitat models (expert literature, expert opinion, and empirical habitat data) and found that models relying upon expert literature were best at predicting black bear movements across highways; these results may be relevant to a wide range of mammals.

The development of GIS predictions of wildlife movement corridors and of potential conflicts with highway facilities depends upon a level of technical sophistication that is typically found in a dedicated GIS facility with requisite staff, hardware, software, and training. In the majority of cases, GIS analyses depend heavily upon collaboration, as the several layers ("coverages") of information required to predict animal locations and corridors of movement are often derived from multiple projects developed by multiple agencies or researchers, and in many cases these were originally developed for other purposes (e.g., the coverage of wetlands developed by the National Wetland Inventory). GIS is an exceedingly useful tool, and may be essential both in an assessment environment where it may predict the locations of wildlife corridors, as well as in a data management environment, where is may help to accumulate, maintain, analyze, and report on wildlife observation and related geo-spatial data (e.g., road-kill reports, track plate/raked soil/remotely-triggered camera locations, etc.).

2.4.1 Large-scale Prioritization of Wildlife Crossing Corridors

The development of a strategy to evaluate wildlife corridors statewide, including a prioritization method, is currently being explored. Locations identified as having the greatest likelihoods of animal-vehicle collisions with large animals will most likely be given the highest priority in order to ensure driver safety. Locations identified as impacting endangered or threatened species will also be given high priority due to regulatory and stewardship obligations. Statewide modeling and mapping of wildlife corridors will allow the Districts to visualize the regional goals associated with safety and connectivity improvements for regional planning and prioritization.

The text box below provides an excellent example of a statewide prioritization effort of wildlife crossings from Florida (derived from Smith 1999). In Smith's (1999) analysis, nationally- and regionally-significant conservation areas and riparian corridors received the highest priority for mitigation measures.

Using GIS to Prioritize Florida Wildlife Crossings

An innovative project in Florida (Smith 1999) specifically addresses the question of how to set wildlife crossing priorities across large spatial scales. Smith's work utilized a GIS approach to prioritize road crossings by assessing their "overall ecological impact." Ecological effect was determined by ranking roads according to several categories of ecological and planning criteria. Important environmental factors for prioritizing relative effect of roads on lands with conservation value were established through a survey conducted at a Florida Department of Transportation sponsored workshop on road-related wildlife mortality. Survey respondents were asked to rank various criteria associated with prioritizing sites for the location of underpasses on Florida roads in order to alleviate road-kills and to provide ecological linkages. Eleven elements were identified and ranked as follows:

1. Chronic road-kill sites
2. Known migration/movement routes
3. Identified hot spots of focal species
4. Landscape linkages (designated greenways)
5. Presence of listed species
6. Identified strategic habitat conservation areas
7. Riparian corridors (with potential for retrofitting existing structures)
8. Core conservation areas
9. Presence of separated required ecological resources (e.g., a forest patch and ephemeral wetland breeding area for amphibians that is separated by a highway) for a species or set of species
10. Public ownership (or in public land acquisition program) vs. private lands
11. Potential to be included in proposed road improvement project

(Criterion 2 was modified to apply to wildlife movement patterns typical for this region; Criterion 8 was divided between two other criteria, public lands and strategic habitat conservation areas due to the severe overlap with other criteria; and Criterion 9 was dropped due to a lack of data for identifying the locations of these areas).

These elements were used to create a rule-based GIS model which was used to rank priorities for mitigation actions. The model assigned the highest priority to road segments within nationally- and regionally- significant conservation areas and riparian corridors. Results suggested that the keys to mitigation of impacts of highways and automobile traffic on wildlife populations and ecologically sensitive areas include programming of wildlife crossing mitigation into road projects and identification of existing structures. Several road projects and suitable existing structures were identified within highly ranked ecological interface zones and the locations of additional needs (underpasses, culverts, etc.) were identified and prioritized.

2.5 Analyze and Interpret Data to Evaluate Crossing Potential

Once you have collected all the necessary data from your surveys to round out your baseline information, it is important to evaluate your site to understand the existing crossing functionality of your project area. The following topics should be considered when making this final evaluation of your baseline.

2.5.1 Areas of High Connectedness

Areas with unusually high measures of connectedness, for example areas that may be easily reached by dispersing individuals or individuals searching for mates, are consequently also areas of relatively high corridor potential, as reductions in connectedness have been shown to reduce survivorship and productivity (e.g., Smith and Hellman 2002). Such sites may be especially important for special status and rare species, as these are species that have already been demonstrated to have small populations. Additional sources of mortality, or reductions in productivity, may constitute cumulative effects as per CEQA, further reduce the abundance of these species, and lead to mitigation efforts. Areas of high connectivity may be relatively difficult to define in nature, however, as their delineation implies a level of local knowledge that is not often available. Further, assessments designed to document areas of high connectedness must be regional in nature and include both adjacent as well as more distant habitat patches upon which animals depend at different times of the year (e.g., breeding vs. wintering) or during different phases of the life cycle (e.g., adult summer range vs. juvenile dispersal corridors). Consult with agency collaborators early in the planning process to begin to identify affected areas and species.

2.5.2 Adjacent important conservation areas

If a highway facility bisects adjacent areas with known conservation importance, it should receive priority in wildlife crossing planning. For example, if a highway passes through a region with a National Wildlife Refuge on one side and a State Wildlife Area, Audubon Sanctuary, or other protected area with high conservation importance on the other, it should be afforded high priority to ensure safe passage of vertebrates between the adjacent protected areas. Such adjacent areas received the highest priority ranking in Smith's (1999) GIS-based prioritization scheme in Florida (see text-box, above).

2.5.3 Separation of seasonally-used habitats

When assessing the effects of a transportation facility improvement, it is important to consider life cycle needs and movements between essential, seasonally-used habitats. Many animals may move seasonally between two adjacent or nearby habitat patches along or across roads, as during migration, dispersal, or for breeding, and accommodating these movements is essential to many species' survival. For example:

- Salamanders require streams, ponds, or wetlands for breeding, typically during the winter, but spend most of their lives underground in upland areas adjacent to the breeding areas. California tiger salamanders, a federal and state-listed species, spend most of the year in underground burrows and descend to ponds with the first heavy rains in winter (Twitty 1941). Tiger salamanders are subject to high rates of mortality when they cross roads between their burrows and breeding ponds (Twitty 1941, Barry and Shaffer 1994).

- Western pond turtles occur throughout the Central Valley of California in a variety of natural and man-made habitats and may move among sites if their preferred moist conditions deteriorate due to seasonal drought (Germano and Bury 2001).
- Toads and some frogs require wetlands or ponds for breeding but spend most of the year in adjacent upland areas; Carr and Fahrig (2001) found that around ponds in Ontario, Canada, mobile frog species are more vulnerable to road mortality than are less mobile species. Findlay and Houlahan (2000), also working in Ontario, found widespread reductions in species abundances of multiple vertebrate taxa extending 2 km outwards from wetlands and showed that road density was strongly correlated with these reductions.
- Desert bighorn sheep move among isolated mountain ranges in southeast California in the course of a year (Epps et al. 2005).
- Deer in northeast California move, often in large numbers, from summer to winter ranges in the autumn and back again in the spring (Ford 1976).

Amphibians, generally, are known to be especially vulnerable to mortality as they attempt to cross roads in their annual movements to and from their breeding locales (e.g., Twitty 1941, Barry and Shaffer 1994, Marsh et al. 2005, Langton 2002), so for example, a section of road crossed by breeding Shasta or California tiger salamanders would be a priority for crossing enhancements.

2.6 Existing Connectivity Attributes/Infrastructure

Roadways may interact with wildlife in complex ways, effectively repelling some species during some seasons, acting as movement corridors during other seasons (Clevenger et al. 2003), and attracting others indirectly through favoring the growth of preferred food plants (Boarman et al. 1997, Forman and Alexander 1998). Roadways that are straight, with good sight-lines and adequate speed control are likely to be more permeable (i.e. have fewer wildlife crossing conflicts) than curved roads with vegetation or other obstacles to sight-lines in the right-of-way. Especially high rates of safe passage are provided by bridges and viaducts spanning canyons as these allow very high levels of connectivity and little if any impediment to wildlife movement, while especially low rates of safe passage are provided by a concrete median without small openings near the ground. Concrete median barriers enhance driver safety by separating opposing lanes of traffic, but provide low permeability to wildlife (Clevenger and Kociolek 2006). Between these two extremes are culverts, which have been shown both

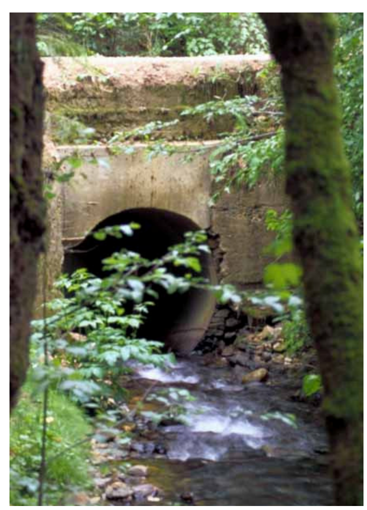


Figure 16: Culvert under rural paved road in the Sierra Nevada

within (Ng et al. 2004) and outside of California (Yanes et al. 1995, Clevenger, Chruszcz, and Gunson 2001, Krawchuk et al. 2005, Taylor and Goldingay 2003) to provide safe passage for a wide variety of organisms. Culverts, although in most cases originally installed to provide continuity for water flow beneath roadways (Figure 16), may provide especially efficient wildlife crossings if modified from their original designs. The subject of modifying existing structures for enhanced wildlife crossing is discussed in Section 3.3.

2.7 Road-side Vegetation

Road-side vegetation interacts with wildlife crossing in complex ways (e.g., Groot Bruinderink and Hazebroek 1996, Boarman et al. 1997, Clevenger and Waltho 2005). Many herbivores, including such diverse organisms as tortoises (Boarman et al. 1997) and deer (Feldhamer et al. 1986), tend to be attracted to roads due to the increase in forage that may occur there. Most large-bodied mammals are more inclined to approach roads and to use crossing structures if vegetation is close-by, minimizing the distance to cover, but mountain lions are less likely to use crossing structures if the distance to cover is minimized (Clevenger and Waltho 2005). Thus, in crossing assessments, the habitat preferences, including sources of both food and cover, of the animal species of management interest must be carefully considered within and along the right-of-way. Include a discussion of road-side vegetation in your baseline assessment.

Figure 17: Encourage use of native plants along roadsides (Caltrans photo)

2.8 Traffic Characteristics

The primary characteristics of traffic, i.e. volume and speed, interact in complex ways with wildlife crossing, and studies of different animals under different conditions or in different locations have reached different conclusions. Where both traffic volume and traffic speed are high, most animals perceive the roadway as a barrier and do not attempt to cross, but decreases in traffic volume may lead some animals to perceive the roadway differently and to attempt to cross. Often, decreases in traffic volume are accompanied by increases in traffic speed, and high speeds can lead to increased rates of animal-vehicle collision.

Field assessments must include evaluations of traffic characteristics; for example, Ng et al. (2004) found that decreases in traffic volume in more rural portions of Ventura County lead to an increase in the frequency of animal highway crossing and this increase in rate of crossing lead to an increase in the rate of vehicle/wildlife collisions (i.e. the

Figure 18: Motorist warning sign

barrier effect of the roadway was less evident to local wildlife when fewer cars were on the road). Conversely, another study from Ventura County found that the greatest incidence of wildlife/vehicle collisions occurred on the busiest stretches of the most heavily-used roads (Cavallaro et al., 2005), a result consistent with that observed by Clevenger et al. (2003) on their study site in Alberta, Canada and by a study of all vertebrates by Lodé (2000) for a roadway in France. Case (1978) found that traffic volume was not significantly correlated with the number of road-killed animals, but that the number of road-killed animals was significantly correlated with vehicular speed.

Thus, the relationships between traffic characteristics and rates of vehicle/wildlife collisions are complex, and these relationships are further compounded by daily and seasonal differences in both animal movement and traffic characteristics. Thus, no overall generalizations are possible, and Department personnel should be aware of these complex relationships and are encouraged to assess the local conditions (traffic characteristics plus wildlife behavior) to best accommodate local needs.

2.8.1 Daily and Seasonal Rates of Crossing

Your baseline assessment should establish patterns in diurnal and seasonal rates of wildlife crossing, as typical daily or seasonal animal movements may result in large differences in rates of crossing, and these differences may, in turn, present quite different public safety and wildlife mortality considerations. Examples of temporal effects on wildlife movements and crossing conflicts include:

- Deer undercrossings on U.S. 395 were installed due primarily to increases in rates of animal-vehicle collisions during spring and fall deer migrations (Ford 1976).
- Cavallaro et al. (2005) found a pattern of an increased frequency of vehicle-animal collisions during the late night or early morning hours in Ventura County.
- Twitty (1941) and Barry and Shaffer (1994) found that California tiger salamanders had far higher rates of mortality while crossing the road between their aestivation sites and breeding pond on the campus of Stanford University.

Field assessments should take into account and document these temporal effects.

2.8.2 Relative Visibility/Compromised Line of Sight

The baseline assessment must consider potential effects due to limited visibility, as sharp curves, undulations in the road surface, and roadside vegetation reduce a driver's line-of-sight, reduce driver response time, and may increase the risk of collision should an animal appear on the roadway (Hedlund et al. 2004). These considerations may be especially important for ungulates and other large-bodied animals as they present the greatest risk to driver safety. Practitioners must compare the conditions as they currently exist in the project area to those that would exist should the project be built and assess whether the new conditions would affect the probability of crossing. The effects of road-side vegetation on animal behavior must also be considered, as road-side vegetation has been shown to both attract and repel wildlife, depending upon the species (see Section 2.7).

2.9 Identify Limitations of Baseline Data

In some cases, there may be insufficient information to thoroughly evaluate the pre-project conditions and therefore the potential effects of a road project on wildlife populations and/or habitats. A lack of information may be due to limitations on:

- data availability – there may have been no prior field work done in the project area or the results of prior investigations are unknown or unavailable to Caltrans staff
- data collection – there may be limits on access, lack of time, seasonal effects or other constraints that prevent or reduce the effectiveness and information content of pre-project surveys that would help to establish baseline conditions
- data analysis – there may be conflicts and incompatibilities with prior data collection efforts or changes in environmental conditions that render prior data ambiguous and confound efforts to utilize existing data to set project baselines
- data interpretation – there may be ambiguities in prior or current data sets that affect your ability to interpret wildlife presence, abundance, and movement patterns evaluate crossing.

It is essential to become familiar with the species of management interest and to make sure that your field surveys are conducted during seasons when the focal species are known to be most active. Many vertebrates have periods of relatively high rates of movement, whether for dispersal, breeding, or migration. For example, if your surveys are focused on potential project effects on salamander movements, it would be essential to conduct field work during the late fall, winter, and early spring when amphibians are moving between summer (non-breeding) and winter (breeding) portions of their range. The U.S. 395 underpasses in Lassen and Sierra counties were installed to enhance habitat connectivity and increase driver safety during spring and autumn migrations of mule deer (Figure 21; Ford 1976). Know the life cycle of your focal species and schedule your field work to ensure that efforts to estimate crossing effects occur when crossings, or physical or behavioral impediments to crossing, are most likely.

3 Project Effect Assessment

Now that you have established your baseline understanding of wildlife crossing at landscape, regional, and local scales, it is time to conduct your assessment of what effects the proposed project may have. In this assessment, it is important to focus on effects associated with the direct, indirect, temporary, and cumulative effects on your focal species, habitat, or habitat connectivity. Based on the life-cycle needs of particular species, different project elements and design features can create different effects. In order to get a clear picture of the effects of a proposed project on wildlife crossing in your project area, consider your baseline and the change in baseline should the project take place. Compare how wildlife is currently crossing to how it might utilize the area or cross the highway facilities should the proposed project occur.

A template for reporting has been developed to help to guide you through the process of documenting this assessment and is available at the wildlife crossing website (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/).

Table 4, below, provides an overview of elements to consider when conducting a wildlife crossing assessment. All projects must consider NEPA and CEQA regulations. Invariably, the steps described below arise in every project and should be included in the effect assessment. Where listed species are present, additional steps are typically required.

Table 3: Planning Process Stages and Relevant Questions to Consider

Planning Process Stage	**Relevant Questions to Consider**
Baseline Information	What information is available? Do I have enough information to assess wildlife crossing?
Regulatory Context	What regulations apply in this instance?
Coordination	Have I worked with the PDT to develop the proposed mitigation measure, required schedules or timelines that I am recommending in my technical document? Can my recommendation be implemented? What are the adjacent land uses? Are landowners amenable to this connectivity enhancement? Have you coordinated with the appropriate agencies, including other transportation agencies (e.g., railroads)?
Effect Analysis	What barriers to connectivity exist? What assumptions am I making? Are known effects cumulative?
Mitigation	What are the goals of this mitigation recommendation? How does my recommendation contribute to solving problems? What regulations authorize the mitigation recommendation? Does my recommendation adequately address mitigation goals? If not, are future efforts or other efforts by other entities going to address these? Are the designs structurally feasible and meet engineering standards? Have alternative mitigation measures been explored?
Maintenance/Monitoring/Adaptive Management	What are the anticipated maintenance needs of your recommendation? Have these been discussed with maintenance? What funding and resources are available to implement post-project monitoring?

3.1 Potential Temporary or Construction-Related Effects

Although temporary, project-related construction activities may effect existing or potential wildlife crossing and these effects may be sustained beyond the construction interval. Construction effects such as noise, increased vehicle traffic, removal of vegetation, increases in dust, staging of equipment, and the construction of access roads may all result in reductions in habitat, either through direct habitat alterations or due to behavioral responses by animals to construction activities (Trombulak and Frissell 2000, Forman and Deblinger 2000). As an example, Welsh and Ollivier (1998) found that highway construction reduced amphibian abundances in streams following storm events that flushed fine sediments into their study sites in Humboldt county. Thus, potential effects due to construction activities should be considered in project planning, especially when special status species are believed to exist within a project area, and mitigation measures for anticipated impacts must be proposed.

3.2 Potential Direct and Indirect Effects

It is essential to consider how your project may effect wildlife movement within, along, and across the right-of-way, especially when special status species may be involved. Be sure to consider both the potential for roads to attract wildlife, and thereby increase its susceptibility to effects (e.g., desert tortoise attracted to vegetation growing in the right-of-way; Boarman, Sazaki, and Jennings 1997) and the potential for the road to repel wildlife, and to serve as a physical or behavioral barrier to movement (e.g., coyotes and bobcats in Ventura county; Riley et al. 2006). Your considerations should include both direct and indirect effects. Direct effects include loss of habitat and blocking of movement corridors, while indirect effects include the growth of vegetation preferred by herbivorous species, indirectly increasing their susceptibility to vehicle strikes or an increase in traffic-related noise levels, with consequent effects on birds and some mammals (Figure 19). Also consider the larger picture – evaluate how your project may interact with other existing and planned projects and habitat alterations in the region to add to effects on wildlife and result in cumulative effects as per CEQA (see Section 3.5, below). Especially consider whether you may have a "source habitat" in the project region (sensu Pulliam 1988), as these habitats may be especially important for regional population persistence. Source habitats are those with a surplus of reproductive output, from which the surplus individuals may disperse to "sink habitats" which may have a deficit of reproduction. Although difficult to document in nature, your consultations with agency and other biologists may reveal habitat areas that are known to be especially important to regional persistence of species of management importance, and effects on these habitats may have widespread deleterious consequences.

You must make a determination as to whether the project is or is not likely to effect wildlife movement by estimating pre-project rates of crossing by species of management interest and comparing these estimates to those expected given the project specifications. Where effects are expected to be substantial, you must suggest an avoidance, minimization, or compensatory mitigation strategy.

3.3 Changes/Effects to Existing and Potential Wildlife Crossing

Your project effect assessment must consider how the project might affect existing as well as potential crossing behavior. Include in your assessment potential behavioral changes in wildlife associated with proposed improvements which may result in avoidance of the highway facility, thereby reducing crossing events. Estimate the magnitude of the reduction in the rate of crossing by the species of interest, and use this estimate to assess the effects of the project on the relative permeability of the highway compared to pre-construction conditions. Be sure to consider major changes such as the addition of lanes and/or median barriers on rates of passage as well as less conspicuous changes such as the deterrence effect of added lighting and increased traffic noise, as many animals perceive noise and light as sources of disturbance and are known to be sensitive to these and similar disturbances (van der Zande, ter Keurs, and van der Weijden 1980, Garber

1995, Reijnen 1996 and 1997, Forman and Alexander 1998, Forman 2000, Bull 2001, Bjurlin and Cypher 2003). Your mitigation suggestions should address these and related impacts associated with both the anticipated infrastructure (primary effects due to road widening, etc.) and resulting (secondary effects due to increased traffic, noise volume and duration, etc.) changes.

3.3.1 Change in Infrastructure

Changes to infrastructure may affect rates of wildlife passage, and the potential magnitude of these effects depends upon the: 1) type of infrastructural change, 2) species of interest, and the 3) existing rate of crossing in the project area. Infrastructural changes may present both opportunities and barriers to wildlife passage in the project region. For example, if the infrastructural changes are or include culvert modifications, the new culverts may provide an opportunity to enhance existing rates of crossing and decrease rates of vehicle-animal collisions if the new culverts are larger than the existing culverts and include wildlife ledges, fencing, and vegetation to enhance their use. In contrast, if the infrastructural changes include the addition of median barriers or guardrails, and these are to be installed in an area of known animal crossing, these may substantially increase the risk of vehicle-animal collision, inadvertently trap animals inside the right-of-way, and decrease rates of crossing, resulting in the need to mitigate these potential impacts. Similarly, if the change in infrastructure increases the number of lanes of traffic, this change, too, may be expected to increase crossing conflicts and may require mitigation measures to offset the anticipated effects.

3.3.2 Changes in Traffic Patterns

You must consider how project-related changes in traffic patterns may effect wildlife crossing. This assessment should take into account both diurnal as well as seasonal changes in traffic. If the projected annual average daily traffic (ADT) or the rate of truck use is expected to increase due to the project, you must estimate the resultant effect on pre-project vs. post-project rates of wildlife crossing and vehicle-animal collisions. Similarly, if night-time traffic volumes are expected to increase compared to pre-construction volumes and this increase in traffic volume may lead to increases in rates of vehicle-animal collisions, you will need to suggest measures to mitigate for these anticipated impacts. In the case of special status species, these considerations may be essential components of estimates of mortality and population persistence.

Changes in traffic patterns may be difficult to assess, and it is generally advisable to consult with your traffic engineer on existing and project-related changes traffic volumes.

3.3.3 Changes in Visibility

Your evaluation must describe any anticipated changes in visibility, especially changes in lines-of-sight, as reductions in visibility may decrease driver response times to animals on the road surface and increase the probability of a collision (Hedlund et al. 2004). Line-of-sight reductions may result from grade/elevation changes, increases in road curvature, or increases in the obscuring effects of vegetation and each of these factors must be considered for effects on driver visibility. If you anticipate significant effects on driver visibility, you must suggest measures to mitigate for these impacts.

3.4 Secondary Effects

Any of the changes described in the preceding sections of the manual may affect your focal species, and you should be prepared to document and to estimate the magnitudes of the anticipated effects. In addition to the primary effects on movement, roads have been shown to have many secondary effects that may be less apparent but no less important to population viability and persistence. When considering secondary effects, consider the "road-effect zone" of Forman and Alexander (1998), that is, the area over which significant ecological effects extend outward from a road (Figure 19).

The range of secondary effects may be large, and includes:

- avoidance of highway corridors by vertebrates due to vehicular noise (van der Zande, ter Keurs, and van der Weijden 1980; Reijnen 1996 and 1997; Forman Reineking,and Hersperger 2002)
- avoidance of highway corridors by vertebrates due to reduction in vegetation (Clevenger and Waltho 2005)
- attraction to roads due to increases in preferred vegetation (Boarman, Sazaki, and Jennings 1997)
- increased rates of predation adjacent to highway infrastructure (the "predator effect"; Hartmann 2003)

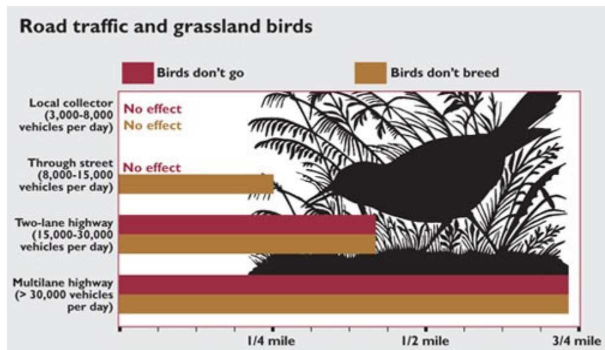


Figure 19: Ecological "road effect" zone for birds.

Derived from http://www.harvardmagazine.com/on-line/050529.html

You must be familiar with the specific habitat requirements, behavioral responses, and movement patterns related to life-cycle stages of your focal species to be able to adequately assess potential secondary effects of a highway project. Where special status species are present, you must examine potential secondary effects of the project (e.g., attraction or avoidance due to changes in vegetation) to estimate effects on the abundance and distribution of the focal species and any potential for these effects to increase mortality and reduce population persistence. Consultations with agency wildlife professionals in the area may help to identify potential significant secondary effects, and your assessment of secondary effects may also help to document cumulative effects, considered below.

3.5 Cumulative Effects

As part of your project effects assessment, you must consider how the potential effects of the proposed project may add to existing as well as reasonably foreseeable probable future effects on wildlife, including wildlife crossing, in the area. Though such assessments are required under both NEPA and CEQA, it may be difficult to determine when a threshold of significant cumulative effects is exceeded (e.g., Theobald, Miller, and Hobbs 1997). For a cumulative effects assessment, you must take a regional view of existing conditions (land use, conservation areas, known or predicted wildlife corridors, areas of relatively natural vegetation) and place your project into this regional context to determine whether anticipated effects on crossing the right-of-way, changes in traffic, and other effects related to the proposed project will significantly add to existing effects on wildlife in the region. Cumulative effects analyses are essential for special status species and formally designated critical habitats, as NEPA and CEQA seek to eliminate significant effects and require that any potential effects be mitigated.

Wildlife crossing effects contribute to overall effects on species populations and habitats through a variety of mechanisms, including:

- isolating populations, with potential reproductive and genetic effects
- reduce available habitat indirectly through vehicle disturbance and road avoidance
- direct loss of habitat
- preventing essential movement (for foraging, breeding, dispersal)

The following eight steps, modified from the Caltrans Standard Environmental Reference, serve as guidelines for identifying and assessing cumulative effects:

1. Identify the species and habitats to consider in the cumulative effect analysis by gathering input from knowledgeable individuals and reliable information sources. This process is initiated during project scoping and continues throughout the NEPA/CEQA analysis.
2. Define the geographic boundary for each species to be addressed in the cumulative effect analysis.
3. Describe the current status and the historical trends of each species.
4. Identify the direct and indirect effects of the proposed project that might contribute to a cumulative effect on the identified species and/or habitats.
5. Identify the set of other current and reasonably foreseeable future actions or projects and their associated environmental effects to include in the cumulative effect analysis.
6. Assess the potential cumulative effects.
7. Report the results of the cumulative effect analysis.
8. Assess the need for mitigation and/or recommendations for actions by other agencies to address a cumulative impact.

Your analysis of cumulative effects will need to take into account past, present, and reasonably foreseeable future actions and their effects on the species of management interest as well as the potential effects due to the proposed project. GIS may be helpful in this type of analysis by enabling you to integrate aerial photography with land use and proposed project shape files in an evaluation of cumulative effects on wildlife crossing and habitat connectivity.

4 Selecting Avoidance, Minimization, or Compensatory Mitigation Measures

Once a field assessment has confirmed the presence of sensitive species or habitats or concluded that a project has potential wildlife crossing effects, it is required to suggest appropriate avoidance, minimization, and/or compensatory mitigation strategies to address the impacts.

In most cases, the choice of strategy will depend upon:

- the type of project (new construction, retrofit, road resurfacing, etc.)
- integration with other project goals
- regulatory considerations (special status species, critical habitats)
- public safety
- public outcry over conspicuously high rates of mortality along well-traveled routes
- the focal species group, and
- additional site-specific considerations such as terrain, engineering feasibility, and cost

Some of these are in response to legal requirements (see Table 1), but others, notably public safety and public outcry, are matters of prudent public policy. On policy issues, be sure to consult with engineers and management.

Once you have considered the above, define the intended goals of the avoidance, minimization or compensatory mitigation actions you are going to consider. In a way similar to the baseline evaluation, ask yourself the question of what needs to be done and why. When doing so, consider if the intended result of your measures includes the following:

- reduction in animal-vehicle related mortality
- increase habitat connectivity/reduction in habitat fragmentation
- improved permeability of a crossing structure
- increased genetic exchange
- reduction in predator influence created by facility
- increased public safety

Lastly, before developing your avoidance, minimization, and mitigation measures evaluate why the Department should pursue such measures. Revisit the laws and regulations that apply to your situation to help justify and support the use of public funds for these measures.

4.1 Project Types and Wildlife Crossing Considerations

According to state and federal statutes, projects are generally required to avoid environmental effects if possible, minimize these impacts if avoidance is not possible, and compensate for what can't be avoided or minimized. Thus, the first consideration when project effects are expected is to consider alternative project designs that will avoid anticipated impacts. Where avoidance is impractical or impossible, project modifications to minimize effects should be explored. And finally, where neither avoidance nor minimization is possible, compensate to mitigate for anticipated impacts.

The choice of mitigation action will depend upon the goals related to reduce the effects of a specific project type. For example, where the mitigation goal is to reduce mortality of amphibians crossing from breeding to summer range (e.g., due to regulatory considerations or public outcry), the best mitigation option may be to install culverts, with an associated substantial fencing system to direct animals to the culverts and prevent them from crossing the road. Where the primary goal is to restore or maintain habitat connectivity and benefit the widest range of species, the best option may be to build a large crossing structure (wildlife bridge or underpass), given cost constraints, and may be enhanced by partnering for the acquisition of conservation easements or land purchases to conserve the wildlife crossing in perpetuity.


Figure 20: Salamanders exiting culvert. Photo: FHWA Critter Crossings website

4.2 Infrastructure Improvements to Wildlife Crossing

When evaluating infrastructure alternatives to improve wildlife crossing it is important to note that one size does not fit all. Depending upon the goal(s) of your structural improvement and focal species that will be using it, different sizes, approaches, substrates, lighting, moisture, temperature, water flow, fencing mesh, and height will need to be considered.

4.2.1 Wildlife Bridges/Overpasses

Wildlife bridges are vegetated structures that are designed primarily for the passage of large-bodied mammals, but they have been demonstrated to be used by all taxa and functional groups (e.g., Clevenger and Waltho, 2005).

- Typically the highest cost option, these are used mainly when wildlife/vehicle collisions are relatively frequent and result in severe injuries or fatalities, or when special status species or large-bodied mammals are involved (e.g., grizzly bears, wolves; Cavallaro et al. 2005)
- May serve as intermediate habitat for smaller-bodied organisms
- Maintain habitat connectivity
- Reduce collisions and facilitate crossing, especially when used in conjunction with vegetation and fencing to guide animals to over-crossing
- Substrate and vegetation on the overpass should match that of surrounding landscapes

- Vegetation is often used to provide a sight and sound barriers to encourage use by disturbance-shy animals
- Fencing and vegetation are used to direct animals to the overpass

4.2.2 Wildlife Underpasses

Figure 21: Wildlife Underpass, Sierra County. Photo courtesy Brian Ehler, Calif. DF&G

Wildlife underpasses are structures that are constructed to allow safe passage of large-bodied animals. In periods of seasonal migrations, especially deer in California, the movements of animals across roadways present serious public safety conflicts. There is a series of three wildlife underpasses on U.S. 395 in Lassen and Sierra counties that were constructed between1976-1978 to reduce deer-vehicle collisions (Ford 1976; Figure 21). As with wildlife bridges, these large structures may be primarily intended to benefit large-bodied animals, but simultaneously provide safe passage to a wide variety of small and medium-bodied animals, too, and are in most cases constructed with fencing to direct animals to and through the structure (Figure 21). The openness ratio is critical to use by the intended species, as a too-low underpass may be perceived as a tunnel, especially by deer. A large, open underpass with an openness ratio > 0.75 is preferred (Cavallaro et al. 2005).

4.2.3 Culverts

Culverts are used in both upland and riparian settings and come in a variety of sizes, from small pipes to large, pre-cast concrete boxes, but are typically galvanized steel, aluminum, PVC, or concrete pipes of various diameters.

Existing culverts were in most cases originally designed and installed to enhance drainage and thus typically benefit mostly smaller-bodied vertebrates, including both aquatic (amphibians) and terrestrial (small mammals, snakes, lizards, tortoises) species, although they have been demonstrated to benefit a variety of vertebrate species (Clevenger et al. 2001, Ng et al. 2004). Larger culverts may benefit a larger number of species including even large-bodies mammals like deer and bear (e.g., Cavallaro et al. 2005).

> *Openness Ratio*
>
> Some studies have found that the structure openness ratio, defined as a structure's (height x width)/length, is important for large and medium-bodied mammals (e.g., Ford 1976, Cain et al. 2003, Clevenger and Waltho 2005). As the openness ratio is a function of structure length, which corresponds to the width of the roadway, the appropriate structural dimensions will be determined by road width. A relatively large openness ratio (i.e. >.75) may enhance a structure's use by large mammals by allowing sight through a crossing structure, as well as by providing more natural lighting conditions.

Best practices include:

- Even in riparian zones, culverts should be built or modified with dry ledges for use by water-shy organisms (Figure 22); these ledges should be constructed to be able to withstand flood events.
- Most mammals prefer to see through to habitat on the opposite side of the culvert – the culvert should not appear as a cave or burrow; the culvert openness ratio is important (see below). However, weasels and amphibians do not require such line of sight through the culvert (Clevenger et al. 2001; Dodd et al. 2004)
- Box Culverts are often deployed and documented as effective in both riparian and upland situations, especially when used in conjunction with fencing to guide (or "funnel") animals in to the culvert (Cavallaro et al. 2005, Taylor and Goldingay 2003, Ng et al. 2004)

Figure 22: Riparian culvert with rock ledge (derived from FHWA website)

- Substrate in floor of culvert demonstrated to be important, and ideal substrate is believed to be that of the surrounding habitat (e.g., Dodd et al. 2004)
- Routine maintenance of existing culverts may in some cases be essential to maintain connectivity for species depending upon these culverts for safe crossing (e.g., Dodd et al. 2004). "Hanging culverts" are often created following periods of intense precipitation, and appropriate monitoring and maintenance should ensure access to and through the culvert; boulders, rip-rap or other coarse materials should not be used to maintain the aprons at the ends culverts used for passage by small-bodied animals, as rought materials may be difficult to negotiate for small bodied and hoofed animals.

A recent (November, 2006) publication that examines the use of culverts for fish and wildlife passage in greater detail is available from the Arizona Department of Fish & Game website (http://www.azgfd.gov/hgis/pdfs/CulvertGuidelinesforWildlifeCrossings.pdf).

4.2.4 Fencing

Fencing is often used in conjunction with other crossing structures to exclude animals from portions of roadways where their crossing is not desired and to direct or "funnel" animals toward a desired crossing location such as a pipe, culvert, or underpass (Figures 21, 24). Exclusion fences have been used for diverse groups including amphibians, reptiles, deer, and elk (Aresco 2005, Gibbs 1998; Figure 23). Exclusion fences may, in some cases, act to trap wildlife within the right-of-way (Clevenger and Kociolek 2006), and must be

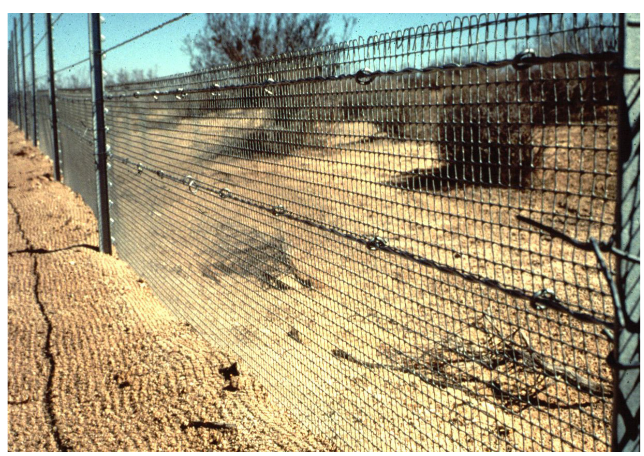


Figure 23: Desert Tortoise barrier fence (William Boarman photo)

built with one-way gates (e.g. Ford 1976; Figure 25), swing gates, or escape ramps (Figure 26) to enable animals otherwise trapped in the right-of-way to escape. To prevent small-bodied animals from entering the right-of-way through fences, fencing should be buried, or otherwise secured in the ground, and should be of a mesh size that will not trap animals in the roadway (see Figures 21, 23).

Fence design, height, and materials are important considerations, as these interact with species type to determine what kind, and how much fencing should be used in a specific setting (Table 5). The ends of fences should be located in a region that deters wildlife, such as a steep change in grade or an urban area, as this minimizes the potential for animals crossing the road to be trapped inside the right-of-way, and wherever possible, fences should only be used in conjunction with a crossing structure, as fences otherwise act as barriers to movement, with potentially serious consequences (Jaeger and Fahrig 2004).

Figure 24: One-way gate in Banff National Park, Canada

Important considerations for specific applications are described in Table 5, design specifications for desert tortoises are given in the Appendix, Section 7.2., and additional information will be provided on the associated website

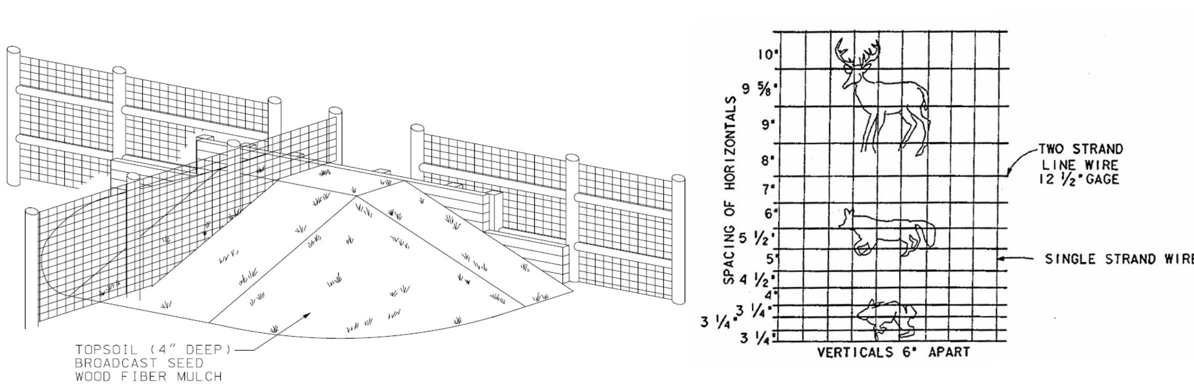


Figure 25: Deer fence with "off-ramp".

This design allows deer to escape the road-way through gaps (road-way is foreground). The variable mesh-size deer-exclusion fence (right), with small animals also excluded at lower level.

(http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/). Note, too, that in some studies, fencing has been shown to increase the rate of predation on prey that have been chased toward and trapped against fences by predators (e.g., Hartmann 2003, Little et al. 2002, Woods 1990).

Table 5: Fencing Attributes and Considerations.

Functional Group	Height	Material	Additional Considerations
Large mammals	8 – 12' (Clevenger and Waltho 2000, Putman et al. 2004, Cain et al. 2003)	Chain link (Singer and Doherty 1985, Foster and Humphrey 1995, Falk et al. 1978)	V-mesh difficult to climb may reduce maintenance costs. Should be buried if digging by coyotes likely to be a problem (Jacobson 2002). Remove trees, large bushes, etc. that could allow an animal to climb over fence. Fencing should extend on either side of the structure the entire length of the parcel boundary or just beyond a natural break in an animal's ability to traverse the landscape. Integrate one-way gates or escape ramps to prevent animals from being trapped in the right-of-way (Ford 1976).
Medium mammals	3 – 6' to prevent medium mammals from jumping or climbing over (Dodd et al. 2004, Taylor and Goldingay 2003)	Chain link (Taylor and Goldingay 2003) or wire with large gap beneath bottom strand if pronghorn passage desired.	To prevent animals from digging under fence, fencing should be buried several inches. Remove trees, large bushes, etc. that could allow an animal to climb over fence. In general, length of fencing should exceed an an animal's ability to traverse the landscape and guide them to the crossing structure.
Small mammals	3 – 4' to prevent small animals from jumping or climbing over (Dodd et al. 2004)	Wire mesh (Lode 2000)	Many small mammals are fossorial; to prevent these animals from digging under fence, fencing should be buried several inches. Remove trees, large bushes, etc. that could allow an animal to climb over fence. In general, length of fencing should exceed an animal's ability to traverse the landscape and guide them to the crossing structure.
Terrestrial reptiles	1.5 – 2.5' with lipped wall or overhang to prevent animals from climbing or jumping over (Dodd et al. 2004, Puky 2003)	Impenetrable materials including galvanized tin, aluminum flashing, plastic, vinyl, concrete, or a very fine mesh.	Fencing should be buried to a depth of several inches to eliminate gaps that may be caused by animals digging. In general, length of fencing should exceed an animal's ability to traverse the landscape and guide them to the crossing structure. Some snakes and treefrogs have been observed climbing vegetation along fencing (Dodd et al. 2004), thus maintenance must include regular removal of vegetation near fencing.
Amphibians and aquatic reptiles	1.5 – 2.5' with lipped wall or overhang to prevent animals from climbing or jumping over (Dodd et al. 2004)	Impenetrable materials including galvanized tin, aluminum flashing, plastic, vinyl, concrete, very fine mesh.	Regular maintenance essential for use, as substrate has been shown to affect use by amphibians (Jackson in Evink et al.1996). Some snakes and treefrogs have been observed climbing vegetation along fencing (Dodd et al. 2004), thus maintenance must include removal of vegetation near fencing.

4.2.5 Median Barriers

Median barriers are nearly ubiquitous across the landscape and are commonly employed to reduce vehicle/vehicle collisions. Perforated median barriers have been deployed to enable passage by small animals, but nearly nothing is known about their efficacy in facilitating wildlife passage, reducing wildlife mortality, or reducing wildlife/vehicle conflicts. Clevenger and Kociolek (2006) recently conducted a review of median barriers, including an exhaustive literature review; this report is essential reading for Caltrans wildlife crossing design staff. Clevenger and Kociolek (2006) note that: "there is a glaring lack of information about how the ubiquitous median barriers on our roadways impact wildlife…..even the most basic or cursory guidelines to help transportation agencies when working on median barrier projects do not exist." A good recent study showing the effectiveness of a barrier wall and culverts in reducing mortality of vertebrates in Florida is provided by Dodd et al. (2004), which found that the combination barrier wall/culvert system reduced mortality of vertebrates crossing a highway by 65-93% vs. pre-barrier conditions.

Figure 26: Median Barrier with gap. Caltrans photo.

Recently, Jersey-type and similar median barriers have been deployed with gaps between barrier segments (Figure 25) with the belief that the gaps between segments would permit safe passage of organisms that might otherwise be trapped on the road surface. However, the efficacy of median barriers with gaps has yet to be demonstrated in field situations (Clevenger and Kociolek 2006). Medians with "scuppers", small, semi-circular openings designed to permit passage by small and medium-bodied mammals, have been deployed near San Luis Obispo, but their efficacy has yet to be demonstrated (Clevenger and Kociolek 2006).

4.2.6 Signs

Signs are used extensively to inform motorists of regions where the danger of wildlife collisions is high. However, despite their widespread use, the effectiveness of signs in reducing collisions has been incompletely studied and is not well known (Transportation Research Board 2002).

- Some work has suggested that signs may be generally ineffective at reducing vehicle collsions with ungulates (reviewed by Groot Bruinderink and Hazebroek, 1996) except in specific cases, such as during well-defined seasonal migrations (Sullivan et al. 2004)
- Sign effectiveness has been shown to decrease

Figure 27: Wildlife Warning Sign (derived from http://www.betterroads.com)

with time, and most studies suggest that to remain effective at reducing motorist speeds and reducing animal-vehicle collisions, signs ought to be used seasonally and/or temporarily (e.g., Sullivan et al. 2004)

- Signs with additional warning mechanisms such as flashing lights, or words deployed seasonally, may be relatively more effective, as many signs are ignored by motorists (Carr et al. 2003, Hardy et al. 2006; Figure 26).
- Signs may be especially appropriate in situations where other crossing measures are impractical, such as in marshy areas or where traffic volumes are low (Carr et al. 2003). In such situations, signs designed to reduce vehicular speed through known wildlife crossing areas may help to reduce rates of collision.

4.2.7 Lighting

Lighting, especially when used in conjunction with fencing and signage, has been shown to be effective in reducing collisions with large mammals (Reed and Woodard 1981, Maine DOT 2001) by increasing driver visibility and reaction time, especially at night when many large animals are most active (Reed and Woodard 1981), and by reducing animal crossing by those animals that avoid lighted areas. Conversely, lighting components of a project may be evaluated to reduce glare in areas important for wildlife crossing where safe passage is ensured.

The use of lighting is, however, often limited to areas with a nearby power source, but has generally been found to be a cost effective solution to vehicle-animal collisions, especially in urban and suburban regions with high collision rates.

4.2.8 Reflectors

Reflectors, typically round plastic devices deployed on top of posts that reflect the lights of on-coming traffic at night, have been used in attempts to prevent deer from entering highway rights-of-way, but these devices have generally been found ineffective (D'Angelo et al. 2007) and their use to enhance wildlife crossing is not encouraged.

4.2.9 Speed Bumps

Speed bumps may be used to reduce vehicle speed and potential for vehicle/animal conflict in local streets, especially where the existing speed limits are relatively low, visibility is limited by a curve in the road or adjacent concealing vegetation, and where surrounding habitat increases the risk of collision (Carr et al. 2003). This is probably not a plausible measure for most highway systems but has been used in some regions with high rates of animal-vehicle collisions to get drivers' attention by creating noise and help to get drivers to slow down.

4.2.10 Vegetation

Vegetation must be carefully considered when designing mitigation structures, as vegetation may enhance or reduce the effectiveness of crossing structures by attracting or repelling species of management interest. Whenever possible, it is preferable to use native plants, as these, although potentially more costly at the outset, may save money in the long term due to lower maintenance requirements, better establishment, and suppression of weed species (White and Ernst 2003). Exotic invasive species pose a serious threat to native species of plants and animals, and as many invasive species are found in association with roadsides, the responses of plants to mitigation and maintenance activities needs to be documented. The Federal Highway Administration maintains a website with much useful information on roads and invasive species at: http://www.tfhrc.gov/pubrds/marapr00/invasiv1.htm.

The design for many wildlife overpasses and underpasses includes the removal of vegetation from wide strips on both sides of the road near to the crossing to discourage animal use of the road while vegetation is left in an area leading to the overpass or underpass. This design is intended to encourage wildlife use the overpass or underpass and these efforts to direct animal movements are often reinforced by fencing.

4.2.11 Animal Detection Systems – Advanced Technology

Although primarily intended to reduce the frequency of vehicle/animal collisions, the utilization of emerging technologies seeks to provide a new method to enhance the crossing of highways by large-bodied mammals. The current state of the art technology was comprehensively reviewed in the recent (08/2006) report, “Animal Vehicle Crash Mitigation Using Advanced Technology” (available at http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/AnimalVehicle.pdf).

Two systems were chosen for evaluation. One system deployed in Yellowstone National Park, intended primarily for elk, the other in Pennsylvania intended primarily for deer.

The Yellowstone system consisted of a microwave signal “break-the-beam” system. While it performed well, it did not detect all of the elk that approached the road due to “blind spots” that may or may not be remedied in other installations. It also did not detect most medium and small sized mammals. This system was poorly accepted by motorists due to its intrusive design, and if deployed, especially in scenic areas, will need to be redesigned to “blend in” more with the surrounding landscape.

The Pennsylvania system was comprised of a microwave signal “area-coverage” system. It failed to detect humans as models for deer movement and was removed; thus, it contributes little to our knowledge of advanced systems for animal detection.

Further study of these and similar systems is needed before any conclusions can be reached regarding their effectiveness in reducing vehicle-animal conflicts.

4.2.12 Escape Ramps/One-way Gates/Median Barrier Gaps

Occasionally, despite the best prevention efforts, animals find their way on to roadways. It is essential to plan for such situations and to include escape ramps (Figure 24), one-way gates (e.g., Ford 1976 for deer underpasses in Lassen and Sierra Counties), gaps in median barriers (Figure 25), or similar structures to enable animals to get out of the right-of-way and to return to adjacent habitats.

4.3 Modifying Existing Infrastructure to Enhance Wildlife Crossing

In many cases, it may be possible to increase permeability, reconnect fragmented habitats, and increase public safety by modifying existing infrastructure. Such modifications may be possible for a fraction of the cost of providing new structures and may help to meet wildlife crossing goals.

4.3.1 Bridges and Overpasses

The slopes beneath bridges and overpasses, even in suburban areas, are often used for movement between habitat patches by many species of wildlife. Bridges and overpasses, although not originally designed to facilitate animal movement, may be modified to permit safe passage by:

- modifying the slope beneath the bridge or overpass to allow easier movement
- providing a slope material that more closely matches surrounding natural substrates
- adding a bench or similar "wildlife path" to facilitate movement
- installing fencing to direct animals to the slope and to prevent their movement on to the road surface

An example is the Bocca/Floristan Upgrade and Bridge Replacement in Nevada County. Here, observations have confirmed use by deer of the slope under the bridge so a bench was provided above the rip-rap to enhance wildlife movement. Additional examples are provided on the wildlife crossing website (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/).

4.3.2 Culverts

Figure 28: Culverts under I-15, San Bernardino County (Caltrans photo)

In many cases, culverts have been installed to convey water under a roadway rather than to enhance wildlife movement; however, if existing culverts are large enough, they may allow safe passage of a variety of small and medium-bodied mammals from amphibians to coyotes (e.g., Yanes et al. 1995; Clevenger and Waltho 1999, Clevenger et al. 2001, Krawchuk et al. 2005, Ng et al. 2004, Taylor and Goldingay 2003). Providing appropriate substrate leading up to a culvert can enhance the possibility of its use: Figure 27 shows an example from San Bernardino County where small gravel was used to fill in the spaces in a rip-rap bed leading up to a series of culverts; these culverts were confirmed to allow passage of desert tortoises after the gravel was added. Adding ledges to culverts (Figure 22) has been shown to encourage many terrestrial species including coyotes, other small and medium-bodied mammals and reptiles to use culverts for crossing beneath roads. Maintenance of the entrances of culverts has been shown to greatly influence their rates of use (e.g., Yanes et al. 1995), as periods of high precipitation can lead to scouring and "hanging culverts" which are inaccessible to animals. Culverts may also become clogged with sediment and may need to be cleaned periodically. Lastly, vegetation may grow up to obscure culvert entrances and must be maintained in an appropriate condition to ensure culvert use (Clevenger et al. 2001).

4.3.3 Median Barriers

Median barriers come in a variety of designs and materials and are used to enhance public safety by separating opposing lanes of traffic. However, median barriers also affect wildlife and these effects were comprehensively documented in a recent (October, 2006) Caltrans-supported report by Clevenger and Kociolek. Concrete "Jersey-style" barriers are the most common style in the U.S. and recently, "Jersey-style" median barriers with "scuppers", or small openings on the bottom, have been installed with the intent of allowing passage beneath the barrier by smaller-bodied organisms; however, the efficacy of these openings in reducing mortality and increasing safe wildlife passage has yet to be demonstrated (Clevenger and Kociolek 2006). Jersey-style concrete barriers with gaps (Figure 25) may permit animals otherwise trapped on the right-of-way to escape and to pass safely across a road surface.

Figure 29: State Hwy. 163 median barrier.

Galvanized steel rails and cables are permeable to small and medium-sized vertebrates, but may impede highway crossing by large-bodied vertebrates (Clevenger and Kociolek 2006), and cables present risks to motorists. Because of the potential for trapping animals near traffic, separating young from their parents, and impeding or preventing passage of animals between habitats, median barriers often present wildlife crossing conflicts and modifications to original designs (e.g., scuppers, gaps, and one-way gates) may help to ameliorate some of these conflicts.

Table 6 summarizes some of the more common median barrier designs and ranks their potential for permeability to wildlife functional groups (after Clevenger and Kociolek 2006).

Table 6: Potential relative permeability of median barrier types to wildlife functional groups.

Median Barrier Type	Wildlife Functional Group				
	1	**2**	**3**	**4**	**5**
Concrete	Red	Red	Yellow	Green	Green
Ontario Tall Wall	Red	Red	Red	Red	Red
Concrete with gaps	Yellow	Yellow	Yellow	Green	Green
Concrete with scuppers	Yellow	Yellow	Yellow	Green	Green
Concrete with gaps and scuppers	Yellow	Yellow	Yellow	Green	Green
Metal beam	Green	Green	Green	Green	Green
Cable	Green	Green	Green	Green	Green
Centerline rumble strips	Green	Green	Green	Green	Green
Vegetated Median	Green	Green	Green	Green	Green

Legend: **Red:** no to low permeability, **yellow:** moderate permeability, **green:** high permeability. 1 = mice, shrews, salamanders, frogs, snakes; group 2 = rats, squirrels, weasels, turtles, young waterfowl, upland birds; group 3 = marten, fisher, mink, badger, skunk, fox, opossum; group 4 = coyote, bobcat, otter, raccoon; group 5 = bear, elk, deer, pronghorn, bighorn sheep, mountain lion.

4.4 Choosing a Wildlife Crossing Improvement Measure

Potential strategies for improvements may include:

1. changing traffic patterns and trying to change driver behavior
2. modifying/controlling wildlife access to road-ways
3. providing infrastructure that allows wildlife passage over or under the roadway

4.4.1 Which Structure or Action?

In cases where the recommendation is to build structures specifically to enhance wildlife crossing, you will need to thoroughly justify your recommendation due to its cost. Your justification should be based upon effects, laws, regulations, and the ability of the recommendation to reduce effects. In some cases, retrofitting an existing bridge, underpass, or culvert will be less expensive than building a new structure and may be a viable alternative to new construction. Table 7 links structures to project goals and Table 8 links design specifications to focal animal groups; together they may help to justify a particular recommendation, but where possible it is best to cite a case study where your recommended action has had demonstrated benefits.

While controlling traffic speed is often the least expensive way to reduce rates of vehicle-wildlife collisions, improve driver safety, and protect wildlife, it is difficult to implement in many situations and may rely upon effective driver education. Where possible, traffic speeds may be reduced by:

1. reducing speed limits combined with enforcement
2. signs with or without accessories (flashing/blinking lights, warning messages)
3. signs and/or lights triggered by wildlife movement
4. rumble strips and other road-bed structures (e.g., Carr et al. 2003)

Controlling traffic speed through the use of signs may be the least effective of these alternatives, as several studies have shown that signs have little effect on driver behavior except immediately after installation (e.g., Ford 1976, Sullivan et al. 2004).

Table 7: Mitigation goals and wildlife size group-appropriate crossing structures.

		Wildlife bridge / underpass	**Large culverts**	**Small culvert or tunnel**	**Traffic calming & education**
Mitigation goals	Retain/restore connectivity	X	X		X
	Reduce traffic accidents	X	X		X
	Connect habitats for protected species	X	X	X	
Species size-group	Small			X	X
	Medium	X	X		X
	Large	X	X		X

4.4.2 How to Size a Structure

Generally, larger structures will provide greater opportunity for a larger number of wildlife species to safely cross over or under a roadway (Cavallaro et al. 2005; Clevenger and Waltho 2005). Vegetated overpasses (“wildlife bridges”) provide connectivity across a highway for the majority of mammals, terrestrial birds, and some reptiles. Similarly, wildlife underpasses provide safe crossing for a large number of vertebrates, although the openness ratio (see text box, below) of the underpass must be large to ensure passage by deer and other large vertebrates (Ford 1976). Culverts with appropriate substrate provide connectivity to most small and medium-sized mammals, reptiles, amphibians, and occasionally some large mammals (Cavallaro et al. 2005). In all cases, the structure's openness ratio may be a critical consideration (see text box, below), as several studies have shown that the "tunnel effect", i.e. the appearance of a tunnel rather than a movement corridor, diminishes the use of many structures (e.g., Ford 1976). Tables 7 and 8 and Section 3.4 summarize size considerations for wildlife structures.

4.4.3 Adjacent Functions and Uses

To make most effective use of crossing enhancement opportunities and actions, and to justify the expenditure of taxpayer dollars, it is essential to consider current and expected land uses and ownership surrounding the project area. In order to make mitigation actions more effective, they should be consistent with local planning regulations. CEQA and NEPA require Environmental Impact documents (EIRs and EISs) to document that feasible alternatives and mitigation measures are consistent with local land uses, planning documents, and regulations. In addition to the planning documents, these functions and uses may be known from knowledge of the area, or discovered through simple mapping of the area of concern. Facilitated crossing using structures or focused traffic calming should be connected to natural or semi-natural corridors that provide conduits to larger areas of natural habitat.

4.4.4 Spacing of Structures

The spacing of structures scales with animal size: smaller species require smaller but more closely-spaced structures with smaller openness ratios while larger species require larger, more widely-spaced structures (Clevenger and Waltho 2005) with larger openness ratios. Accommodating a diversity of species requires a diversity of crossing structures (e.g., over and under-passes, pipe and box culverts; Clevenger and Waltho 2005). While some studies have found that crossing *location* is the most important determinant of use (Yanes et al. 1995; Ng et al. 2004), others have emphasized structure *design* as being more important (Cain et al. 2003). A crossing plan should consider both local and regional wildlife movement needs, and take both habitat characteristics and focal species group into consideration (Clevenger and Waltho 2005) to benefit the largest number of species. Spacing of crossing location improvements may also depend on the topography and the appropriate site locations for improvements. Spacing of structures should help accomplish the goals you have considered to address the effects associated with your project and the context of your location.

4.5 Design Specifications

There are currently no standard design specifications for wildlife crossing structures adopted by the Department; however there are several examples of structures that have been utilized for different species and environmental circumstances. Since crossing locations can be expected to differ substantially from one another in terms of topography, facility type, focal species, grade, and other considerations, design specifications must be location, species, and goal-appropriate. The most appropriate design specification in any given situation will result from coordination with your PDT, knowledge of what has worked elsewhere in similar circumstances, and consultations with local experts. Table 8 summarizes the preferred design specifications for the three functional species groups.

In general, the sizes of the animals in the focal group correlate directly with the size of the most appropriate crossing structure, e.g., large-bodied animals require large, open crossing structures, medium-sized animals will utilize both the larger structures required by larger animals as well as smaller culverts, and small-bodied animals will utilize the smallest culverts but terrestrial forms require ledges or other dry substrate if the culvert is installed in a drainage. Small animals may perceive the largest crossing structures as appropriate habitat and live permanently thereon (Clevenger and Waltho 2005).

The USDA Forest Service has a Website with a small library of design drawings for constructed crossings (http://www.fs.fed.us/rm/RRR/Technologies/Wildlife_Crossings.html). The "Wildlife Crossing Toolkit" also has some useful descriptive drawings (http://www.wildlifecrossings.info/summary.htm). Additional design specifications are available in recent reports from work in Ventura County (Cavallaro et al. 2005) and are reviewed comprehensively by Forman and Alexander (1998). Some case studies of crossing improvements have also been identified on FHWA's "Keeping it Simple" website at http://www.fhwa.dot.gov/environment/wildlifeprotection/.

Table 8: Preferred design specifications appropriate for functional species groups.

Species Group	Preferred Design Specifications
Large mammals (deer, elk, bear, mountain lion)	large, open crossing structures with an openness ratio of at least 0.75, are easily accessible, and incorporate fencing ("funneling") to direct animals to the crossing structures and to prevent animals from entering the highway (Cavallaro et al. 2005); one-way gates or escape ramps must be incorporated to enable trapped animals to escape. Clear visibility through to vegetation at the other end of the crossing essential.
Medium-sized mammals (fox, coyote, skunk, rabbit, raccoon, opossum)	box or pipe culverts (Clevenger et al. 2003) that are at least 3' high, have an openness ratio of at least 0.4, are easily accessible, incorporate funneling to prevent animals from entering the highway and direct them to the crossing structure (Cavallaro et al. 2005). Clear visibility through to vegetation at the other end of the crossing essential. Ledges needed in modified, existing culverts for drainage.
Small mammals (squirrels, rats, voles, mice), reptiles, and amphibians	a mix of small pipes, box culverts, and pipe culverts that are 1' or more high, provide natural vegetation of low stature near the openings to provide cover, are easily accessible, and incorporate funneling to prevent animals from entering the highway and to direct them to the crossing structure (Cavallaro et al. 2005). Should be closely spaced to accommodate movements of small bodied animals.

4.6 Identify Maintenance Needs

Existing and newly-installed wildlife crossing structures must be periodically maintained to continue to provide safe passage as, in the absence of routine maintenance, these structures may be avoided or become unusable by the species that they were intended to benefit (e.g., Dodd

2004). Although crossing structures may become ineffective without post-project monitoring and maintenance, reliable funding has been a historical problem. As shown in the decision trees (Figures 2 and 3), it is essential to identify the requirements for monitoring (see also Section 3.8) and to monitor and maintain the crossing site and to ensure that long-term maintenance resources are provided in the project budget.

Maintenance staff should be involved in the wildlife crossings planning to provide input on design considerations and their effects on maintenance needs as well as in post-project assessments to consult on any maintenance concerns that may have arisen. It cannot be assumed that crossing structures, once in place, will remain effective without periodic maintenance, and maintenance crews must be informed of the procedures necessary to keep crossing structures accessible and to function as intended.

Maintenance activities may include:

- clearing of vegetation and maintenance of aprons of culverts. If scouring following storms prevents access, the scoured rocks or soil should be replaced with like materials to eliminate "hanging culverts" and not replaced with boulders, rip-rap or other substrates unsuited to the animal species the culvert was intended to benefit
- fences should be cleared of accumulated debris and repaired if they are torn or displaced from their original positions
- vegetated over and under-crossings should be kept free of weeds that inhibit passage of all but the largest animals while native plants are encouraged to provide cover or forage

4.7 Costs

The costs associated with mitigating wildlife/vehicle conflicts can be substantial and these costs increase through time. The materials costs of several types of structures for enhancing wildlife passage for a variety of mammals are estimated in Table 9 and were derived from the 2003 Caltrans Contract Cost Data book, available at: http://www.dot.ca.gov/hq/esc/oe/awards/2003CCDB/2003ccdb.pdf.

Table 9: Crossing Structure Materials Costs

Crossing Structure Type	**Approximate Range of Cost(s)**
Box culvert, Class 1 concrete	$565-$1,380/cubic meter
Box culvert, Class 2 concrete	$620-$3,630/cubic meter
12" alternative pipe culvert	$113/linear foot
18" alternative pipe culvert	$192/linear foot
1050 mm alternative pipe culvert	$1,250/meter

These costs are variable depending upon site and application-specific characteristics, and include material costs alone; installation and maintenance costs are additional. It is suggested that collaboration with your design engineer and project manager are essential in understanding the design and costs associated with proposed structural improvements or installation. Caltrans intends to compile cost data on a per project basis as projects are undertaken and to post available data on the website (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/) that accompanies this manual.

4.8 Post-project Monitoring and Adaptive Management

It is essential to incorporate post-project monitoring and adaptive management into project planning and to assess the effectiveness of mitigation measures (Clevenger 2005; Dodd et al. 2004). Such monitoring and assessment actions are of great benefit to local, regional, and statewide transportation professionals, as knowledge of what does and does not work in particular circumstances will lead to better mitigation outcomes and save time, effort, and money. Projects should be monitored for several years, as field research has shown that there may be a lag period after project completion and effects on species populations (Findlay and Houlahan 1997, Findlay and Bourdages 2000). Long-term, post-project monitoring is also essential to accurately assess the results of installing crossing enhancements, as in many cases there is a period, often lasting up to 3 years for large-bodied mammals, of "structure shyness", that is, an active avoidance of new structures by the very animals that they are designed to benefit (Clevenger and Waltho 2003, Wildlife Crossings Toolkit 2003, Hardy et al. 2003; Huijser et al. 2006). Post-project assessments help to inform not only Caltrans, but also an international audience of biologists, planners, and engineers of effective design types and actions (Carr et al. 2003) and case study examples should be entered into the wildlife crossing website (http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/). The best projects will incorporate both pre-project assessments and post-project monitoring, to quantify and document mitigation effectiveness (e.g., Trombulak and Frissell 2000; Dodd et al. 2004).

Similarly, if post-project monitoring suggests that modifications to the original design will result in greater use, these modifications should be implemented, documented, and made widely known to Caltrans staff. For example, if an original project plan called for the installation of a culvert with associated fencing but the fencing was subsequently found to be inappropriate or ineffective, modified, and the modified design was shown to be more effective, this provides a valuable example of adaptive management. Such adaptive management actions may be especially helpful to improve mitigation performance elsewhere, and the results of such actions should be widely disseminated among Department staff, including by entering a case study record into the wildlife crossing website.

Mitigation Effectiveness Criteria

- Comparison of pre- to post-project total number of crossings
- Comparison of pre- to post-project crossing rates for target species
- Comparison of pre- to post-project repel rates
- Comparison of pre- to post-project rates of percentage use
- Ratio of observed to predicted use of structures
- Post-project reduction in number of animal-vehicle collisions

P. Cramer, 2007; personal communication

Coordination with regulatory agencies is an essential component of monitoring and reporting requirements and may require partnering with adjacent landowners or land managers.

A range of options to assess project effectiveness has been described, but few projects have incorporated both pre-project assessments and post-project monitoring; three projects illustrate excellent design:

1. The SR 23 widening project in Ventura County utilized information from the Ng et al. (2004) study of mountain lion crossings in Southern California, which used a combination of remotely triggered cameras and gypsum track stations to monitor three culverts prior to, during, and after construction. This on-going study will evaluate of the effectiveness of mitigation and maintenance measures (improved fencing, culvert cleaning); thus, this project represents a good template for similar projects because of the thoroughness of the pre- and post-project monitoring and assessment (Sikich and Riley, 2007).

2. An assessment of a barrier wall and culvert project in Paynes Prairie State Preserve, Florida (Dodd et al. 2004) calculated rates of mortality along a busy highway for one year prior to project construction and compared these to the rates one year after the barrier wall and culverts were installed to quantitatively assess the effectiveness of the barrier wall and culvert system at reducing mortality rates.

3. Clevenger and Waltho (2005) studied primarily large-bodied mammals (carnivores and their prey) in Banff National Park, Canada and found that species' response to crossing structures was not uniform but was instead species-specific, and concluded that where the goal is to benefit a diverse array of species, a similarly diverse array (sizes, types) of crossing structures is needed.

Hardy et al. (2003) provide a generalized overview of the methodological issues involved in evaluating the effectiveness of mitigation strategies. According to the Hardy et al. (2003) approach, the seven steps to plan an effective evaluation effort are to:

1. Identify evaluation questions and definitions of effectiveness
2. Identify effectiveness criteria (see text box, above)
3. Design monitoring program
4. Pilot methods, adjust to meet goals, project budgets
5. Collect data for evaluation
6. Analyze data to determine effectiveness
7. Report results

It is also essential to document and report negative results, that is, findings that a project was not effective at meeting its objectives, and to try to understand the factors responsible for the lack of effectiveness. Documenting and disseminating the results of actions allows all to gain from local experience, and knowledge gained from one project may serve to increase the likelihood of success in the future.

5 Keeping Informed

The field of road ecology is advancing rapidly, with results of research and mitigation actions being published at ever-increasing rates. Similarly, new materials and techniques are being developed and field-tested which may provide a greater range of opportunities for enhancing wildlife crossing while protecting public safety. Thus, it is essential for Department staff to keep informed of new developments, and the following section provides a guide to primarily web-based resources that are updated continually and have been found to be particularly useful.

5.1 Internet Resources

The science of road ecology is new and developing rapidly. The internet may serve as the best resource to enable Caltrans staff to stay abreast of research and developments. Below is provided a listing of some of the internet resources that may be especially helpful.

5.1.1 Caltrans Resources

- Caltrans Standard Environmental Reference (SER), Chapter 14, Biological Resources, http://www.dot.ca.gov/ser/vol1/sec3/natural/Ch14Bio/ch14bio.htm#14decisiontree.
- EnviroNet (Caltrans intranet site) – http://pd.dot.ca.gov/env/bio/html/wildlife/crossing_index.htm
- Caltrans Intranet "Connectivity and Crossings" webpage http://pd.dot.ca.gov/env/bio/html/wildlife/crossing_index.htm
- Caltrans Wildlife Crossings Collaboration Website. The Caltrans-supported website, http://www.dot.ca.gov/hq/env/bio/wildlife_crossings/, provides a continuously updated and searchable electronic version of this manual, including a searchable bibliography, plus additional resources such as case studies and process decision trees.

5.1.2 Federal Highway Administration Resources

- Federal Highway Administration (FHWA)
  - Keeping It Simple, part of the Critter Crossings Web site (http://www.fhwa.dot.gov/environment/wildlifeprotection/index.cfm)
  - federal wildlife legislation affecting transportation (http://www.fhwa.dot.gov/environment/env_sum.htm)

5.1.3 Academic Institution Resources

- U.C. Davis Road Ecology Center
  - the Road Ecology Center (http://roadecology.ucdavis.edu/) at the University of California, Davis has many resources, including scientific reports and upcoming workshop announcements
- The Wildlife, Fisheries, and Transportation Research Database hosted by the Center for

Transportation and the Environment at North Carolina State University in Raleigh (http://www.itre.ncsu.edu/CTE/gateway/wildlife.htm)

  - contains links to primary literature, agency reports, and ICOET proceedings and is searchable by several criteria

5.1.4 International Conference on Ecology and Transportation (ICOET)

- The ICOET website ((http://www.icoet.net/) contains announcements and links to PDF files to all conference proceedings

5.1.5 Other Wildlife Crossings-related Websites

- Wildlife and Roads Web Site
  - the Wildlife and Roads web site (http://www.wildlifeandroads.org/) is specifically oriented toward the evaluation of the use and effectiveness of wildlife crossings and should be consulted for additional information, current literature, and research results
- The Infra Eco Network Europe web site (http://www.iene.info/)
  - contains announcements, member information, and a database searchable by literature, measures (mitigation types), metadata, or projects
  - primarily European focus
- The deercrash.com web site (http://deercrash.com/) of the Deer-Vehicle Crash Clearinghouse at the Texas Transportation Institute
  - contains announcements and information for those interested in mitigating deer-vehicle conflicts
- The American Association of State Highway and Transportation Officials Center for Environmental Excellence web site (http://environment.transportation.org/)
  - site provides much current information, announcements, compliance guides, and even a technical assistance program
  - developed in cooperation with the Federal Highway Administration
- Wildlife Crossings Toolkit, USDA Forest Service (http://www.wildlifecrossings.info/)
- Wildlife crossing and structures, Defenders of Wildlife (http://www.defenders.org/wildlife/flbears/wildlifecrossing.html)
- Wildlife crossings – design and placement, USDA Forest Service (http://www.fs.fed.us/rm/RRR/Technologies/Wildlife_Crossings.html)
- Wildlife crossing guidebook for municipal planners, Portland Oregon (http://www.metro-region.org/article.cfm?articleid=15005)
- Wild animals and roads, Humane Society of the United States (http://www.hsus.org/wildlife/issues_facing_wildlife/wildlife_crossings_wild_animals_and_roads/

5.2 Additional Information on Wildlife Survey Methods

There are many sources of additional information on field survey methods; some of the most useful include:

- The Caltrans Standard Environmental Reference, Volume 3 Biological Resources, Chapter 2 – Natural Environment Study, Section 2-4.4 cites 6 standard references (Brookhout, T. A. Editor. 1994; Cooperrider et al., Editors, 1986; Davis 1990; Hays et al. 1981; Leedy and Adams 1982; and Ralph et al. 1993) published by agencies or professional associations; each of these provides sufficient detail to enable any competent biologist to employ a field method with which he or she may not have previously been familiar.
- The California Department of Fish & Game Web site provides basic survey and monitoring protocols and guidelines (http://www.dfg.ca.gov/hcpb/species/stds_gdl/survmonitr.shtml)
- The Wildlife Crossings Toolkit developed by the USDA Forest Service is designed for wildlife biologists and highway engineers and provides many useful case histories in a database format (http://www.wildlifecrossings.info/beta2.htm)
- Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. 1994. Edited by Heyer et al. A superb overview of field methods for amphibians but with much relevance to reptiles.
- Measuring and Monitoring Biological Diversity: Standard Methods for Mammals. 1996. Edited by Wilson et al. Excellent reference providing thorough reviews of field methods appropriate for all mammal groups.
- Ecological Census Techniques, a text edited by Wm. J. Sutherland (1996, 2006), provides instructions for conducting ecological censuses for a variety of organisms and is written for specialists and non-specialists alike.
- Pollock et al. (2002) provide a thorough review of statistical methods for design and analysis of large-scale monitoring of wildlife, but is intended for a sophisticated audience most interested in experimental design and proper statistical analyses

5.3 Additional Mitigation Design Information

The following are recent reports that, although not updated, provide excellent coverage of wildlife crossings issues as well as numerous illustrations and photographs depicting specific case studies and real-world implementations of crossing structures.

- "Designing Road Crossings for Safe Wildlife Passage: Ventura County Guidelines" available at: http://www.bren.ucsb.edu/research/documents/corridors_final.pdf.
- "Wildlife Crossings: Rethinking Road Design to Improve Safety and Reconnect Habitat", describes an extensive effort in the Portland, Oregon region; available at: http://www.metro-region.org/article.cfm?ArticleID=15005
- "Doing the Right Thing: Improving Transportation and Enhancing Ecosystems, Exemplary Ecosystem Initiatives" found on the Federal Highway Administration web

site at http://www.fhwa.dot.gov/environment/ecosystems/index.htm has many excellent examples of wildlife crossing mitigation measures from 2002-2005 from sites across the country

5.4 Recommended Reading

There are two books which are extremely valuable introductions and summaries of wildlife crossings and road ecology and that come as close as any to be "essential reading" for Caltrans biologists:

- Road Ecology: Science and Solutions (Forman et al., Island Press, 2003), and
- Corridor Ecology (Hilty, Lidicker, and Merenlander, Island Press, 2006).

Both texts provide excellent introductions that examine the many interactions between roads and wildlife. For an excellent overview article on roads and their ecological effects, see:

- Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major ecological effects. Ann. Rev. Ecol. Syst. 29: 207-231.

6 Literature Cited

Aresco, M.J. 2005. Mitigation measures to reduce highway mortality of turtles and other herpetofauna at a north Florida lake. J. Wildl. Manage. 69: 549-560.

Barry, S.J. and H.B. Shaffer. 1994. The status of the California Tiger Salamander (Ambystoma californiense) at Lagunita: A 50-year update. J. Herpetology 28: 159-164.

Bass, R.E., A.I. Herson, and K.M. Bogdan. 1999. CEQA Deskbook. Second Edition. Point Arena: Solano Press Books.

Beier, P. and S. Loe. 1992. A checklist for evaluating impacts to wildlife movement corridor. Wildl. Soc. Bull. 20: 434-440; PDF available at: http://oak.ucc.nau.edu/pb1/vitae/Beier-Loe_1992.pdf

Bennett, A.F. 2003. Linkages in the landscape: The role of corridors and connectivity in wildlife conservation. IUCN Forest Conservation Programme: Conserving Forest Ecosystems. Series 1. Available as pdf at: http://app.iucn.org/dbtw-wpd/edocs/FR-021.pdf

Boarman, W.I., M. Sazaki, and W.B. Jennings. 1997. The effect of roads, barrier fences, and culverts on desert tortoise populations in California, USA. Proc.: Conservation, Restoration, and Management of Tortoises and Turtles – An International Conference, pp. 54-58.

Brookhout, T. A., Editor. 1994. Research and management techniques for wildlife and habitats. The Wildlife Society, Bethesda, MD. 740 pp.

Brown, V., H.G. Weston, and J. Buzzell. 1986. Handbook of California Birds, Third Edition. Naturegraph Publishers. 224 pp.

Bull E. L., R. S. Holthausen, L. R. Bright. 1992. Comparison of three techniques to monitor marten. Wildl. Soc. Bull. 20: 406 – 410.

Cain, A.T., V.R. Tuovila, D.G. Hewitt, and M.E. Tewes. 2003. Effects of a highway and mitigation projects on bobcats in Southern Texas. Biol. Cons. 114: 189-197.

Caro, T. M., Shargel, J. A. and Stoner, C. J., 2000. Frequency of medium-sized mammal road kills in an agricultural landscape in California. American Midland Naturalist 144: 362-369.

Carr, L.W. and L. Fahrig. 2001. Effect of road traffic on two amphibian species of differing vagility. Cons. Biol. 15: 1071-1078.

Carr, T., R. Dacanay, K. Drake, C. Everson, A. Sperry, and K. Sullivan. 2003. Wildlife Crossings: Rethinking Road Design to Improve Safety and Reconnect Habitat. Portland Oregon, Metro.

Case, R.M. 1978. Interstate highway road-killed animals: A data source for biologists. Wildlife Society Bulletin 6: 8-13.

Cavallaro, L, K. Sanden, J. Schellhase, and M. Tanaka. 2005. Designing Road Crossings for Safe Wildlife Passage: Ventura County Guidelines. MS Thesis, U.C. Santa Barbara.

Clarke, G.P., P.C.L. White, and S. Harris. 1998. Effects of roads on badger *Meles meles* populations in southwest England. Biol. Cons. 86: 117-124.

Clevenger, A.P. 2005. Conservation value of wildlife crossings: measures of performance and research directions. GAIA – Ecol. Perspect. For Sci. Tech. 14: 124-129.

Clevenger, A.P., B. Chruszcz, and K. Gunson. 2001. Drainage culverts as habitat linkages and factors affecting passage by mammals. J. Appl. Ecol. 38: 1340-1349.

Clevenger, A.P., B. Chruszcz, and K. Gunson. 2003. Spatial patterns and factors influencing small vertebrate fauna road-kill aggregations. Biol. Cons. 109: 15-26.

Clevenger, A.P. and A.V. Kociolek. 2006. *Highway median impacts on wildlife movement and mortality: State of the practice survey and gap analysis*. Prepared for the California Department of Transportation, Sacramento, California. Available at: http://www.dot.ca.gov/newtech/researchreports/reports/2006/median_barrier_final_report.pdf

Clevenger, A.P., J. Wierzchowski, B. Chruszcz, and K. Gunson. 2002. GIS-generated expert-based model for identifying wildlife habitat linkages and planning mitigation passages. Cons. Biol. 16: 503-514.

Clevenger, A.P. and N. Waltho. 2005. Performance indices to identify attributes of highway crossing structures facilitating movement of large mammals. Biol. Cons. 121: 453-464.

Cochran, W.G. 1977. Sampling techniques. Third edition. New York, NY: John Wiley & Sons.

Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart, Editors. 1986. Inventory and Monitoring of Wildlife Habitat. U.S. Department of Interior, Bureau of Land Management, Service Center. Denver, CO., 858 pp.

Craighead, A.C., E.A. Roberts, and F.L. Craighead. 2001. Bozeman Pass Wildlife Linkage and Highway Safety Study. International Conference on Ecology and Transportation, Keystone, Colorado, September, 2001.

Cypher, B.L., G.D. Warrick, M.R.M. Otten, T.P. O'Farrell, W.H. Berry, C.E. Harris, T.T. Kato, P.M. McCue, J.H. Scrivner, and B.W. Zoellick. 2000. Population dynamics of San Joaquin Kit Foxes at the Naval Petroleum Reserves in California. Wildlife Monogr. 145.

D'Angelo, G.J., R.J. Warren, K.V. Miller, G.R. Gallagher, and S.A. Valitzski. 2007. Final Project Report: Development and evaluation of devices designed to minimize deer-vehicle collisions. Available from the Transportation Research Board website (http://gulliver.trb.org/news/blurb_detail.asp?id=7947)

Davis, D. E. 1990. CRC Handbook of Census Methods for Terrestrial Vertebrates. CRC Press. 375 pp.

Dodd, C.K., W.J. Barichivich, and L.L. Smith. 2004. Effectiveness of a barrier wall and culverts in reducing wildlife mortality on a heavily traveled highway in Florida. Biol. Cons. 118: 619-631.

Drennan, J.E., P. Beier, and N.L. Dodd. 1998. Use of track stations to index abundance of sciurids. J. Mammal. 79(1): 352-359.

Dreschel, T.W., R.B. Smith, and D.R. Breininger. 1990. Florida scrub-jay mortality on roadsides. Florida Field Naturalist 18: 82-83.

Elzinga, C.L., D.W. Salzer, J.W. Willoughby, and J.P. Gibbs. 2001. Monitoring Plant and Animal Populations. Malden, Mass., Blackwell Science.

Erritzoe, J., T.D. Mazgajski, and L. Rejt. 2003. Bird casualties on European roads – a review. Acta Ornithologica 38: 77-93.

Evink, G.L. 1990. Wildlife Crossings of Florida I-75. pages 54-59 in: Transportation Research Record 1279, Transportation Research Board, National Research Council, Washington, D.C.

Evink, G.L., P. Garrett, D. Zeigler and J. Berry. 1996. (eds.). Trends in Addressing Transportation Related Wildlife Mortality, proceedings of the transportation related wildlife mortality seminar. State of Florida Department of Transportation, Tallahassee, FL. FL-ER-58-96.

Falk, N.W., H.B. Graves, and E.D. Bellis. 1978. Highway right-of-way fences as deer deterrents. J. Wildl. Manage. 42: 646-650.

Feldhamer, G.A., J.E. Gates, D.M. Harman, A.J. Loranger, and K.R. Dixon. 1986. Effects of interstate highway fencing on white-tailed deer activity. J. Wildl. Manage. 50: 497-503.

Ford, S.G. 1976. Evaluation of highway deer kill mitigation on SIE/LAS-395: interim report. Federal Highway Administration report number FHWA/CA/TP-80/01.

Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major ecological effects. Ann. Rev. Ecol. Syst. 29: 207-231.

Forman, R.T.T., B. Reineking, and A.M. Hersperger. 2002. Road Traffic and Nearby Grassland Bird Patterns in a Suburbanizing Landscape. Environmental Management 29 : 782-800.

Forman, R.T.T, D. Sperling, J. A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R.L. France, C.R. Goldman, K. Heanue, J. Jones, F. Swanson, T. Turrentine, and T.C. Winter. 2003. Road Ecology: Science and Solutions. Washington, D.C.: Island Press.

Foster, M. L. and S. R. Humphrey. 1995. Use of highway underpasses by Florida panthers and other wildlife. Wildlife Society Bulletin 23(1): 95-100.

Frank, K., K.T. von Toschanowitz, and S. Kramer-Schadt.. 2005. Modeling roads and wildlife populations – two examples for the contribution of modeling to landscape fragmentation research. Gaia – Ecological Perspectives for Science and Society 14: 107-112.

Germano, D.J. and R.B. Bury. 2001. Western pond turtles (*Clemmys marmorata*) in the Central Valley of California: Status and population structure. Trans. West. Sec. Wildl. Soc. 37: 22-36.

Gibbs, J.P. 1998. Amphibian movements in response to forest edges, roads, and streambeds in southern New England. J. Wildl. Manage. 62: 584-589.

Gibbs, J.P. and W.G. Shriver. 2002. Estimating the effects of road mortality on turtle populations. Cons. Biol. 16: 1647-1652.

Gibbs, J.P. and W.G. Shriver. 2005. Can road mortality limit populations of pool-breeding amphibians. Wetlands Ecology and Management 13: 281-289.

Gontier, M., B. Balfors, and U. Mörtberg. 2006. Biodiversity in environmental assessment – current practice and tools for prediction. Env. Impact Assessment Rev. 26: 268-286.

Groot Bruinderink, G.W.T.A. and E. Hazebroek. 1996. Ungulate traffic collisions in Europe. Cons. Biol. 10: 1059-1067.

Gutierrez-Espeleta, G.A., S.T. Kalinowski, W.M. Boyce, and P.W. Hedrick. 2000. Genetic variation and population structure in desert bighorn sheep: implications for conservation. Conservation Genetics 1: 3-15.

Hardy, A., A. Clevenger, M. Huijser, and G. Neale. 2003. An overview of methods and approaches for evaluating the effectiveness of wildlife crossing structures: emphasizing the science in applied science. Proceedings of the International Conference on Ecology and Transportation, Lake Placid, New York, August 24-29, 2003.

Hardy. A.A., S. Lee, and A.F. Al-Kaisy. 2006. Effectiveness of animal advisory messages on dynamic message signs as a speed reduction tool: A case study in rural Montana. Trans. Res. Board Annual Meeting

Hartmann, M. 2003. Evaluation of wildlife crossing structures: their use and effectiveness. Wildlands CPR website (http://www.wildlandscpr.org/). Site accessed September 2007.

Hatch, S. A. 2003. Statistical power for detecting trends with applications to seabird monitoring. Biological Conservation 111:317-329.

Hays, R. L., C. Summers, and W. Seitz. 1981. Estimating Wildlife Habitat Variables. FWS Report FWS/OBS-81/47. 111 pp.

Heyer W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster. 1994. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Smithsonian Institute Press, Washington, D.C., U.S.A.

Hilty, J.A., W.Z. Lidicker, and A. Merenlender, Eds. 2006. Corridor Ecology: The Science and Practice of Linking Landscapes for Biodiversity Conservation. Washington, D.C.: Island Press.

Hilty, J.A. and A.M. Merenlander. 2000. A comparison of covered track-plates and remotely-triggered cameras. Trans. West. Sec. Wildl. Soc. 29: 27-31.

Huijser, M.P., P.T. McGowen, W. Camel, A. Hardy, P. Wright, A.P. Clevenger, L. Salsman, and T. Wilson. 2006. Animal vehicle crash mitigation using advanced technology. Phase I: Review, design and implementation. Salem, OR: Oregon Department of Transportation. Available at: http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/AnimalVehicle.pdf.

Jacobson, S. 2002. Using wildlife behavioral traits to design effective crossing structures. Wildlife Crossings Toolkit, U.S. Department of Agriculture, Forest Service.

Jameson, E.W., Jr. and H.J. Peeters. 2004. Mammals of California, Second Edition. University of California Press. 440 pp.

Krausman, P.R., V.C. Bleich, J.W. Cain III, T.R. Stephenson, D.W. DeYoung, P.W. McGrath, P. K. Swift, B.M. Pierce, and Brian D. Jansen. 2004. Neck lesions in ungulates from collars incorporating satellite technology. Wildl. Soc. Bull. 32: 987-991.

Krawchuk, A., K.W. Larsen, R.D. Weir, and H. Davis. 2005. Passage through a small drainage culvert by mule deer, *Odocoileus hemionus*, and other mammals. Can. Field-Nat. 119: 296-298.

Langton, A.E.S. 2002. Measures to protect amphibians and reptiles from road traffic. Chap. 20 in: Wildlife and Roads: The Ecological Impact. B. Sherwood, D. Cutler, and J.A. Burton, Eds. London: Imperial College Press.

Leedy, D. L. and L. W. Adams. 1982. Wildlife Considerations in Planning and Managing Highway Corridors. FHWA Report. FHWA-TS-82-212. 93 pp.

Little, S.J., R.G. Harcourt, and A.P. Clevenger. 2002. Do wildlife passages act as prey traps? Biol. Cons. 107: 135-145.

Lodé, T. 2000. Effect of a motorway on mortality and isolation of wildlife populations. Ambio 29: 163-166.

Loos, G. and P. Kerlinger. 1993. Road mortality of saw-whet and screech-owls on the Cape May Peninsula. J. Raptor Research 27: 210-213.

Mace, R.D., S.C. Minta, T.L. Manley, and K.E. Aune. 1994. Estimating grizzly bear population size using camera sightings. Wildl. Soc. Bull. 22: 74-83.

Maine Dept. of Transportation. 2001. Collisions between large wildlife species and motor vehicles in Maine, Interim Report. Maine DOT, April 2001. available at: http://www.maine.gov/mdot/safety-programs/pdf/ (site accessed 03/29/2007)

Malo, J.E., F. Suárez, and A. Díez. 2004. Can we mitigate animal-vehicle accidents using predictive models? J. Appl. Ecol. 41: 701-710.

Marsh, D.M., G.S. Milam, N.P. Gorham, and N.G. Beckman. 2005. Forest Roads as Partial Barriers to Terrestrial Salamander Movement. Cons. Biol. 19: 2004-2008.

Mayer, K.E. and W.F. Laudenslayer, Jr., Eds. 1988. A Guide to Wildlife Habitats of California. State of California, Resources Agency, Department of Fish & Game.

Miles, S.R. and C.B. Goudey. 1997. Ecological Subregions of California: Section and Subsection Descriptions. USDA Forest Service R5-EM-TP-005.

Mladenoff, D., J. Sickley, and A.P. Wydeven. 1999. Predicting gray wolf landscape recolonization: logistic regression models vs. new field data. Ecol. Appl. 9: 37-44.

Montana Department of Transportation 2006. US 93 Preconstruction wildlife monitoring field methods handbook. FHWA/MT-06-008/1744-2.

Mumme, R.L., S.J. Schoech, G.E. Woolfenden, and J.W. Fitzpatrick. 2000. Life and death in the fast lane: Demographic consequences of road mortality in the Florida scrub-jay. Cons. Biol. 14: 501-512.

Ng, S.J., J.W. Dole, R.M. Sauvajot, S.P.D. Riley, and T.J. Valone. 2004. Use of highway undercrossings by wildlife in southern California. Biol. Cons. 115: 499 – 507.

Peery, M. Z., 2004. Power to Detect Trends in Pallid and Shovelnose Sturgeon Populations in the Missouri River. Sustainable Ecosystems Institute.

Penrod, K., R. Hunter, and M. Merrifield. 2001. Missing Linkages: Restoring Connectivity to the California Landscape, Conference Proceedings. Co-sponsored by California Wilderness Coalition, The Nature Conservancy, U.S. Geological Survey, Center for Reproduction of Endangered Species, and California State Parks.

Perrin, J. and R. Disegni. 2003. Safety Benefits of UDOT Highway Program, Animal-Vehicle Accident Analysis. Salt Lake City, Utah DOT. Available at: http://www.dot.state.ut.us/dl.php/200312091625312/save/UT-03.31.pdf.

Pollock, K.H., J.D. Nichols, T.R. Simons, G.L. Farnsworth, L.L. Bailey, and J.R. Sauer. 2002. Large scale wildlife monitoring studies: statistical methods for design and analysis. Environmetrics 13: 105-119.

Puky, M. 2003. Amphibian mitigation measures in Central-Europe. Proceedings of the International Conference on Ecology and Transportation, Lake Placid, NY, August 24-29, 2003.

Pulliam, H.R. 1988. Sources, sinks, and population regulation. American Naturalist 132: 652-661.

Putman, R.J. 1997. Deer and road traffic accidents: Options for management. J. Wildl. Manage. 51: 43-57.

Pyke, C.R. 2005. Assessing suitability for conservation action: prioritizing interpond linkages for the California tiger salamander. Cons. Biol. 19: 492-503.

Ralph, C. J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. Handbook of Field Methods for Monitoring Land Birds. Pacific Southwest Research Station Report. PSW-GTR-144. 41 pp.

Reading, C.J. 1989. Opportunistic predation of common toads Bufo bufo at a drift fence in southern England. In: Langton, T.E.S. (Ed.), Amphibians and Roads. Proceedings of the Toad Tunnel Conference. Rendsburg, Federal Republic of Germany, 7-8 January 1989. ACO Polymer Products, Bedfordshire, England, pp. 105-112.

Reed, D.F. and T.N. Woodard. 1981. Effectiveness of Highway Lighting in Reducing Deer-Vehicle Accidents. J. Wildlife Manage. 45: 721-726

Riley, S.P.D., J.P. Pollinger, R.M. Sauvajot, E.C. York, C. Bromley, T.K. Fuller, and R.K. Wayne. 2006. A southern California freeway is a physical and social barrier to gene flow in carnivores. Mol. Ecol. 15: 1733-1741.

Roe, J.H., J. Gibson, and B.A. Kingsbury. 2006. Beyond the wetland border: estimating the impact of roads for two species of water snakes. Biol. Cons. 130: 161-168.

Rubin, E., W.M. Boyce, M.C. Jorgensen, S.G. Torres, C.L. Hayes, C.S. O'Brien, and D.A. Jessup. 1998. Distribution and abundance of bighorn sheep in the Peninsular Ranges, California. Wildl. Soc. Bull. 26: 539-551.

Sanderson, G.C. 1966. The Study of Mammal Movements: A Review. J. Wildl. Manage. 30: 215 – 235.

Sawyer, J.O. and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society. (on-line at: http://davisherb.ucdavis.edu/cnpsActiveServer/index.html)

Shilling, F.M., E.H. Girvetz, C. Erichsen, B. Johnson, and P.C. Nichols. 2002. A guide to wildlands conservation planning in the Greater Sierra Nevada Bioregion. California Wilderness Coalition, 187 p. Available at: http://cain.nbii.org/repository/Sierra.pdf

Shilling, F.M. and E. Girvetz. 2007. Barriers to implementing a wildland network. Landscape and Urban Planning 80: 165-172.

Sikich, J. and S. Riley. 2007. Effects of State Route 23 Widening Project on Culvert Use and Road Mortality of Wildlife. Santa Monica Mountains N.R.A., National Park Service Final Pre-construction Monitoring Report.

Singer, F.J. and J.L. Doherty. 1985. Managing mountain goats at a highway crossing. Wildl. Soc. Bull. 13: 469-477.

Small, A. 1994. California Birds: Their Status and Distribution. Ibis Publishing. 342 pp.

Smallwood, S. and E.L. Fitzhugh. 1995. A track count for estimating mountain lion *Felis concolor californica* population trend. Biol. Cons. 71: 251-259.

Smith, D.J. 1999. Identification and prioritization of ecological interface zones on state highways in Florida. Proceedings of the Third International Conference on Wildlife Ecology and Transportation, FL-ER-73-99, Florida Department of Transportation, Tallahassee, 1999, pp. 209-230. Available at: http://www.dot.state.fl.us/EMO/sched/montana2.pdf.

Smith, J.N.M. and J.J. Hellmann. 2002. Population persistence in fragmented landscapes. Trends in Ecology and Evolution 17: 397-399.

Stebbins, R.C. 2003. A Field Guide to Western Reptiles and Amphibians. Third Edition. Houghton Mifflin. 560 pp.

Sullivan, T.L., A.E. Williams, T.A. Messmer, L.A. Hellinga, and S.Y. Kyrychenko. 2004. Effectiveness of temporary warning signs in reducing deer-vehicle collisions during mule deer migrations. Wildl. Soc. Bull. 32: 907-915.

Sutherland, W.J. 2006. Ecological Census Techniques: A Handbook. 2nd Ed. Cambridge: Cambridge Univ. Press.

Taylor, B.D. and R.L. Goldingay. 2003. Cutting the carnage: wildlife usage of road culverts in north-eastern New South Wales. Wildlife Research 30: 529-537.

Theobald, D.M., J.R. Miller, and N.T. Hobbs. 1997. Estimating the cumulative effects of development on wildlife habitat. Landscape and Urban Planning 39: 25-36.

Thorne, J., R. Cameron, and V. Jigour. 2002. Guide to Wildlands Conservation for the Central Coast of California. California Wilderness Coalition. Available as pdf at: http://cain.nbii.org/repository/CC.pdf

Toft, C.A. and P.J. Shea. 1983. Detecting communitywide patterns: estimating power strengthens statistical inference. American Naturalist 122:618-625.

Transportation Research Board. 2002. Interaction Between Roadways and Wildlife Ecology. A synthesis of highway practice. National Cooperative Highway Research Program, Transportation Research Board, The National Academies. Washington, D.C. Available as pdf at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_305.pdf

Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Cons. Biol. 14: 18-30.

Twitty, V.C. 1941. Data on the life history of *Ambystoma tigrinum californiense* Gray. Copeia 1941: 1-4.

Van Der Grift, E. and R. Pouwels. 2006. Restoring habitat connectivity across transport corridors: identifying high-priority locations for de-fragmentation with the use of an expert-based model. Chap. 10 in: J. Davenport and J.L. Davenport, Eds. The Ecology of Transportation: Managing Mobility for the Environment. AA Dordrecht, The Netherlands: Springer.

Van der Zande, A.N., W.J. ter Keurs, and W.J. van der Weijden. 1980. The impact of roads on the densities of four bird species in an open field habitat – evidence of a long distance effect. Biol. Cons. 18: 299-321.

Waller, J.S. and C. Servheen. 2005. Effects of transportation infrastructure on grizzly bears in northwestern Montana. J. Wildl. Manage. 69: 985-1000.

Warner, R.E., and K.M. Hendrix, editors. 1984. *California Riparian Systems: Ecology, Conservation, and Productive Management.* Berkeley: University of California Press.

Welsh, H.H. and L.M. Ollivier. 1998. Stream amphibians as indicators of ecosystem stress: a case study from Californa's redwoods. Ecol. Appl. 8: 1118-1132.

White, P.A. and M. Ernst. 2003. Second Nature: improving transportation without putting nature second. Defenders of Wildlife Surface Transportation Policy Project. Available from U.C. Davis Road Ecology Center (http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1201&context=jmie/roadeco)

Wilson, D.E., F.R. Cole, J.D. Nichols, R. Rudran, and M.S. Foster. 1996. Measuring and Monitoring Biodiversity: Standard Methods for Mammals. Washington and London: Smithsonian Institution Press.

Woods, J.G. 1990. Effectiveness of fences and underpasses on the Trans-Canada Highway and their impact on ungulates populations project (Final Report). Parks Canada. Banff National Park Warden Service, Banff, Alberta, Canada.

Woods, J.G., D. Paetkau, D. Lewis, B.N. McLellan, M. Proctor, and C. Strobeck. 1999. Genetic tagging of free-ranging black and brown bears. Wildl. Soc. Bull. 27: 616 – 627.

Yanes, M., J.M. Velasco, and F. Suárez. 1995. Permeability of roads and railways to vertebrates: the importance of culverts. Biol. Cons. 71: 217-222.

York, E.C., T.L. Moruzzi, T.K. Fuller, J. Organ, R.M. Sauvajot, and R.M. DeGraff. 2001. Description and evaluation of an inexpensive remote camera and triggering system for monitoring carnivores. Wildl. Soc. Bull. 29: 1228-1237.

Zielinski, W. J., and H. B. Stauffer. 1996. Monitoring Martes populations in California: survey designs and power analysis. Ecological Applications 6:1254-1267.

6.1 On-line Resources Cited

Wildlife and Roads: A collaborative resource among the U.S.G.S., Utah State University, and the Transportation Research Board of the National Academies of Sciences for helping to mitigate roads for wildlife: http://www.wildlifeandroads.org/index.cfm

Surface Transportation Policy Project: http://www.transact.org/default_ct_2_17_06.asp

UCSB Ventura County Report: http://www.bren.ucsb.edu/research/documents/corridors_final.pdf

Maureen Hartmann's Evaluation of Wildlife Crossing Structures: Their Use and Effectiveness, on the Wildlands web site; accessed 8/07; http://www.wildlandscpr.org/evaluation-wildlife-crossing-structures-their-use-and-effectiveness

Federal Highway Administration (FHWA) Critter Crossings Web site: http://www.fhwa.dot.gov/environment/wildlifecrossings/

Federal Highway Administration. 2002. Wildlife Habitat Connectivity Across European Highways. Office of International Programs, Federal Highway Administration, available at: http://international.fhwa.dot.gov/wildlife_web.htm

Center for Transportation and the Environment (CTE) at North Carolina State University, at: http://www.itre.ncsu.edu/CTE/index.asp

Western Transportation Institute at Montana State University: http://www.coe.montana.edu/wti/

7 Appendices

7.1 Definitions

Definitions derived from Designing Road Crossings for Safe Wildlife Passage: Ventura County Guidelines; available at: http://www.bren.ucsb.edu/research/documents/corridors_final.pdf.

Connectivity: The degree to which the landscape facilitates or impedes movement among habitat patches (Taylor and Goldingay, 2003). The concept of connectivity is used to describe how the spatial arrangement and quality of elements in the landscape affect the movement of organisms among habitat patches (Merriam, 1984; Taylor and Goldingay, 2003; Forman and Alexander, 1998).

Crossing Structure: A structure such as a pipe, culvert, bridge underpass or overpass that may be used by wildlife for passage over or under a roadway. Most traditional crossing structures are primarily intended to facilitate the flow of water. Studies have shown the crossing structures can also facilitate wildlife passage, reduce wildlife mortality from vehicle collisions, improve highway safety, and improve habitat connectivity.

Crossing Substrate: The surface material composing the bottom of the crossing structure.

Functional Group: A group of species that tend to prefer similar crossing structure design characteristics (see Section 3.4.1, above). Note that this term is not a scientific classification system.

Landscape linkage: a large regional arrangement of habitat, not necessarily linear or continuous, that enhances the movement of animals or the continuity of ecological processes at the landscape level (Bennett, 2003). A landscape linkage may include numerous wildlife movement corridors.

Rescue Effect: the emigration or movements of individuals from an area with a relatively large number of individuals (large local population) into an area with a relatively low number of individuals to rescue this population from local extinction. Related to source and sink habitats, below.

Riparian: plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial and intermittent lotic and lentic water bodies such as rivers, streams, lakes, or drainage ways. Riparian areas have one or both of the following characteristics: 1) distinctively different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between wetland and upland habitats (U.S. Fish & Wildlife Service/National Wetlands Inventory, 1997).

Sink Habitat: an area of habitat that is unable to support a viable long-term population by itself. A sink habitat offers suitable short-term cover, food, and water to animals, but production of young in a local population is less than the mortality rate.

Source Habitat: an area of habitat that is able to support a viable long-term population by itself. A source habitat offers suitable long-term cover, food, and water to animals, and productivity rate in the local population is greater than the mortality rate, resulting in net surpluses of individuals (population growth or source of additional individuals for dispersal to other regions).

Wetland: lands that are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water; they generally contain plant communities that are adapted to periodic inundation. The frequency of occurrence of water is sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, vernal pools, wet meadows, river and stream overflows, mudflats, ponds, springs, and seeps.

Wildlife Crossing: 1) a region of concentrated animal movement where it intercepts a road. 2) a structure that facilitates the movement of animals from one side of a road to the other.

Wildlife Movement Corridor: A swath of wildlife habitat, generally vegetated, which joins two or more larger areas of wildlife habitat.

7.2 U.S. Fish & Wildlife Service Recommended Specifications for Desert Tortoise Exclusion Fencing

The following desert tortoise exclusion fencing specifications were derived from the U.S. Fish & Wildlife Service, Southwest Region 2, Arizona Ecological Services Field Office website at: http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/DesertTortoise/Tortoise%20Fencing.pdf) accessed 01/2008.

RECOMMENDED SPECIFICATIONS FOR
DESERT TORTOISE EXCLUSION FENCING
September 2005

These specifications were developed to standardize fence materials and construction procedures to confine tortoises or exclude them from harmful situations, primarily roads and highways. Prior to commencing any field work, all field workers should comply with all stipulations and measures developed by the jurisdictional land manager and the U.S. Fish and Wildlife Service for conducting such activities in desert tortoise habitat, which will include, at a minimum, completing a desert tortoise education program.

FENCE CONSTRUCTION

Materials

Fences should be constructed with durable materials (*i.e.,* 16 gauge or heavier) suitable to resist desert environments, alkaline and acidic soils, wind, and erosion. Fence material should consist of 1-inch horizontal by 2-inch vertical, galvanized welded wire, 36 inches in width. Other materials include: Hog rings, steel T-posts, and smooth or barbed livestock wire. Hog rings should be used to attach the fence material to existing strand fence. Steel T-posts (5 to 6-foot) are used for new fence construction. If fence is constructed within the range of bighorn sheep, 6-foot T-posts should be used (see New Fence Construction below). Standard smooth livestock wire fencing should be used for new fence construction, on which tortoise-proof fencing would be attached.

Retrofitting Existing Livestock Fence

Option 1 (see illustration below). Fence material should be buried a minimum of 12 inches below the ground surface, leaving 22-24 inches above ground. A trench should be dug or a cut made with a blade on heavy equipment to allow 12 inches of fence to be buried below the natural level of the ground. The top end of the tortoise fence should be secured to the livestock wire with hog rings at 12 to 18-inch intervals. Distances between T-posts should not exceed 10 feet, unless the tortoise fence is being attached to an existing right-of-way fence that has larger interspaces between posts. The fence must be perpendicular to the ground surface, or slightly angled away from the road, towards the side encountered by tortoises. After the fence has been installed and secured to the top wire and T-posts, excavated soil will be replaced and compacted to minimize soil erosion.

Option 2 (see illustration below). In situations where burying the fence is not practical because of rocky or undigable substrate, the fence material should be bent at a 90E angle to produce a lower section approximately 14 inches wide which will be placed parallel to, and in direct contact with, the ground surface; the remaining 22-inch wide upper section should be placed vertically against the existing fence, perpendicular to the ground and attached to the existing fence with hog rings at 12 to18-inch intervals. The lower section in contact with the ground should be placed within the enclosure in the direction of potential tortoise encounters and level with the ground surface. Soil and cobble (approximately 2 to 4 inches in diameter; can use larger rocks where soil is shallow) should be placed on top of the lower section of fence material on the ground covering it with up to 4 inches of material, leaving a minimum of 18 inches of open space between the cobble surface and the top of the tortoise-proof fence. Care should be taken to ensure that the fence material parallel to the ground surface is adequately covered and is flush with the ground surface.

New Fence Construction

Options 1 or 2 should be followed except in areas that require special construction and engineering such as wash-out sections (see below). T-posts should be driven approximately 24 inches below the ground surface spaced approximately 10 feet apart. Livestock wire should be stretched between the T-posts, 18 to 24 inches above the ground to match the top edge of the fence material; desert tortoise-proof fencing should be attached to this wire with hog rings placed at 12 to 18-inch intervals. Smooth (barb-less) livestock wire should be used except where grazing occurs.

If fence is constructed within the range of bighorn sheep, two smooth-strand wires are required at the top of the T-post, approximately 4 inches apart, to make the wire(s) more visible to sheep. A 20 to 24-inch gap must exist between the top of the fence material and the lowest smooth-strand wire at the top of the T-post. The lower of the top two smooth-strand wires must be at least 43 inches above the ground surface. (72-inch T-posts: 24 inches below ground + 18 inches of tortoise fence above ground + 20 to 24-inch gap to lower top wire + 4 inches to upper top wire = 66 to 70 inches).

INSPECTION OF DESERT TORTOISE BARRIERS

The risk level for a desert tortoise encountering a breach in the fence is greatest in the spring and fall, particularly around the time of precipitation including the period during which precipitation occurs and at least several days afterward. All desert tortoise fences and cattleguards should be inspected on a regular basis sufficient to maintain an effective barrier to tortoise movement. Inspections should be documented in writing and include any observations of entrapped animals; repairs needed including bent T-posts, leaning or non-perpendicular fencing, cuts, breaks, and gaps; cattleguards without escape paths for tortoises or needed maintenance; tortoises and tortoise burrows including carcasses; and recommendations for supplies and equipment needed to complete repairs and maintenance.

All fence and cattleguard inventories should be inspected at least twice per year. However, during the first 2 to 3 years all inspections will be conducted quarterly at a minimum, to identify and document breaches, and problem areas such as wash-outs, vandalism, and cattleguards that fill-in with soil or gravel. GPS coordinates and mileages from existing highway markers should be recorded in order to pinpoint problem locations and build a database of problem locations that may require more frequent checking. Following 2 to 3 years of initial inspection, subsequent inspections should focus on known problem areas which will be inspected more frequently than twice per year. In addition to semi-annual inspections, problem areas prone to wash-outs should be inspected following precipitation that produces potentially fence-damaging water flow. A database of problem areas will be established whereby checking fences in such areas can be done efficiently.

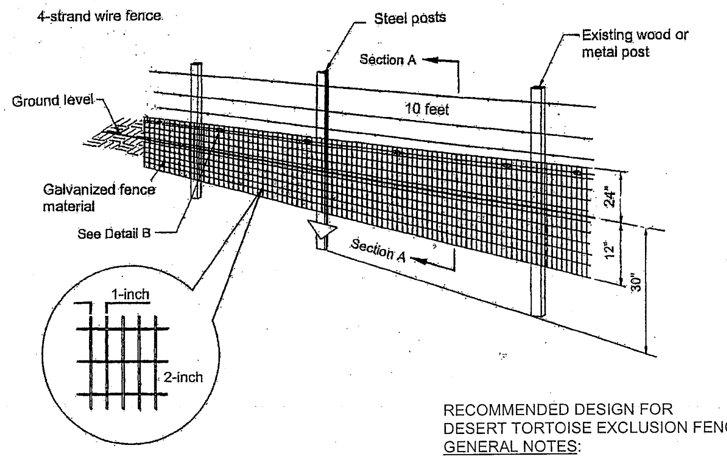
REPAIR AND MAINTENANCE OF DESERT TORTOISE BARRIERS

Repairs of fence wash-outs: (1) realign the fence out of the wash if possible to avoid the problem area, or (2) re-construct tortoise-proof fencing using techniques that will ensure that an effective desert tortoise barrier is established that will not require frequent repairs and maintenance.

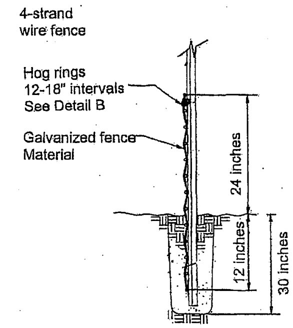
Gaps and breaks will require either: (a) repairs to the existing fence in place, with similar diameter and composition of original material, (b) replacement of the damaged section to the nearest T-post, with new fence material that original fence standards, (c) burying fence, and/or (d) restoring zero ground clearance by filling in gaps or holes under the fence and replacing cobble over fence constructed under Option 2. Tortoise-proof fencing should be constructed and maintained at cattleguards to ensure that a desert tortoise barrier exists at all times.

All fence damage should be repaired in a timely manner to ensure that tortoises do not travel through damaged sections. Similarly, cattleguards will be cleaned out of deposited material underneath them in a timely manner. In addition to periodic inspections, debris should be removed that accumulates along the fence. All cattleguards that serve as tortoise barriers should be installed and maintained to ensure that any tortoise that falls underneath has a path of escape without crossing the intended barrier.

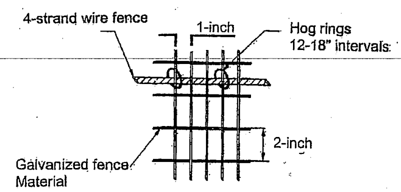
DESERT TORTOISE EXCLUSION FENCE (2005)



DETAIL A



SECTION A



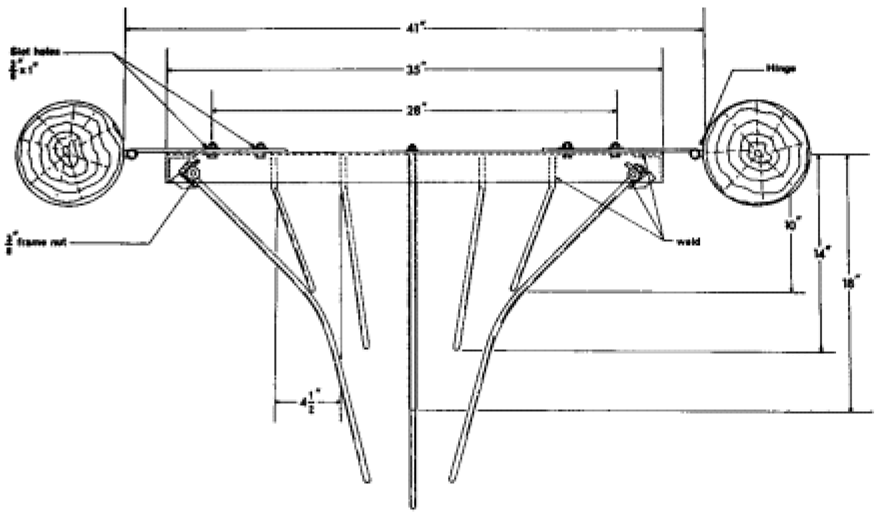
DETAIL B

RECOMMENDED DESIGN FOR
DESERT TORTOISE EXCLUSION FENCE
GENERAL NOTES:

1. Ensure that fence posts and materials conform to the standards approved by the U.S. Fish and Wildlife Service.
2. Ensure that the height above ground level is no less than 18 inches and no higher than 24 inches.
3. Ensure that the depth of fence material below ground level is about 12 inches but no less than 6 inches. (See SECTION A above)
4. Install additional steel posts when span between existing fence posts exceed 10 feet.
5. Attach fence material to existing fence or wire using hog rings at 12-inch intervals.
6. Fasten fence material to posts with 3 tie wires with a wire near the top, bottom, and center of the fence material.
7. Backfill trenches with excavated material and compact the material.
8. Attach fence material to all gates. Ensure that clearance at base of gate achieves zero ground clearance.
9. Substitute smooth wire for barbed wire if additional support wires are necessary.
10. The number and placement of support wires may be modified to allow sheep and deer to pass safely.
11. Erosion at the edge of the fence material where the fence crosses washes may occur and requires appropriate and timely monitoring and repair.
12. Tie the fence into existing culverts and cattleguards when determined necessary to allow desert tortoise passage underneath roadways.

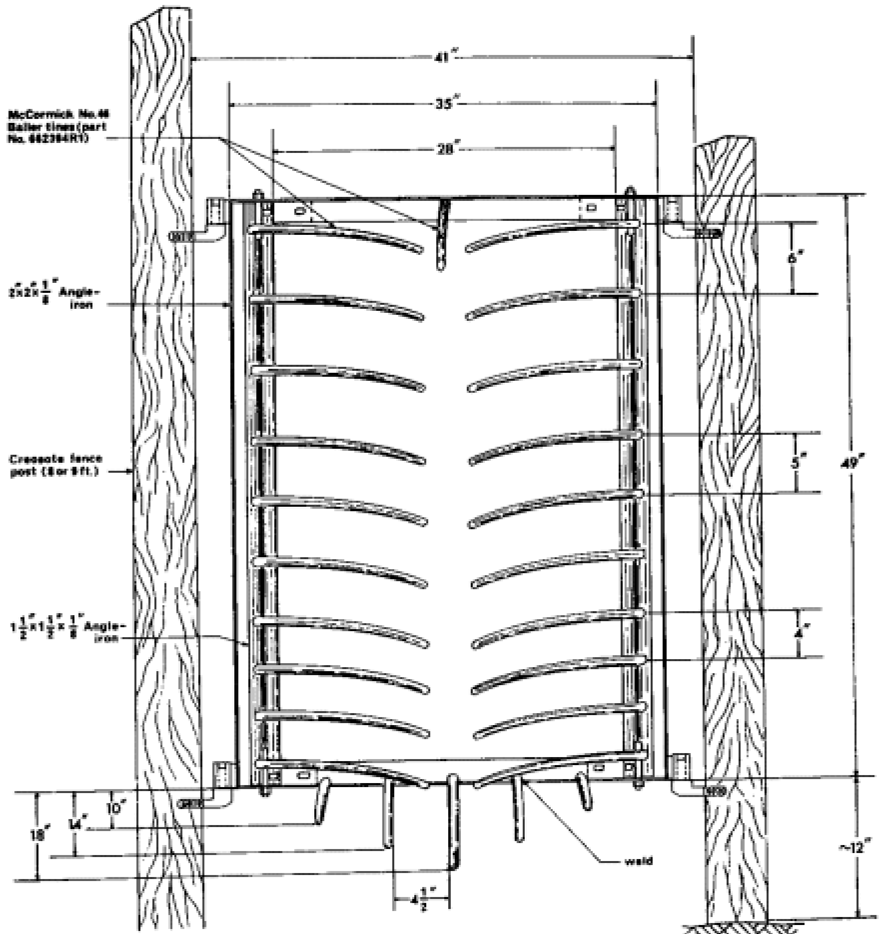
7.3 Deer One-way Gate Design Considerations

The following provides an example of design considerations for a one-way gate that is intended to allow deer and other large-bodied vertebrates to escape from roadway rights-of-way and is adapted from the Transport Canada web site, accessed 01/2008 (http://www.tc.gc.ca/civilaviation/AerodromeAirNav/Standards/WildlifeControl/Deer/6c.htm).

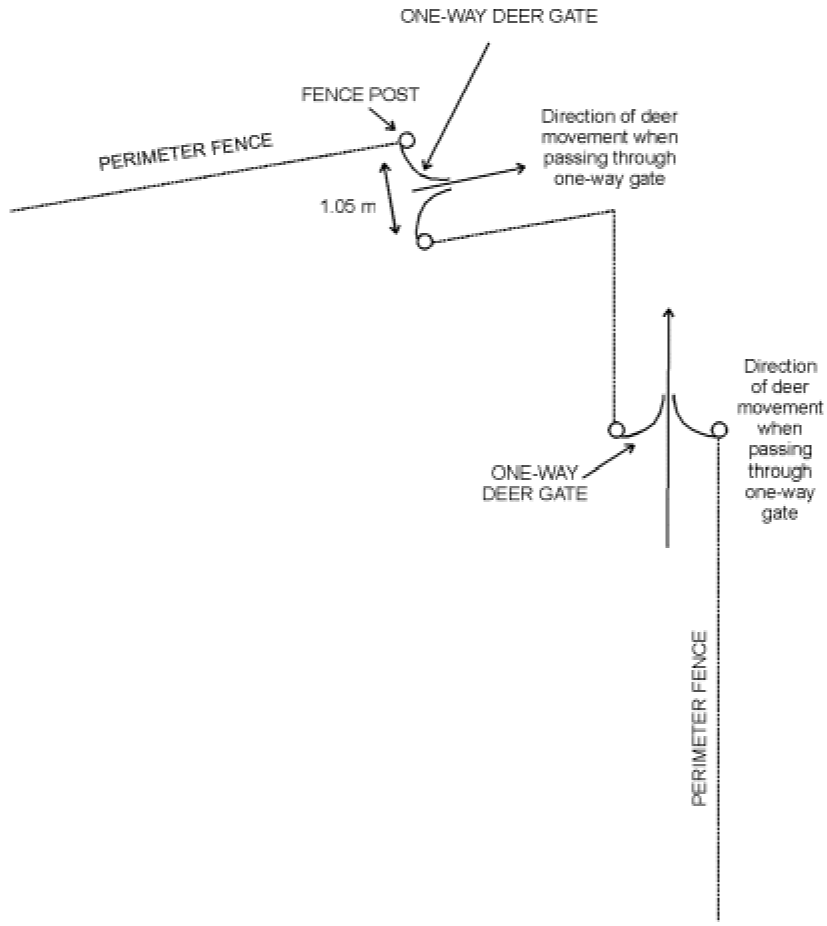


TOP VIEW

SCALE: $\frac{1}{8}$"=1"



FRONT VIEW
SCALE: $\frac{1}{8}''$: 1"


ONE-WAY DEER GATE
FENCE POST
PERIMETER FENCE
Direction of deer movement when passing through one-way gate
1.05 m
Direction of deer movement when passing through one-way gate
ONE-WAY DEER GATE
PERIMETER FENCE

Appendix H

Resource Management Plan Outline

Appendix H
Resource Management Plan Outline

OCTA and the Preserve Managers will prepare a site-specific Resource Management Plan (RMP) for each Preserve consistent with the requirements of this Plan. The RMP will be prepared utilizing the general format presented below as guidance:

RESOURCE MANAGEMENT PLAN – SAMPLE TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

1.1.1 OCTA M2 NCCP/HCP Goals and Objectives Relevant to the Specific Preserve

1.2 Relevant Conservation Plans

1.2.1 Specific Plan if applicable
1.2.2 Other Existing Conservation Programs

1.3 Permitted Activities and Threats to Conservation

1.4 Preserve Specific Management Objectives and Actions

2.0 SITE DESCRIPTION

2.1 Project Setting, Adjacent Property Owners, and Land Uses

2.2 Physical Characteristics

2.3 Biological Resources

2.3.1 Vegetation
2.3.2 Wildlife
2.3.3 Jurisdictional Resources
2.3.4 Special Status Biological Resources

2.4 Cultural Resources

3.0 PRESERVE MANAGEMENT

3.1 Public Access

3.1.1 History of Public Access on the Preserve
3.1.2 Guiding Principles for Defining a Public Access Plan
3.1.3 Public Access Plan
3.1.4 Public Education and Enforcement of Public Access

3.2 Invasive Plant Species Control

3.3 Habitat Restoration

3.4 Vegetation Management

3.5 Fire Management

3.5.1 Fire Management Plan
3.5.2 Strategy and Approach
3.5.3 Post-Fire Response

3.6 Nonnative Animal Species Management

3.6.1 Invasive Nonnative Species Control
3.6.2 Feral and Domestic Animal Restrictions and Control

3.7 Property Management

3.7.1 Lighting and Noise
3.7.2 Fencing
3.7.3 Signage
3.7.4 Hydrology and Erosion Control

3.8 Land Uses within the Preserve

3.8.1 Allowed Uses
3.8.2 Prohibited Uses

3.9 Land Use Adjacent to the Preserve

3.9.1 Existing Land Use
3.9.2 Future Land Use

3.10 Management of Cultural Resources

3.11 Public Outreach and Education

4.0 BIOLOGICAL MONITORING AND MANAGEMENT

4.1 Biological Monitoring and Management

3.6.1 Covered Plant Species
3.6.2 Covered Animal Species
3.6.3 Natural Communities

4.2 Adaptive Management

4.3 Annual Progress Reports

5.0 FINANCIAL SECTION

5.1 Financial Requirements

6.0 REFERENCES

Appendix A	Checklist and Annual Schedule for Ongoing Preserve Management and Biological Monitoring Actions
Appendix B	Baseline Biological Surveys Technical Reports. Measure M2 Freeway Environmental Mitigation Program Acquisition Properties Evaluation in Orange County, California
Appendix C	Nesting Bird Policy

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Appendix I
Science Advisors Report

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INDEPENDENT SCIENCE ADVISORS REPORT

ORANGE COUNTY TRANSPORTATION AUTHORITY

M2 NCCP/HCP

Prepared by:
Dr. Matt Rahn (Lead Science Advisor)
Dr. Peter Bowler (Advisor)
Dr. Kristine Preston (Advisor)
Trish Smith (Advisor)
Bruce DiGennaro (Facilitator)

Prepared for:
Orange County Transportation Authority

July 2011

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 INTRODUCTION 2

3.0 GOALS AND OBJECTIVES 4

3.1 Conservation Program Goals 4

3.2 Biological Goals and Objectives 5

4.0 COVERED SPECIES AND SPECIES OCCURRENCE DATA 7

4.1 Specific Comments on Natural Community and Species Accounts 7

5.0 MODELING 10

5.1 Species Inventory and Data 10

5.2 Modeling Approach 11

5.3 Recommendations 12

6.0 CONSERVATION STRATEGIES AND RESERVE DESIGN 14

6.1 Restoration 15

6.2 Other 15

7.0 MANAGEMENT, MONITORING, AND OVERSIGHT 17

7.1 Oversight of the NCCP/HCP 17

7.2 Long-Term Management and Monitoring Endowment 17

7.3 Biological Monitoring 18

7.4 Resource Management 19

8.0 LITERATURE 20

1.0 Executive Summary

The following report is the result of an independent scientific review of the Orange County Transportation Authority's (OCTA) draft M2 Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) (2011). Overall, the plan provided a scientifically valid and defensible approach to conservation planning and management. OCTA is to be commended for developing a plan that integrates into other regional conservation efforts. They go well beyond the basic requirements of conservation planning by not only addressing the mitigation required for roadway improvement impacts, but also providing additional regional benefits through a creative strategy of habitat conservation critical to the regional long-term success species and habitat conservation in the region. It is refreshing to see a permittee go beyond the minimal requirements and assume a proactive role in regional conservation planning and management, particularly when the predicted project-related impacts to species and habitats are relatively low.

The following observations are intended to provide additional guidance and support for the conservation plan and with modest revision may help to enhance the existing conservation plan. There are five main areas that we address, with both general and specific guidance provided:

1. Goals and Objectives
    a. Clearly state the underlying goal of the plan
    b. Identify measurable and tangible targets
    c. Provide clear links between quantitative conservation objectives and the goal of increasing, expanding, or enhancing habitat
    d. Develop opportunities for stakeholder involvement
2. Covered Species and Occurrence Data
    a. Supplement current species distribution data with additional other available data and information
    b. Species specific comments are provided
3. Modeling
    a. Include expert opinion to support/supplement the modeling approach
4. Conservation Strategies and Reserve Design
    a. Make sure to address potential small or fragmented habitats that may be important in the overall regional conservation program
    b. Determine whether longer performance standards for restoration
5. Management, Monitoring, and Oversight
    a. Develop a scientific advisory committee to participate in the process
    b. The monitoring program should prioritize species, and include thresholds for management action
    c. Develop Resource Management Plans for each property conserved, linking the plan back to the goals and objectives of the HCP/NCCP

2.0 Introduction

The science advisory group for the Orange County Transportation Authority (OCTA) was established to provide an independent scientific review of the draft M2 Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP). The panel consists of four members. Dr. Matt Rahn was the lead science advisor, with Dr. Peter Bowler, Dr. Kristine Preston, and Trish Smith. Bruce DiGennaro facilitated the review and meetings. The advisors represent subject matter experts in conservation planning, endangered species, habitat restoration, and environmental policy and regulation. The advisors also have significant experience within the proposed project planning area on reserve design, ecosystem management, and conservation programs for various rare, sensitive, and endangered species.

The science advisors provided independent scientific review and input into the following elements of the M2 NCCP/HCP development process:

1. Process for selection of the proposed covered species
2. Species profiles describing the ecology, distribution in the plan area, status, and potential threats to each proposed covered species
3. Natural community profiles describing the composition, distribution in the plan area, status, and potential threats to natural community
4. Predicted species distribution model and associated documented locations for each proposed covered species
5. Conservation goals for covered species and natural communities
6. Conservation strategy to achieve conservation goals

The advisors were provided with the biological inventory report and associated appendices for review in mid March, 2011. This report included background information on the methods, process, and initial results of items 1 – 6, above. The group met in San Diego on April 1. They were provided presentations by organizations previously involved in the planning process (including the Conservation Biology (CBI) Institute and Technology Associates International Corporation [TAIC]). The science advisors discussed the draft document, and had an opportunity to ask questions of the regulatory/resource agencies and OCTA staff. The ISA facilitator and lead scientist facilitated a discussion, questions, comments, and initial recommendations during the later part of the workshop.

The following draft report is provided on behalf of the science advisors, summarizing their comments and input as formal recommendations to OCTA. The OCTA is to be praised for its use of M2 funding to purchase ecologically significant additions to and linkages between existing reserves, and to create meaningful restoration projects that enhance the ecological condition of preserved sites. This is an enlightened amelioration strategy, and goes far beyond that which could be accomplished by merely mitigating roadway improvement impacts within existing easements. While this project was initiated because of the potential freeway project impacts, the conservation program is much more broadly integrated into regional conservation efforts, attempting to supplement existing efforts by filling in the gaps and linkages of existing HCPs/NCCPs and regional preserves. The CBI Conservation Assessment forms a strong basis for these positive actions, and with modest modifications it can be enhanced to meet the highest standards of conservation.

3.0 Goals and Objectives

3.1 Conservation Program Goals

The first step in monitoring plan development is the creation of goals and objectives (Mulder et al. 1999, USFWS & NMFS 1996, Gibbs et al. 1999, Noon 2003). This is often the most underappreciated portion of many conservation programs. In our evaluation, the HCP/NCCP did an admirable job of addressing this important component of the plan.

While the goals and objectives establish the foundation of a monitoring program, the future monitoring program should include specific criteria and be clear and robust enough to provide assurances that the plans will be successful. The underlying goal of all HCPs is to protect the covered species from jeopardy, and to minimize and mitigate the impacts of take to the maximum extent practicable. This primary goal should be explicitly stated in the plan.

There is a clear emphasis on scientific rigor and core principles for guiding the plan. However, the specific program goals should be grouped into sub areas. For example, those goals that address "scientific" goals should be in a separate group from the "business" goals, or "regulatory" goals. As described below, the goals lack certain specificity necessary to determine whether they are being met or not. For example, the goals include statements such as "less costly," or "coordinate," or "provide opportunities for…" These terms are rather ambiguous, and lack a quantitative or qualitative basis on which to assess success or failure. This could be resolved by creating objectives under each goal that provides additional specificity and necessary rigor.

The importance of these "business and regulatory goals" cannot be overstated. The OCTA plan has attempted to address these needs; however it falls short with regard to detail and certainty. For example, the Plum Creek HCP described the "business goals" and objectives associated with commercial forestry, emphasizing the inherent consumptive nature of the permitted activities while defining how these stressors can be mitigated or minimized while also acknowledging the constraints and needs of the business. One of their business goals was to "create an environment of regulatory predictability to preserve the ability to confidently make long-term business decisions", and the objectives are to: "retain the ability to manage timber and land resources in a profitable manner of a long-term planning horizon" and to "protect certainty and confidence for long-term business planning and investment." By articulating the conservation and business goals, objectives, and commitments, it is very clear how the conservation program is intended to operate and maintain the covered species, habitats, and permitted activities. This may be a useful exercise for the OCTA conservation plan, and provide additional certainty and transparency.

3.2 Biological Goals and Objectives

In our assessment of the biological goals and objectives for the OCTA plan, we specifically addressed the following areas:

- Are the biological goals and objectives appropriate for the conservation planning context of this NCCP/HCP (i.e., relatively small impacts, and a conservation strategy based on acquisition and restoration to contribute to a significant existing preserve system)?
    - What is the best way to set quantitative goals?
    - How should we relate project impacts to goals?
    - How should we assign conservation credit from restoration in an equitable and even way consistent with (apples to apples) the credits from acquisitions?

The plan uses terms in the biological goals such as "increase, expand, and enhance." These goals lack measureable and tangible targets. Mulder (1999) indicated goals should express a clear statement of the information and value provided by the monitoring program while Bisbal (2001) stressed the need for simple and clearly defined goals not open to interpretation. A simple framework is often more useful than detailed goals and objectives, largely due to the variability and uncertainty involved in large-scale, long-term plans. Therefore, it is important that the goals have a realistic temporal and spatial scale that are readily measured or assessed through monitoring (Bisbal 2001). Ringold et al. (1999) felt hierarchical goal creation ensured priority goals are clearly linked to more specific objectives while Mulder (1999) argued goals should be designed in rigorous, quantitative terms that help suggest potential indicators to measure. Clearly, both approaches have merit. Overall, the goals for this plan are lofty, but lack specific targets or desired conditions. If there is no ability to provide this type of metric, the plan should include a section that describes how those measurable targets (etc.) will be identified in the future.

The section of quantitative biological objectives attempts to address this issue. However, the plan lacks a clear link between the broad goals, and the specific targets generally focused on conservation of acreage and restoration programs. It is important to show a clear link between the quantitative conservation objective, and how that feeds back to addressing the goal of "increasing, expanding, or enhancing."

Objectives are often misunderstood and improperly defined in conservation programs. First, objectives must be clearly defined and directly linked to the goals. In essence, monitoring objectives are supposed to support the goals, providing information for decision-makers (Gibbs et al. 1999). Gibbs et al. (1999) and Bisbal (2001) suggest that objectives should describe the targeted outcome, which in turn helps identify what actually needs to be measured in a monitoring program. Finally, Mulder et al. (1999) and

Noon (2003) stress the need to identify potential barriers to attaining the goals and objectives. Potential remedies to avoid these pitfalls can then be identified in the plan, or at least contingencies put in place should the potential barrier impact the implementation of the conservation plan. For the OCTA plan, it is important to integrate the notion of realistic temporal and spatial scales into the description of the objectives.

The Clark County MSHCP provides another example of unique goals and objectives. This plan provided straightforward, specific goals and objectives linking many, but not all of these, to the monitoring plan. Some of the goals were focused on the scientific nature of the HCP (like the OCTA plan). However, their scientific goals also included specific objectives to develop and adopt biologically sound methodology for detecting status of species and another that focused on the identification of alleged stressors and threats to covered species. The planning process was also addressed in the goals and objectives, where the plan specifically calls for the identification of additional stakeholders and integration into future planning, along with the development of a coordination committee for oversight and planning. This is an extremely important part of all conservation plans. This level of specificity could be beneficial in the OCTA plan.

4.0 Covered Species and Species Occurrence Data

The treatment of the covered species and species occurrence data could be expanded, and there are good templates and significant additional information that would strengthen this aspect of the report. The species distribution and occurrence data could be improved, and the considerations of population size and viability could be incorporated. Many species are omitted, and there appears to be a focus on particular groups – at least in terms of the number of taxa included – such as bats, for example. While the California Natural Diversity Data Base and similar data collection points such as the digital database of the Consortium of California Herbaria (http://ucjeps.berkeley.edu/consortium/) are useful, they do not capture all of the information included in status reports and population censuses for many of these species. For example, there are Fish and Game management plans for the Pacific Pond Turtle that require monitoring populations. Although there are a few records of pond turtles in the Newport Back Bay area, the largest natural population in the County is at the University of California Natural Reserve System's San Joaquin Freshwater Marsh Reserve, with an estimated 236 individuals in a robust age class distribution. Robert Goodman (see Goodman, 2009) has surveyed this population over a number of years, and the data in his reports would be useful to reflect in the treatment of the species. We recommend working with CDFG and the USFWS in seeking reports, status analyses, and the names of individuals – consultants or agency personnel – who provide better current information for use in this document. It would be useful to examine the U.S. Department of the Interior National Natural Landmark database, vegetation maps, and surveys of the Irvine Ranch National Natural Landmark. Links to state and federal recovery plans for listed taxa should be provided. For example, it would be useful to link the U.S. Fish and Wildlife Service Tidewater Goby Recovery Plan (U.S. Fish and Wildlife Service, 2005) with the descriptor of *Eucyclogobius newberryi* in the review document.

Overall, the covered species section needs to be evaluated; some species could be discarded. Specific examples are discussed below. There are many models that could be considered in revising this section, going beyond older ones such as Stephenson and Calcarone (1999), for example.

4.1 Specific Comments on Natural Community and Species Accounts

Note that general comments on species distribution models can be found in Section 3.0.

- Coniferous forest – the discussion of Tecate cypress could be updated with 2009 survey results and the management plan for this species referenced (NROC website). There should be a brief discussion of the threats to this species from frequent fire.

- Page A-9 – Is there a basis for the claim that chaparral is not a primary foraging and reproductive habitat for mountain lions? A study of radio-collared lions in the Santa Ana Mountains by the UC Davis Wildlife Health Center documents frequent use of chaparral in addition to other habitats.

- Page A-16. Regarding the statement that the “annual grasses and forbs vegetation community was found to be under-protected…”, is this referring to non-native grassland? The focus should be on protecting native grasslands and forb lands. Non-native grasslands should be prioritized for conservation only if they provide a specific conservation benefit. This could include conserving non-native grassland with environmental attributes favorable for restoration to native grassland or sites that are important for retaining connectivity, that support other sensitive species, or provide important foraging habitat for raptors.

- Southern tarplant is not widely distributed in Orange County and the model indicates substantially more potential habitat than is realistic (see Modeling Section).

- The Fisher 2000 report (CDFG website) has specific distribution and abundance information for reptiles and amphibians in Orange County’s Central and Coastal NCCP.

- The southwestern pond turtle model appears to over-predict suitable habitat based upon the actual known distribution. Many of the small drainages identified as suitable are not (e.g., no pools). Species experts at United State Geologic Survey (USGS) and researchers studying populations in the San Joaquin Marsh should be consulted to update this account.

- The Southwestern Willow Flycatcher model indicates a substantial amount of suitable riparian habitat in the study area. However, the species is usually found in wider floodplains with standing or slow moving water. Many of the riparian drainages indicated as suitable do not fit this description.

- All scrub below 1,758’ is predicted by the Cactus Wren distribution model to be suitable habitat, even though the species is restricted to cactus scrub. The model does not realistically depict suitable habitat for this species. The account should be revised to reflect the significant decline (>80%) of Cactus Wren in central and coastal Orange County over the last two decades. The population estimates in the account are no longer applicable. Reports can be downloaded from the NROC and CDFG Local Assistance Grant websites describing the current status of this species in Orange County. It is important to note that in addition to population declines in coastal and central Orange County, populations in the north were also recently impacted by wildfire.

- It is not clear why so many bat species have been identified as covered species in the NCCP. It would be helpful to explain the rationale for this in Section 5. There should be some documentation of bats roosting under freeway bridges in southern California. There are few or no location records for all five of the bat species covered by the NCCP. It is unclear how a species can be covered if it is not documented as occurring in the plan area. There should be more information on bat species distribution in the plan area. Trish Smith of the Nature Conservancy should be contacted regarding bat mist netting studies conducted in central Orange County.

- The bat models are overly predictive as they identify roost habitat as any slope >85%. Not all steep slopes are suitable, as it is the rock crevices and cliffs that provide habitat. The foraging habitat models are also not helpful as just about all natural habitats in the plan area are indicated as suitable. The models do not provide information for identifying parcels that are actually of importance to bats.

- It is not clear why so many bat species are included in the plan. If there are concerns regarding infrastructure use by bats and potential project impacts (e.g. bridge roosting species), then it is recommended to provide specific concerns and appropriate mitigation measures for these specific roost types. For example, certain species (e.g. *Tadarida brasiliensis* or *Yuma myotis*) are commonly associated with bridges, however mitigation of the loss of this habitat type through the conservation of general native habitat is not typically a suitable offset. Artificial structures often provide roosting opportunities and encourage colony sizes that may not actually occur on the native/natural landscape. Some bat species take advantage of anthropogenic roosts, which may require specialized avoidance, minimization, and mitigation measures.

- Additional bobcat information can be found in the 2000 mammalian carnivore report on the CDFG website.

- The mountain lion account should indicate that lions have not been detected in the San Joaquin Hills for many years. The habitat model does not take into account fragmentation and isolation of habitat patches making some areas unsuitable for lions. The 2000 mammalian carnivore report on the CDFG website provides some information on mountain lion detections. Dr. Winston Vickers from UC Davis and his collaborators are currently studying mountain lion movement and mortality in the Santa Ana Mountains. He should be contacted for information on their current distribution, movements and threats to conservation. He can also provide recommendations regarding important areas for conserving connectivity for mountain lions in the Santa Ana Mountains.

5.0 Modeling

5.1 Species Inventory and Data

A Conservation Assessment was conducted for the OCTA M2 NCCP/HCP to develop regional conservation priorities, identify components of a regional reserve network, and develop specific conservation objectives and to use this information to identify areas where conservation should be prioritized (CBI 2009). This comprehensive review included evaluation of lands in relation to landscape integrity, vegetation, special status species locations, core habitat patches, connectivity, and land use buffers. OCTA has also developed criteria for evaluating and prioritizing private parcels from willing sellers for acquisition and inclusion in the NCCP/HCP. This parcel evaluation includes both biological and non-biological criteria.

The OCTA M2 NCCP/HCP Biological Inventory and Baseline Data Report (ICF International 2011) was developed to summarize the scientific information gathered for developing the NCCP/HCP. This report summarized the methods used in the species list development process. In short, an initial list of 22 species was included from the NCCP/HCP Planning Agreement (California Department of Fish and Game 2009). The initial list increased to 38 species based on a search using a comprehensive species occurrence database developed for Orange County. This effort ensured that all special-status species within the Plan Area were evaluated for coverage under the plan. Based on location data and an evaluation of five criteria, 21 plant and animal species were selected for coverage under the NCCP/HCP. The next phase in the OCTA Conservation Strategy is integrate the regional conservation priorities and specific conservation objectives with baseline data to compare and evaluate parcels in order to identify and prioritize those parcels that meet the conservation goals and objectives and that are high priority for acquisition and conservation.

The inventory and baseline data are based upon existing datasets, which are largely biased toward publicly owned and already conserved lands. In reviewing the species distribution maps it becomes apparent that known species locations were missing for some species, indicating that not all species information is incorporated into the inventory. The report acknowledges this (Table 4-2) and identifies additional information and questions that were not included in development of the inventory, and which could be relevant to natural community and species profiles. Compiling a more complete database of known species occurrences would improve the reserve selection process.

However, even if all known species locations were compiled, there will still be a gap in knowledge of species distributions, particularly for privately-owned lands. Surveys are not planned or feasible to fill in these information gaps. Other approaches are needed to supplement species occurrence data and prioritize lands for conservation that meet species goals and objectives. To augment species occurrence data the authors developed species distribution models to identify potentially suitable habitat for the 21 species covered by the NCCP/HCP.

5.2 Modeling Approach

The modeling approach employed in the NCCP/HCP represents a type of species distribution modeling used when there is little species occurrence data. It incorporates computer based Geographical Information Systems software and environmental data layers (Marcot 1986, Clevenger et al. 2002, Petit et al. 2003, Johnson and Gillingham 2004). In this approach, environmental variables considered important to the species are identified and decision rules are formulated to determine whether habitat is suitable for the species in regards to a particular variable. Several variables can be included in a Boolean decision making framework.

Optimization modeling is a well-established and powerful tool for comparing reserve design alternatives in conservation planning (Margules and Pressey 2000, Possingham et al. 2000, 2006). This approach attempts to maximize conservation values in the most efficient manner. MARXAN is an accepted method for systematic reserve selection, however it is sensitive to the uncertainty associated with species occurrence data and habitat suitability model predictions (Rondinini et al. 2005, Grand et al. 2007, Langford et al. 2009, Smith et al. 2009, Underwood et al. 2009). For these reasons, it is important that the uncertainty of the habitat models be reduced and the species distribution data made more comprehensive if they are to form the basis of the model input.

We understand that the preparers of the NCCP are well aware that there are limitations to this type of modeling. It is sometimes criticized for being overly simplistic. It is often difficult to explain complex ecological relationships in computer models, while often expert opinion can also introduce uncertainty and bias (Clevenger et al. 2002, Petite et al. 2003, Johnson and Gillingham 2004). Finding a suitable middle-ground is often a challenge. One approach is to use species occurrence data to make spatially explicit predictions of habitat suitability based on empirically derived habitat relationships. These models typically consist of multivariate environmental relationships derived from a statistical model or machine learning algorithm (Guisan and Zimmerman 2000, Elith et al. 2006, Rotenberry et al. 2006, Phillips and Dudik 2008). In using species distribution models for conservation planning, it is critical that each model is tested to determine how well it predicts species habitat and to evaluate uncertainty associated with predictions. Models that perform well in predicting suitable habitat can provide a powerful tool for conservation planning.

Although the models used in this conservation plan are new, this approach tends to err on the side of caution, which may over-predict potential habitat for species such as southern tarplant, southwestern pond turtle, Southwestern Willow Flycatcher, San Diego Cactus Wren, the various bat species, and mountain lion. This over-prediction may result in commission (false-positive) errors in which land is considered suitable and potentially occupied when it is not. This is a risk inherent to all habitat modeling techniques, particularly since habitat can be unoccupied for reasons other than suitability.

An example of this over-simplification and over-prediction is the southwestern pond turtle distribution model. Most drainages across the study area are predicted as suitable habitat when the species has more defined habitat requirements and is very limited in distribution. Furthermore, the predictions of models based on environmental attributes that do not define a species distribution can also lead to erroneous predictions. The southern tarplant is restricted to seasonally moist saline soils within salt marshes, alkaline meadows, vernal pools and occasionally grasslands. The OCTA M2 NCCP/HCP model includes grassland as a variable defining suitable habitat and predicts the species as potentially widespread, since grassland is widespread. However, the species only occurs in a limited number of locations within the County. Similarly the Cactus Wren model predicts the species as likely to occur in scrub habitats below 1,750' throughout the plan area. However, this species is confined to a subset of coastal sage scrub that supports cactus, which is not reflected by the model.

Comparing Tables 7-2 and 7-3 indicates there is a discrepancy between actual conservation of known occurrences and predicted habitat for the existing network of protected areas. Potentially suitable habitat is 77.6% ± 5.8 (std) conserved across 29 species, whereas 54% ± 11.2 (std) of occurrences for the 16 species with location records are conserved in the Plan Area. While the species occurrence data is problematic because it is not comprehensive, this discrepancy between levels of potential habitat conservation and known species locations indicate that neither dataset may be performing well in predicting actual levels of conservation. The problem with using overly broad predictions of suitable habitat in the reserve selection process is that it is difficult to distinguish parcels that may have the highest conservation values.

5.3 Recommendations

Despite these potential drawbacks, species distribution models can be important planning tools when they are well validated and the uncertainty in predictions is quantified. For these reasons, the California Gnatcatcher model may useful in reserve selection. This model incorporates several variables into a more complex habitat relationship and has been validated for San Diego County (Winchell and Doherty 2006). The gnatcatcher also has the advantage of being a habitat specialist so that its distribution is relatively easy to model. However, one serious limitation is whether this model can be applied more broadly to the conservation goals for other species based on our limited understanding of the species and their ecological associations.

It appears that there may be enough data for several of the species to develop species-specific models. However, for those species with insufficient data, OCTA could create better decision tree models incorporating additional environmental variables (similar to the gnatcatcher model).

Based on a review and an understanding of species habitat relationships we suggest that at a minimum the following models in their current form be removed as part of the overall reserve design analysis:

- southern tarplant
- southwestern pond turtle
- southwestern willow flycatcher
- San Diego cactus wren
- all bat species models

For the remaining models, most have some species location data for Orange County and an analysis could be performed to see how well the models predict these occurrences (i.e., see Fielding and Bell 1997). The mountain lion model should be reviewed by Winston Vickers who has many thousands of lion locations from an ongoing radio-tracking study in Orange County. He could refine the model to reflect where the lions actually occur.

Using the current habitat model predictions as input into MARXAN may not be very informative. It may be worth considering incorporating additional expert opinion regarding important lands for conservation. If species specific habitat models are used, some assessment of how well the models perform in predicting species' occurrences should be provided.

The panel realizes there is a relatively small level of impact to covered species from OCTA M2 projects as most construction will be within existing freeway right-of-ways. Thus, the covered species are likely to be adequately mitigated through establishment of a large reserve system that significantly exceeds standard mitigation requirements. This provides an opportunity to prioritize and select parcels for conservation based on reserve design attributes and to use restoration to enhance degraded areas important for connectivity. To that end, rather than relying solely on the species distribution models it may be better to focus on the Conservation Assessment (CBI 2010) and prioritize parcels that augment and link already conserved lands and encompass a diversity of vegetation communities. Species occurrence data and expert knowledge can be used to inform these prioritizations. Under this approach, it would be important that experienced biologists conduct site visits to candidate acquisition parcels to assess existing habitat value or restoration potential and the potential for occurrence of Covered Species. The NCCP/HCP is unique as there are already large blocks of land conserved within the plan area and the focus can be on filling gaps in conservation and providing greater connectivity.

6.0 Conservation Strategies and Reserve Design

The overall conservation strategy – that of purchasing inholdings and expanding preserved areas, emphasizing linkage and connectivity, and raising ecological condition through restoration – is innately valid. This approach has regional benefits that extend well beyond the actual impact area for the project. The prioritization of funding commitment is correct in that preserving additional habitat outweighs limited restoration efforts or those of mitigating isolated impacts. In terms of reserve design, connectivity and linkages are a fundamental principle as urbanization, roads and other anthropocentric actions continue to divide and isolate the larger reserve areas. In this regard, simply adding to existing preserves – just adding acreage – is not always the most productive approach. Bigger is not always better – in part, additions to reserves depend upon the condition of the added landscape and the condition of the habitat to which it is amended. With limited funding, there is strong merit in the “string of pearls” concept in which stepping stones link habitat allowing meta-population communication that would be restricted were expansion of a reserve the sole consideration. An excellent example of this is the creation of patches of cacti to provide line of site connections between isolated populations, such as those in Newport Bay and the UCI Ecological Preserve. In this sense despite being isolated, small fragments have great importance as linking archipelagos and buffered refugia integrating and bridging distributional gaps in larger preserved habitats.

Fragments can serve as refugia for some species, providing value even if not directly connected to larger habitats. In 1993 and 2007 large fires decimated coastal cactus wren populations in the Orange County, and the pairs surviving in isolated fragments became extremely important in sustaining genetic diversity and providing out-migrants for re-colonization of burned areas.

Linkages are not just migration corridors, but they are connectors that assist in the sustenance of biodiversity, even if only for birds and insects (organisms that can fly when a fragment is surrounded by roads or urban development). High priority linkage areas need to be re-visited and it should be determined if there are key sites/connections that are missing. Species lists can be used to assist in evaluating potential linkage needs.

In summary, don’t overlook small habitat areas – fragments – that may provide important functions such as refuge from catastrophic events like fire in larger preserved areas, preservation of genetic diversity, and as connectors or stepping stones between larger preserves. Biological corridors, reserve design, and linkages have been discussed in relevant ways to this project in references such as Beier and Lowe (1992), Beier and Noss, (1998), Noss, et. al. (2001), Noss, et. al. (2002), NCCP Core Group Report, (1997), and Stephenson and Calacarone (1999), among many others. Bowler (1992) suggested the important role filled by disturbed lands as buffers and corridors. While no specific recommendations are provided in our analysis, this may be a useful exercise to conduct with regional conservation experts and planning staff, and may already be addressed by the recommendations above.

6.1 Restoration

Potential restoration opportunities should be prioritized with the same rigor as potential acquisition opportunities. Funding should target areas where restoration could have immediate benefits (e.g., key linkage areas such as the State Route 91 Coal Canyon wildlife crossing). Acquisitions should include areas with opportunities for riparian restoration – which will be needed along with upland restorations. It is important to remember that restoration as discussed here means whole community restoration, not just canalized elements of community such as shrubs – a characteristic of mitigation approaches.

Establishing performance standards such as those for mitigation projects could be useful, with monitoring over a longer period of time to assess effectiveness. Targeting "real" restoration goals (e.g., 90% cover by native plants after 15 years, or for example) would help ensure that restoration projects contribute and are sustainable over a long period of time. However, restoration targets need to be realistic, and can be based off of the existing conditions in the region. For example, based on the characteristic diversity of the region, it may be unrealistic to set a restoration goal of 90% cover (based on soil characteristics, slope, aspect, etc.) and some invasive species may never be adequately removed from the ecosystem. This more pragmatic approach is particularly necessary in areas with significant historic degradation or continuing urban influence.

Finally, restoration requires a long-term commitment that extends beyond the traditional 5 to 10-year targets for percent cover or percent native species. Because of the potential for continued impact, restoration projects often become degraded over time and the original habitat integrity and utility can be lost. It is important that long-term commitments are made so that restorations are sources, not sinks (Bowler, 2000).

6.2 Other

Although often overlooked, some habitat features like rock outcrops are important for lichens, bryophytes, and other cryptogams as well as selected rare plants, bats, raptors and reptiles. Thus they should be recognized as having ecological value for these groups, rather than disregarded as having no role in a habitat.

Climate change considerations must be addressed, and could place new challenges upon the selection of sites to be added to preserved lands. Predictions for the study area include, among others, a rise in sea level between 12 and 18 inches by 2050, the local climate will be hotter and drier, wildfires will increase in frequency and intensity, and there will be local extinctions (The San Diego Foundation, 2010). Dawson et al. (2011) suggest developing a "vulnerability assessment" in predicting which species and habitats are placed in greatest risk. Considering the development of other risk criteria for species could be another approach worth exploring. How close is a species to losing viability, how resilient is it and its ecological context to climate change, for example? Other recent approaches include the SAFE analysis (Clement, et. al., 2011), which incorporates earlier studies of the minimum population size needed for a species survival, then estimating how close the taxon is to the minimum viable population size. This tool is intended to be a "relative threat" risk estimate that uses a formula to determine the distance a population is from its minimum viable population as an indicator of vulnerability. According to the authors, it is meant to be an adjunct to the methods used by the International Union of for Conservation of Nature (IUCN) Red List of Threatened Species, and it has been found to be particularly effective in estimating vulnerability and risk in mammalian taxa. Another approach (Angert, et al., 2011) suggests assessing the rapidity with which species can migrate either in elevation or latitude in response to climate change. As they note, "The species that aren't able to expand their range are the ones we need to spend more resources protecting."

In view of the climate changes predicted and the strategies discussed above, it might be prudent to consider topography in selecting new sites for preservation – so that diversity in landscape and elevation could provide a more heterogeneous template in which species could adjust as the ecology changes. Finally, going back to the original goals of the project, and the limited habitat impacts predicted, climate change (while an important issue) is likely addressed simply due to the disproportionate habitat acquisition and restoration activities (when compared with actual project-related impacts). Furthermore, the focus on protecting vital linkages and ensuring connectivity is substantially related to the ability for species to migrate and adapt to climate change, with one caveat: consider including an analysis for conserving (or ensuring the protection) of areas that allow for migration along altitudinal gradients. This needs to be highlighted within the plan to let the readers know that the existing conservation approach used in the plan is already (inherently) providing climate change mitigation.

7.0 Management, Monitoring, and Oversight

7.1 Oversight of the NCCP/HCP

Successful implementation of the NCCP/HCP is largely dependent on maintaining strong involvement, support and oversight of a governing body. The Science Advisors support adopting the existing "Environmental Oversight Committee" as an oversight entity. The entity body should be part of a review of annual work plans, monitoring and management. The US Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG), in particular, should maintain a strong leadership role, providing direct oversight of research and management programs and review and approval of annual work plans and management plans. In addition, if the makeup of the governing body is largely non-scientific, it may be worth creating a Technical Advisory Committee (TAC) to review and help direct science-related management and monitoring programs for conserved lands. The TAC could be comprised of independent scientists/biologists with background and experience in southern California ecosystems.

A major potential unforeseen problem that should be addressed at the outset is the need for OCTA and its agents to have access to the conserved properties to complete monitoring and management activities. Currently, it is difficult for researchers and biological monitors to gain timely access to publicly conserved lands in Orange County due to onerous permit processes and insurance requirements. Regular communication between the landowner and the OCTA biomonitor on the design, timing, and ongoing results of monitoring actions could help ensure that monitoring and management actions are streamlined. We therefore recommend that the Framework Monitoring and Management chapter include discussion of the need to coordinate monitoring and management among preserve areas and between preserve management entities, including facilitating access to property for biological monitoring.

7.2 Long-Term Management and Monitoring Endowment

The Science Advisors applaud the establishment of long-term endowment for monitoring and management of the conserved lands. We also strongly support the endowment be held and managed by a single entity such as OCTA. OCTA will likely be able to implement a more aggressive investment strategy than other public agencies, thereby generating more funding for monitoring and management. The endowment should not be held or managed by the various potential land manager/owners of the conserved properties. If the investment remains pooled and held by one entity, release of management funding to landowner/managers can be tied to performance, providing an incentive for manager/owners to provide a high level of resource management on the conserved properties. It is our experience that over time, some properties may require greater financial resources on occasion due to unexpected, natural or human induced impacts to covered species and habitats. A funding strategy that addresses this may be worth including in the document.

7.3 Biological Monitoring

1. Experience gained from existing NCCPs in southern California has taught us that the monitoring program developed for the plan should not be prescriptive but rather responsive to changing circumstances and technologies. The monitoring program should be able to sufficiently document trends for covered species but flexible enough so that it can be changed in response to changing circumstances, such as catastrophic fire events, emerging invasive species (?), disease, and new monitoring technologies.
2. We recognize that it would be financially infeasible to monitor all covered species; therefore, the development of the monitoring program should include a process for prioritizing species/habitats for monitoring. We suggest that OCTA model their prioritization efforts after the process developed for the San Diego Multiple Species Conservation Plan (Franklin, et al. 2006). This prioritization scheme uses a step-down approach that firsts assigns a Risk Category to each species (from most to less endangered) and then identifies and ranks the degree of threats (high, medium, low) for each species. The threats were further identified as covering a high, moderate, or low portion of the species range in San Diego County. The temporal response of species to the threats was also identified as short-term or long-term. A similar approach was used for prioritizing habitats used by the covered species. Those species/habitats that were identified as highly endangered or having high-ranking threats were given high priority for monitoring.
3. All biological monitoring that is tied to permit conditions should be overseen and conducted by a third party ("OCTA Biomonitor") that is not a landowner or manager of the conserved properties. Centralizing monitoring efforts (versus delegating the monitoring to land managers) will better ensure that monitoring is performed rigorously, consistently and as scheduled.
4. The monitoring program should link, whenever possible, to monitoring programs established for nearby HCP/NCCPs, such as the Nature Reserve of Orange County's long-term cactus wren, gnatcatcher and vegetation monitoring programs. This would provide cost savings and provide a larger regional data set to assess trends through time for target species and habitat types.
5. There should be centralized data storage and dissemination made available (after QA/QC) as either an annual report or part of a regional database.
6. The adaptive management and monitoring program should follow the process identified by USGS in the 2004 report "Designing monitoring programs in an adaptive management context for regional multiple species conservation plans" (Atkinson, Trenham et al. 2004). This process includes 1) developing monitoring goals and objectives, 2) identifying species/habitats to be monitored, 3) developing conceptual models for the species to be monitored as well as hypotheses to be tested, 4) identifying thresholds for management intervention, 5) implementing a pilot/baseline data collection phase, 6) analyzing data, 7) implementing management or additional research action based on data, and 8)

refining monitoring goals, methods, hypotheses and conceptual models based on results of analyses. Periodic review of monitoring programs should follow this general process every 5-10 years.

7. Monitoring programs for species and habitats should identify thresholds for intervention. Intervention may consist of direct management action to reverse the change and/or additional directed research to target the reasons for the detected change.

These recommendations all point to the need to invest a great deal of time and effort into planning and designing the monitoring program for the NCCP/HCP. This planning phase can be costly, and include a period of research, however, having a clear statistically sound monitoring design and analysis approach saves costs over the long term (Lengyel, Deri et al. 2008; Marsh and Trenham 2008).

7.4 Resource Management

1. A Resource Management Plan (RMP) should be prepared for each property that specifically identifies how the property will be managed, and what the priorities for management should be. Management Plans should address: baseline conditions for biological species and habitat, goals and objectives for resource management (which should reflect the goals of the NCCP/HCP), the nature, location and extent of public use and trails, areas for fencing and exclusion, habitat restoration (identify what habitats could be restored where, as well as priorities for restoration), invasive species control (species, locations, and priorities for control), fire management (prevention, suppression and post fire response) and enforcement.
2. If the primary purpose of the conserved lands is mitigation for impacts to habitats and species, then it should be specifically stated in management agreements, deed restrictions/conservation easements, and plans that natural resource conservation and protection shall receive priority over public use and recreation.
3. Activities of landowner/managers should be guided by annual work plans and budgets that are tied to the goals and objectives of the RMPs and NCCP/HCP. Annual work plans should be reviewed and approved by the governing board (with DFG and USFWS providing a major role in reviewing work plans).
4. Conflicts or questions regarding resource management should be resolved by CDFG and USFWS in consultation with OCTA.
5. All annual monitoring and management reports should be posted on OCTA's website. OCTA may also want to consider holding annual public meetings to present the status of implementation of the plan as well as results of monitoring and management actions for the NCCP/HCP. This could also be good for public outreach and education.

8.0 Literature

Atkinson, A., P. Trenham, et al. (2004). Designing monitoring programs in an adaptive management context for regional multiple species conservation plans. Sacramento, CA., U.S. Geological Survey Technical Report**:** 69.

Beier, P. and S. Loe. 1992. "In my experience…." A checklist for evaluating impacts to wildlife corridors. Wildlife Society Bulletin 20: 434 – 440.

Beier, P. and R.F. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 12(6): 1241 – 1252.

Bisbal, G. A. 2001. Conceptual design of monitoring and evaluation plans for fish and wildlife in the Columbia River ecosystem. Environmental Management 28:433-453.

Bowler, P.A. 1992. Biodiversity Conservation in Europe and North America. II. Shrublands - In Defense of Disturbed Land. *Restoration Management Notes* 10(2): 144-149.

Bowler, P.A. 2000. Ecological Restoration of Coastal Sage Scrub and Its Potential Role in Habitat Conservation Plans. *Environmental Management* 26: S85-S96.

California Department of Fish and Game. 2009. Planning agreement by and among Orange County Transportation Authority, California Department of Transportation, California Department of Fish and Game, and United States Fish and Wildlife Service for the Orange County Transportation Authority Natural Community Conservation Plan (NCCP)/Habitat Conservation Plan (HCP). April. Available: http://www.dfg.ca.gov/habcon/nccp/pubs/2009-OCTA-NCCP-Draft-Agreement.pdf

CBI. 2009. Conservation Assessment of Orange County. Prepared for the Orange County Transportation Agency. December. 54 pp.

Clements, G.R., C.J.A. Bradshaw, B.W. Brook, and W.F. Laurance. 2011. The SAFE index: using a threshold population target to measure relative species threat. Frontiers in Ecology and the Environment 110330054251016 DOI: 10.1890/100177. See also the Science Daily summary at
http://www.sciencedaily.com/releases/2011/04/110407101615.htm

Clevenger, A.P., J. Wierzchowski, B. Chruszcz, and K. Gunson. 2002. GIS-generated expert-based models for identifying wildlife habitat linkages and planning mitigation passages. Conservation Biology 16:503-514.

Dawson, T.P., S.T. Jackson, J.I. House, I.C. Prentice and G.M. Mace. 2011. Beyond Predictions: Biodiversity Conservation in a Changing Climate. Science 332: 53 – 58. See http://www.sciencedaily.com/releases/2011/03/110331142215.htm for the Science Daily synopsis.

Elith J., C.H. Graham, R.P. Anderson, M. Dudik, S. Ferrier, A. Guisan, R.J. Hijmans, F. Huettmann, J.R. Leathwick, A. Lehmann, J.Li, L.G. Lohmann, B.A. Loiselle, G. Manion, C. Moritz, M. Nakamura, Y. Nakazawa, J. McC. Overton, A. T. Peterson, S. J. Phillips, K. Richardson, R. Scachetti-Pereira, R.E. Schapire, J. Soberón. S. Williams, M.S. Wisz, and N.E. Zimmerman. 2006. Novel methods improve prediction of species' distributions from occurrence data. Ecography 29:129-151.

Franklin, J., L.A. Hierl, D.H. Deutschman, H.M. Regan (2006). Grouping and Prioritizing Natural Communities for the San Diego Multiple Species Conservation Program, California Department of Fish and Game.

Fuller, W. A. (1999). "Environmental surveys over time." Journal of Agricultural, Biological, and Environmental Statistics 4(4): 331-345.

Gibbs, J. P., H. L. Snell, and C. E. Causton. 1999. Effective monitoring for adaptive wildlife management: lessons from the Galapagos Islands. Journal of Wildlife Management 63:1055-1065.

Grand, J., M.P. Cummings, T.G. Robelo, T.H. Ricketts, and M.C. Neel. 2007. Biased data reduced efficiency and effectiveness of conservation reserve networks. Ecology Letters 10:364-374.

Goodman, R.H., Jr. 2009. Report: 2nd Trapping Season and Status of the San Joaquin Marsh Southwestern Pond Turtle (*Actinemys marmorata pallida*) Population. Prepared for Moore Twining Associates and the California Department of Fish and Game. 14 pages.

Guisan, A. and N.E. Zimmerman. 2000. Predictive habitat distribution models in ecology. Ecological Modeling 135:147-186.

Johnson, C.J. and M.P. Gillingham. 2004. Mapping uncertainty: sensitivity of wildlife habitat ratings to expert opinion. Journal of Applied Ecology 41: 1032-1041.

Langford, W.T., A. Gordon, and L. Bastin. 2009. When do conservation planning methods deliver? Quantifying the consequences of uncertainty. Ecological Informatics 4:123-135.

Marcot, B.G. 1986. Use of expert systems in wildlife-habitat modeling. Pages 145-150 in J. Verner, M.L. Morrison, and C.J. Ralph, editors. Wildlife 2000: Modeling Habitat Relationships of Terrestrial Vertebrates. University of Wisconsin Press, Madison.

Margules, C.R. and R.I. Pressey. 2000. Systematic conservation planning. Nature 405:243-253.

Marsh, D., P. Trenhem (2009). "Current Trends in Plant and Animal Population Monitoring. " Conservation Biology 22(3):505-809.

Mulder, B. S., B. R. Noon, T. A. Spies, M. G. Raphael, C. J. Palmer, A. R. Olsen, G. H. Reeves, and H. H. Welsh. 1999. The strategy and design of the Effectiveness Monitoring Program for the Northwest Forest Plan. General Technical Report PNW-TTR-437. U.S. Department of Agriculture, Forest Service, Regional Ecosystem Office, Portland, Oregon.

NCCP Core Group Report. March 26, 1997. Research Guidance to address the needs of land managers. Coastal Sage Scrub Natural Community Conservation Planning (NCCP). U.S. Department of the Interior, U.S. Geological Survey. Biology Resources Center, California Science Center.

Noon, B. R. 2003. Conceptual issues in monitoring ecological resources. in D. E. Busch and J. C. Trexler, editors. Monitoring Ecosystems: interdisplinary approaches for evaluating ecoregional initiatives. Island Press, Washington, D.C.

Noss, R., P. Beier, D. Faulkner, R. Fisher, B. Foster, T. Griggs, P. Kelly, J. Opdycke, T. Smith and P. Stine. July 1, 2001. Independent Science Advisor's Review: North County Subarea Plan, Count of san Diego Multiple Specie Conservation Program. Part I: Review of Habitat Evaluation Model, with Suggestions for Conservation Planning Principles, Species Coverage, and Adaptive Management. 26 pages.

Noss, R., P. Beier, D. Faulkner, R. Fisher, B. Foster, T. Griggs, P. Kelly, J. Opdycke, T. Smith and P. Stine. February 27, 2002. Independent Science Advisor's Review: North County Subarea Plan, Count of san Diego Multiple Specie Conservation Program. Part II. Review of Consultants' Response to Part I Report and Revision of Preserve Planning Process. 5 pages.

Petit, S., D. Chamberlain, K. Haysom, R. Pywell, and J. Vickery. 2003. Knowledge-based models for predicting species occurrence in arable conditions. Ecography 26:626

Phillips, S.J. and M. Dudik. 2008. Modeling of species distributions with Maxent: new extensions and a comprehensive evaluation. Ecography 31:161-175.

Possingham, H.P., I.R. Ball, and S. Andelman. 2000. Mathematical methods for identifying representative reserve networks. In Quantitative Methods for Conservation Biology (eds. Ferson, S. and M. Burgman). Springer-Verlag, New York. Pp 291-305.

Possingham, H.P., K.A. Willson, S.J. Adelman, and C.H. Vynne. 2006. Protected areas: goals, limitations, and design. In: Groom, M.J., G.K. Meff, C.R. Carroll (eds), Principles of Conservation Biology. Sinauer Associates Inc. Sunderland, MA.

Ringold, P. L., B. S. Mulder, J. Alegria, T. Czaplewski, T. Toole, and K. Burnett. 1999. Establishing a regional strategy, the Pacific Northwest Forest Plan. Environmental Management 23:179-192.

Rondinini, C., S. Stuart, and L. Boitani. 2005. Habitat suitability models and the shortfall in conservation planning for African vertebrates. Conservation Biology 19:1488-1497.

Rotenberry, J.T., K.L. Preston, and S.T. Knick. 2006. GIS-based niche modeling for mapping species' habitat. Ecology 87:1458-1464.

Smith, R.J., A. Monadjem, C.N. Magagula, and T.A.M. Mahlaba. 2009. Conservation planning and viability: problems associated with identifying priority sites in Swaziland using species list data. African Journal of Ecology 48:709-717.

Stephenson, J.R. and G.M. Calcarone. 1999. Southern California Mountains and Foothills Assessment: Habitat and Species Conservation Issues. General Technical Report GTR-PSW-172. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 402 pages. Available electronically at: http://www.treesearch.fs.fed.us/pubs/6778

The San Diego Foundation. 2010. San Diego's Changing Climate: A Regional Wake-Up Call. The Focus 2050 Study.

U.S. Fish and Wildlife Service, and National Marine Fisheries Service. 1996. Habitat conservation planning and incidental take permit processing handbook. U.S. Department of the Interior, U.S. Department of Commerce.

U.S. Fish and Wildlife Service. 2005. Recovery Plan for the Tidewater Goby (*Eucyclogobius newberryi*). U.S. Fish and Wildlife Service, Portland, Oregon. vi + 199 pp. An electronic version of this recovery plan is available at http://www.r1.fws.gov/ecoservices/endangered/recovery/plans.html and http://endangered.fws.gov/recovery/index.html and at http://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/TidewaterGobyFinalRecoveryPlan.pdf

Underwood, J.G., C. D'Agrosa, and L.R. Gerber. 2009. Identifying conservation areas on the basis of alternative distribution data sets. Conservation Biology 24:162-170.

Winchell, C.S. and P.F Doherty. 2006. Using California Gnatcatcher to test underlying models in Habitat Conservation Plans. The Journal of Wildlife Management 72:1322-1327.