Response to Correspondence from Arroyos & Foothills Conservancy Regarding the ArtCenter Master Plan

Note that the emails (Attachment A) dated after April 25, 2018, were provided to the City after the end of the CEQA comment period, and, therefore, the emails and the responses below are not included in the EIR, and no response is required under CEQA. However, for sake of complete analysis and consideration of all comments submitted, the City responds herein and this document is made part of the project staff report.

Response to Correspondence

This correspondence with the Arroyos & Foothills Conservancy occurred in the context of the preparation of the EIR for the ArtCenter Master Plan. The formal comment letter from Arroyos & Foothills Conservancy included in this correspondence was responded to as Letter No. 6 in Section III, Response to Comments, of the April 2018 Final EIR for the ArtCenter Master Plan.

The primary correspondence herein is comprised of emails between John Howell and Mickey Long discussing whether there is a wildlife corridor within the Hillside Campus, as well as emails between John Howell and CDFW regarding whether there is a wildlife corridor and whether CDFW will provide a comment letter regarding the ArtCenter Project for the Planning Commission hearing on May 9, 2018. Note that CDFW submitted a comment letter on May 9, 2018, after completion of the Draft EIR and Final EIR. The City has also provided a separate response to this late comment letter.

This correspondence centers around the potential for the Hillside Campus to contribute to a wildlife corridor. The CDFW was contacted during preparation of the Final EIR to obtain specific mapping information to provide a more comprehensive description of the potential for wildlife movement within the Hillside Campus within the Final EIR. However, copies of any formal mapping by the CDFW were not available. In its May 9, 2018, comment letter that was received after the Final EIR was published, CDFW indicated that the Hillside Campus areal is located in and contributes to a regional wildlife movement/ live-in habitat corridor and linkage complex that includes the Verdugo Mountains/San

Rafael Hills. The City acknowledges this conclusion. Likewise, the City does not dispute statements regarding wildlife corridors made by the Arroyo & Foothills Conservancy.

Regardless, as discussed in both the Draft and Final EIR for the ArtCenter Master Plan, the improvements within the Hillside Campus would be limited to portions of the campus that are already developed. Thus, the Project would not add buildings or structures within the Hillside Campus that would impede or reduce the ability for wildlife to move around the perimeter of the campus or through the undeveloped hillsides. As such, the Project does not have the potential to affect the Verdugo Mountains/San Rafael Hills regional wildlife movement/live-in habitat corridor and linkage complex noted by the CDFW and AFC. Furthermore, because the Project does not pose any barriers to wildlife movement through these areas, it is not necessary for the City to provide a detailed evaluation of regional wildlife movement within the undeveloped portions of the Art Center property and/or the adjoining portions of the San Rafael Hills, since such a study would not provide any informational value for purposes of Project impact disclosure and mitigation or for the Project's decision making process.

Attachment A: Email Correspondence

Attachment B: HTC Biological Report

Attachment A

Email Correspondence

From: John Howell [mailto:johnhowell@arroyosfoothills.org]
Sent: Wednesday, May 09, 2018 6:34 PM
To: Sinclair, David
Cc: Sheppard, Natsue; 'Erinn Wilson'; 'Barbara Goto'; 'Scott Harris'; Mickey Long
Subject: FW: FW: [FWD: ArtCenter College of Design Master Plan: Final EIR and Public Hearing]

David,
Here is Michael Long's email that is referenced in the prior email chain I sent you.
Thanks
John

From: Mickey Long [mailto:mlongbird@gmail.com]
Sent: Saturday, April 28, 2018 4:20 PM
To: John Howell
Subject: Re: FW: [FWD: ArtCenter College of Design Master Plan: Final EIR and Public Hearing]

John,
I'm plowing through all the Art Center documents, (will now read the pgs. 75-87) and I guess since this is the Final EIR, they don't repeat any maps showing the project plans anywhere. Do you have a project map?

So far, my careful scan of Google earth imaging shows broadly the following for wildlife movement corridors:

From Cottonwood Canyon's upper headwaters there is a corridor of native habitat leading west through open space toward Hwy. 2 (with pinch points between housing). From Cottonwood Canyon headwaters southward, Art Center is in the middle of an extensive open space of native habitat opening south around east of Scholl Canyon Landfill then turning westward around the south end of Scholl Canyon then continuing west around the south end of Scholl Canyon Landfill all the way to Hwy. 2. This is a wildlife corridor

Also, due west of Art Center there is open space native habitat through two gaps in housing development north of Scholl Canyon, with a broad swath of habitat all the way to Hwy. 2. This is also a wildlife corridor.

Mickey

On Thu, Apr 26, 2018 at 2:47 PM, John Howell <johnhowell@arroyosfoothills.org> wrote:

Mickey,

How do you feel about spinning through another EIR?

Art Center's draft EIR (for AC's master plan) concluded that the Hillside Campus does is not part of a wildlife corridor. We made written comment to the contrary. We directed them, among other things, to CDFW and its Eastern Rim of the Valley CAPP (we also included our Biological Study, which is the CAPP with CAPP references and maps that show tier 1 parcels removed (as I recall). They reply that they contacted CDFW and received no reply. The final EIR concludes that, without access to the CAPP, none of the other information we provided is conclusive and they do not have reliable information to conclude that a wildlife corridor exists that includes the Hillside Campus and that the portion of the north campus that is south if Lida is not in the HTC. That's just a broad brush.

If you can muster the energy would you like to review PDF pages 75-87 (not the pages as numbered in the EIR) and discuss the findings? Public hearing on it is May 9.

Thanks,

John

John Howell
Chief Executive and General Counsel
Arroyos & Foothills Conservancy

www.arroyosfoothills.org

From: John Howell [mailto:johnhowell@arroyosfoothills.org]
Sent: Wednesday, May 09, 2018 6:29 PM
To: Sinclair, David
Cc: Sheppard, Natsue; 'Erinn Wilson'; 'Barbara Goto'; Scott Harris
Subject: RE: Comments to Draft EIR for ArtCenter Master Plan

David,
I write to further inform the process that the entire Art Center hillside campus, including the undeveloped portions, are within one or more wildlife corridors, and ask that the EIR be amended to reflect it.

The Initial Study, September 2016, page 1 defines the "Hillside Campus" to include all 155.95 acres "approximately 75% of which is undeveloped." Responses to comments that suggest that the undeveloped portions, particularly those north of Lida, are not part of the "Hillside Campus" are incorrect.

"Response Comment No. 6-3" of the EIR, and elsewhere, states an inability to secure a copy of the CAPP (as referenced therein), and without it a lack of substantial evidence of a wildlife corridor. I asked California Department of Fish and Wildlife to inform the process and they agreed. See the attached email chain, Exhibit A, which indicates that a letter will be coming shortly to address the issue. I ask that the findings in the letter, when received, (and at the present the email chain) be considered.

In addition, please note the findings of biologist Michael C. Long that the Hillside Campus is a part of three wildlife corridors, in the email chain.

I hold in my possession a map that reflects the entire Art Center hillside campus to be within the CAPP (and the area of study of our Biological Study that we submitted earlier), which is a wildlife corridor study. DFW does not want it to be public to avoid land speculation. I can provide it for evaluation, provided it does not become part of the public record.

Thank you.

John R. Howell
Chief Executive and General Counsel
Arroyos & Foothills Conservancy
johnhowell@arroyosfoothills.org
www.arroyosfoothills.org
(626) 796-0782
PO Box 1 Pasadena Ca 91102
301 E Colorado Bl Ste 320 Pasadena Ca 91101

From: John Howell [mailto:johnhowell@arroyosfoothills.org]
Sent: Wednesday, January 17, 2018 11:37 AM
To: 'Sinclair, David'
Cc: 'Sheppard, Natsue'; 'Erinn Wilson'; 'Barbara Goto'
Subject: RE: Comments to Draft EIR for ArtCenter Master Plan

Here you go David. Let me know if you need anything else.
Thanks
John

John Howell
Chief Executive and General Counsel
Arroyos & Foothills Conservancy
www.arroyosfoothills.org

From: Sinclair, David [mailto:dsinclair@cityofpasadena.net]
Sent: Tuesday, January 16, 2018 4:53 PM
To: John Howell
Cc: Sheppard, Natsue; Erinn Wilson; Barbara Goto
Subject: RE: Comments to Draft EIR for ArtCenter Master Plan

John –

Any progress on this?

David

From: Sinclair, David
Sent: Tuesday, January 16, 2018 8:58 AM
To: 'John Howell' <johnhowell@arroyosfoothills.org>
Cc: Sheppard, Natsue <nsheppard@cityofpasadena.net>; Erinn Wilson <Erinn.Wilson@Wildlife.ca.gov>; Barbara Goto <barbaragoto@arroyosfoothills.org>
Subject: RE: Comments to Draft EIR for ArtCenter Master Plan

Thank you John.

Any studies or documents that are relevant to the points made in your letter would be helpful for us.

Thank you.

David

David Sinclair
Senior Planner
Planning & Community Development Department
City of Pasadena
t. (626) 744-6766

From: John Howell [mailto:johnhowell@arroyosfoothills.org]
Sent: Friday, January 12, 2018 7:38 PM
To: Sinclair, David <dsinclair@cityofpasadena.net>
Cc: Sheppard, Natsue <nsheppard@cityofpasadena.net>; Erinn Wilson <Erinn.Wilson@Wildlife.ca.gov>; Barbara Goto <barbaragoto@arroyosfoothills.org>
Subject: RE: Comments to Draft EIR for ArtCenter Master Plan

Hi David,
As discussed in my letter dated December 11, 2017, AFC commissioned an ecological study (called the "HTC Biological Report") that we provided to CDFW for its use in preparing its Conceptual Area Protection Plan ("CAPP"). We would be happy to provide it to you the first part of next week. It should prove helpful. While the CAPP has been adopted by CDFW, that document is proprietary to CDFW and used for internal purposes; I don't believe they distribute it.

Our HTC Biological Report ranks the Hillside campus in the top tier of importance to the Hahamongna to Tujunga Wildlife Corridor, and we are assured by DFW that the CAPP does the same.

We'll get the HTC Biological Report to you shortly. If there is anything else we can help you with please don't hesitate to let us know.
John

John Howell
Chief Executive and General Counsel
Arroyos & Foothills Conservancy
www.arroyosfoothills.org

From: Sinclair, David [mailto:dsinclair@cityofpasadena.net]
Sent: Friday, January 12, 2018 3:25 PM
To: barbaragoto@arroyosfoothills.org
Cc: John Howell; Sheppard, Natsue
Subject: RE: Comments to Draft EIR for ArtCenter Master Plan

Barbara –

I am following up on my email from yesterday concerning the Eastern Rim of the Valley Conceptual Area Protection Plan. We getting close to some deadlines on the Final EIR and it would be very helpful for us to have a copy of that plan.

Thank you.

David

David Sinclair
Senior Planner
Planning & Community Development Department
City of Pasadena
t. (626) 744-6766

From: Sinclair, David
Sent: Thursday, January 11, 2018 2:37 PM
To: 'barbaragoto@arroyosfoothills.org' <barbaragoto@arroyosfoothills.org>
Cc: John Howell <johnhowell@arroyosfoothills.org>; Sheppard, Natsue <nsheppard@cityofpasadena.net>
Subject: RE: Comments to Draft EIR for ArtCenter Master Plan

Barbara –

In preparing responses to the comments we received on the Draft EIR it would be helpful to have a copy of the adopted 2017 Eastern Rim of
the Valley Conceptual Area Protection Plan referred to in your letter. Our consultant contacted CDFW for a copy but was told it is not available to the public. Given that your comments specifically reference this document, and that it identifies property that ArtCenter owns, it would be helpful and educational for us to have our own copy.

Thank you in advance for your prompt response.

David

David Sinclair
Senior Planner
Planning & Community Development Department
City of Pasadena
t. (626) 744-6766

From: barbaragoto@arroyosfoothills.org [mailto:barbaragoto@arroyosfoothills.org]
Sent: Monday, December 11, 2017 12:55 PM
To: Sinclair, David <dsinclair@cityofpasadena.net>
Cc: John Howell <johnhowell@arroyosfoothills.org>
Subject: Comments to Draft EIR for ArtCenter Master Plan

Dear David,

Attached you will find comments to the draft environmental impact report on the Art Center College of Design's Master Plan. We thank you for including our comments in the record.

Sincerely,

Barbara Goto
Director of Operations
BarbaraGoto@arroyosfoothills.org

Arroyos & Foothills Conservancy
"Securing Protecting & Stewarding
Our Precious Open Spaces"
Arroyos & Foothills Conservancy
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P.O. Box 1
Pasadena, CA 91102
(818) 389-5563

Attachment B

HTC Biological Report

Hahamongna to Tujunga Wildlife Corridor Biological Study

Arroyos and Foothills Conservancy

Prepared by

Kristeen Penrod, Director

Science & Collaboration for Connected Wildlands

P.O. Box 1052, Fair Oaks, CA 95628

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www.scwildlands.org

206-285-1916

February 2016

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Appendices

HAHAMONGNA TO TUJUNGA WILDLIFE CORRIDOR STUDY

1. Proposal overview

Strategically conserving and restoring natural landscapes and essential connections between wildland areas is an effective and cost-efficient means to reduce the adverse effects of habitat loss and fragmentation, and is an essential mitigation measure for climate change. The primary goal of the Hahamongna to Tujunga Wildlife Corridor Biological Study (HTC study) is to maintain and enhance wildlife habitat, habitat connectivity and wildlife movement among several existing protected areas within the Hahamongna to Tujunga Wildlife Corridor, part of the Rim of the Valley Corridor[1], namely the San Gabriel Mountains, Verdugo Mountains, and San Rafael Hills (Figure 1). Approximately 95% of the HTC study area lies within the boundary adjustment to the Santa Monica Mountains National Recreation Area (SMMNRA) under the Preferred Alternative of the Rim of the Valley Corridor Draft Special Resource Study and Environmental Assessment (NPS Spring 2015). The analysis extent encompasses 22,098 acres and includes substantial conservation investments (62%); the remaining 38% (8,400 acres) currently has no conservation status, and is the primary focus of this HTC study. The Arroyos and Foothills Conservancy initiated the preparation of this HTC study with support from the Santa Monica Mountains Conservancy to identify and prioritize lands that contribute to maintaining and restoring habitat connectivity in the Hahamongna to Tujunga Wildlife Corridor and to collaborate with several agencies and organizations that administer land in the region to implement this HTC study.

Disruption of landscape connections for species movements and range changes is one of the greatest stressors to ecosystems. Movement is essential to wildlife survival, whether day-to-day movement of individuals seeking food, shelter, or mates; juvenile dispersal; seasonal migration; or recolonization after a local population goes extinct. Maintaining and enhancing connectivity is also essential to support ecosystem functions, such as predator-prey relationships, pollination and seed dispersal, energy flow, and nutrient cycling. Additionally, enhancing connectivity and linking natural landscapes is essential to accommodate species movements, range shifts, and continued ecological functions as the climate changes. Significant portions of the Verdugo Mountains and San Rafael Hills remain intact and opportunities remain to restore, enhance and maintain connectivity between these ranges and the greater San Gabriel Mountains.

The Rim of the Valley Corridor Draft Special Resource Study and Environmental Assessment (NPS Spring 2015) found that "[m]any of the significant resources within the study area augment the national significance of Santa Monica Mountains National Recreation Area (SMMNRA) and provide habitat connectivity essential for long-term preservation of the significant resources within the Santa Monica Mountains, thus warranting physical connection to SMMNRA and/or a seamless, collaborative management approach". Further, the "study area contains nationally significant resources, not currently represented in the national park system, which offer new opportunities for scientific research, interpretation, and education and are therefore suitable for inclusion in the national park system". The study recommends "an adjustment to the boundary of SMMNRA and a collaborative partnership-based management model exemplified by SMMNRA, which respects the complex mix of existing land use,

[1] As directed by Congress through the Consolidated Natural Resources Act of 2008 (P.L. 110-229-May 2008), the National Park Service (NPS) is conducting a "special resource study" of the area known as the Rim of the Valley Corridor, generally including the mountains encircling the San Fernando, La Crescenta, Santa Clarita, Simi, and Conejo Valleys in California.

ownership, and regulatory authorities". Approximately 95% of the land in the proposed HTC study (20,948 acres) lies within the boundary adjustment to the SMMNRA under the Preferred Alternative.

Habitat connectivity has long been recognized as essential to the long-term preservation of the significant natural resources in the Eastern Rim of the Valley (Figure 1). The connection between the Angeles National Forest and the Verdugo Mountains was identified by a California Department of Fish and Wildlife biologist at the statewide Missing Linkages conference (Penrod et al. 2001). Former Chief of Natural Resources at California State Parks, Richard Rayburn, a partner in the Missing Linkages effort and the subsequent South Coast Missing Linkages Project; an instrumental player in the preservation of Coal Canyon; and an avid ambassador on the importance of habitat connectivity in Sacramento, expressed the need to maintain and restore connectivity between the Verdugo and San Gabriel Mountains and his desire to see it done (pers. comm., 8/21/2001 from R. Rayburn to K. Penrod carpooling to Pasadena for their interview with Larry Mantle on KPCC's Air Talk http://www.scpr.org/programs/airtalk/2001/08/21/10007/wildlife-corridors/). The Verdugo Mountains were also identified as a Natural Landscape Block in need of connectivity by the California Essential Habitat Connectivity Project (Spencer et al. 2010). This HTC study connects the Verdugo Mountains and San Rafael Hills to the South Coast Wildland Network delineated by a highly collaborative inter-agency effort that prioritized and designed landscape linkages to maintain connected wildlife populations from the southern Sierra Nevada to Baja California and from the coast to the desert (Figure 2; Beier et al. 2006, SC Wildlands 2008, http://www.scwildlands.org/reports/SCMLRegionalReport.pdf). This interconnected system of wildlands should allow natural ecological processes -- such as migration and range shifts with climate change -- to continue operating as they have for millennia. These landscape linkages and the wildlands they connect are largely considered the backbone of a regional conservation strategy for southern California to which smaller wildlands, such as the Verdugo Mountains and San Rafael Hills, can be connected.

2. Ecological values

The Hahamongna to Tujunga Wildlife Corridor Biological Study area features land of exceptional value that is essential for sustaining ecological and evolutionary processes across the landscape. Remarkable features include:

- Expansive intact habitat with a diversity of over 20 different natural communities.
- 47 currently recorded species and communities listed as threatened, endangered, or sensitive.
- Designated critical habitat for two species, southwestern willow flycatcher (*Empidonax traillii extimus)* and Santa Ana sucker (*Catostomus santaannae*), covering 1,452 acres of land in the HTC study, with approximately 5.6 miles of Big Tujunga Wash designated as critical habitat for the Santa Ana sucker.
- Streams and rivers that support species such as the Santa Ana sucker, arroyo chub (*Gila orcuttii*), Santa Ana speckled dace (*Rhinichthys osculus* ssp. 3), and western pond turtle (*Emys marmorata*)..
- Over 400 native plant taxa that have been documented in the Verdugo Mountains and San Rafael Hills (Soza et al. 2013), including 12 taxa considered rare or endangered by the California Native Plant Society.
- Three Significant Ecological Areas in Los Angeles County: Tujunga Valley/Hansen Dam, Verdugo Mountains and the Altadena Foothills and Arroyos.
- The Tujunga Valley/Hansen Dam Important Bird Area identified by National Audubon Society.

2.1. Physiographic features

The Verdugo Mountains and San Rafael Hills are part of the Transverse Ranges and together form a 13-mile long mountainous region that runs parallel to the San Gabriel Mountains. They are bound by the San Fernando Valley to the west, the Crescenta Valley to the east, and the Arroyo Seco to the south, and are largely surrounded by a highly urbanized landscape. Three major strands of habitat extend from the San Gabriel Mountains; from west to east these include 1) Little Tujunga Wash to Hansen Dam and the Tujunga Valley; 2) Big Tujunga Wash to the Verdugo Mountains, and 3) Arroyo Seco to Cottonwood Creek in the San Rafael Hills. The Verdugo Mountain range encompasses 19 square miles of habitat that remains tenuously connected to the Angeles National Forest via Big Tujunga Wash. Southwest-facing canyons in the Verdugo Mountains include La Tuna, McDonald, Chandler, Jeffries, Fisher, Brace, McClure, Stough, Wildwood, Sunset, Deer, Elmwood, Childs, Pomeroy, Sherer and Dead Horse Canyons, while transmontane canyons in the Verdugos include Avars, Engleheard, Henderson, Cunningham, Sheep Corral and Las Barras Canyons. The San Rafael Hills are divided from the Verdugo Mountains by Verdugo Wash and are bordered to the east by the Arroyo Seco. Major physiographic features in the San Rafael Hills include Cottonwood Canyon, Sycamore Canyon, Scholl Creek, and Flint Peak. The Hahamongna to Tujunga Wildlife Corridor Biological Study area is topographically diverse with elevations ranging from approximately 600 to 3100 feet.

2.2. Historic and current land use

The Hahamongna to Tujunga Wildlife Corridor Biological Study area is part of the indigenous Tongva people's ancestral territory, and ethnographic studies indicate that the Verdugo Mountains historically contained villages at some springs in the canyons (Gumprecht 1999). During California's Spanish and Mexican periods, the HTC study area was part of the Rancho San Rafael land grant with the boundaries primarily defined by the Verdugo Mountains, the Arroyo Seco and the Los Angeles River, and was primarily rangeland (Kielbasa 1998). More information on historic use of the land in the HTC study area is described in Section 3.1.

The Hahamongna to Tujunga Wildlife Corridor is located in Los Angeles County, which recently completed a 2035 General Plan that was adopted by the Los Angeles County Board of Supervisors on October 6, 2015. Available county land use data, circa 1980, shows that most land uses in the planning area focus on natural resources, with the great majority identified as Open Space or Recreation. Past agricultural and ongoing urbanization has radically altered the landscape in land adjacent to the HTC study area, as well as limited areas within the HTC study, but opportunities still remain to restore, maintain and enhance natural connectivity. The 2035 General Plan includes Significant Ecological Areas (SEA), three of which combined overlap 61% (13,395 ac) of the planning area (Figure 4): Verdugo Mountains SEA (11,270 acres), Altadena Foothills and Arroyos SEA (8,457 acres), and the Tujunga Valley/Hansen Dam SEA (2,597 acres; Los Angeles County 2012 a,b,c). These SEAs largely coincide with the land use data from decades ago, documenting the continued ecological importance of these areas for conservation. This HTC study would provide connectivity between these SEAs. In addition to unincorporated Los Angeles County, the cities of Burbank, Glendale, Pasadena and Los Angeles all have land within their jurisdictions that are in or adjacent to the HTC study area. Land planning, land use, and open space policies in county and city general plans can substantially influence conservation of land in the HTC and General

Plan update processes provide opportunities to ensure zoning in the HTC study area is conducive to conserving natural connectivity.

Urban development covers relatively little land in the HTC and is primarily situated along major transportation routes, creating choke-points where development has severed or threatens to sever connectivity. Rural residential and ranch-style development is expanding in the San Rafael Hills, along La Tuna Canyon in the Verdugo Mountains, and through Shadow Hills between the Verdugo Mountains and Hansen Dam. These areas at the urban-wildland interface should be targeted for outreach campaigns focused on land stewardship and maintaining landscape permeability for wildlife. There are three golf courses depicted on the land use map (Figure 4) covering 317 acres, although the 352-acre Angeles National Golf Club in Big Tujunga Wash north of I-210 is not depicted on the map or in other available land use data. It will be important to work with Angeles National Golf Club, Oakmont Country Club, Chevy Chase Country Club and Scholl Canyon Golf and Tennis Club to make their grounds more amenable to wildlife movement, particularly at key choke-points.

2.3. Wildlife and habitat values

The Hahamongna to Tujunga Wildlife Corridor is within the South Coast Ecoregion of California. The ecoregion supports a multitude of irreplaceable biological resources and is a hotspot for species at risk of extinction. California has the greatest number of threatened and endangered species in the continental United States (Wilcove et al. 1998). In an analysis that identified "irreplaceable" places for preventing species extinctions (Stein et al. 2000), the South Coast Ecoregion stood out as one of the six most important areas in the United States (along with Hawaii, the San Francisco Bay Area, Southern Appalachians, Death Valley, and the Florida Panhandle). The ecoregion is part of the California Floristic Province, one of 25 global hotspots of biodiversity, and the only one in North America (Mittermeier et al. 1998, Mittermeier et al. 1999).

2.3.1. Fish, wildlife and habitat presence, use, and diversity

The Hahamongna to Tujunga Wildlife Corridor study area supports a rich mosaic of natural communities (Figure 5). Chaparral and coastal sage scrub are the dominant plant communities, with groves of coast live oak woodland and walnut woodland on north facing slopes and in ravines, scattered grasslands (native bunchgrass and valley and southern coastal grassland), and riparian forest, woodland and scrub communities along drainages dominated by cottonwood, sycamore, and various willow species. Table 1 provides a summary of the vegetation and land cover types that occur on the HTC parcels, while Appendix A-3 provides vegetation and land cover types by parcel. Sumac shrub covers the most area within the HTC, followed by lower montane mixed chaparral and California sagebrush. Designated sensitive natural communities within the HTC include Riversidian alluvial fan sage scrub, southern coast live oak riparian forest, southern sycamore alder riparian woodland, and southern mixed riparian forest. These natural communities along with year-round water sources support a remarkable array of native plants and animals.

The Hahamongna to Tujunga Wildlife Corridor study area supports a high level of plant diversity. A recent floristic study of the Verdugo Mountains and San Rafael Hills (Soza et al. 2013) documented 422 native plant taxa in these ranges, including 12 species considered rare or endangered by the California Native Plant Society. The study included a survey of historical collections from 6 herbaria along with field

work. Because the field component followed several fires that occurred between 1999 and 2002, it includes extensive documentation of fire followers for the area.

Table 1. Vegetation and Land Cover Summary for HTC Parcels (Source: CalVeg 2014)

Vegetation or Land Cover	Acres	Protected	% Protected
Annual Grasses & Forbs	520.17	181.94	35%
Baccharis (Riparian)	20.34	18.82	93%
Barren	585.64	337.34	58%
Bigcone Douglas Fir	6.5	1.46	22%
Buckwheat	108.33	81.27	75%
California Bay	4.26	0.63	15%
California Sagebrush	3465.18	1793.36	52%
California Sycamore	13.71	9.47	69%
Ceanothus Mixed Chaparral	482.60	145.20	30%
Coast Live Oak	542.18	237.11	44%
Coastal Mixed Hardwood	312.22	267.00	86%
Eucalyptus	5.42	1.57	29%
Fremont Cottonwood	0.25	0.25	100%
Lower Montane Mixed Chaparral	4018.48	2914.17	73%
Non-Native/Invasive Grass	26.02	19.39	75%
Non-Native/Ornamental Conifer	18.20	10.77	59%
Non-Native/Ornamental Conifer/Hardwood	190.86	82.53	43%
Non-Native/Ornamental Grass	468.15	319.63	68%
Non-Native/Ornamental Hardwood	77.04	50.15	65%
Orchard/Agriculture	9.11	9.10	100%
Pasture & Crop Agriculture	0.07	0.07	100%
Riparian Mixed Hardwood	50.55	35.99	71%
Riparian Mixed Shrub	6.38	0.00	0%
Riversidian Alluvial Scrub	890.45	713.64	80%
Scalebroom	14.06	8.06	57%
Scrub Oak	867.33	627.26	72%
Soft Scrub Mixed Chaparral	1544.06	357.79	23%
Sumac Shrub	6138.65	4514.06	74%
Urban or Industrial Impoundment	7.67	7.67	100%
Urban/Developed (General)	1235.32	413.29	33%
Urban-related Bare Soil	231.09	188.95	82%
Water	73.18	54.96	75%
White Alder	3.58	3.25	91%
Willow	239.80	235.86	98%
Willow (Shrub)	21.95	7.22	33%

The HTC study area supports an unusually high diversity of bird species, with over 50 species recorded on just one 11-acre parcel in Cottonwood Canyon (Juhasz 2013, Long 2013). The region's wetland and riparian communities are important to resident, over-wintering, and migratory birds on the Pacific Flyway, in addition to providing year-round habitat and critical resources for resident species. Audubon Society has identified Tujunga Valley/Hansen Dam as an Important Bird Area (National Audubon Society 2008). The area southwest of the Dam is used as a spreading ground, which has created several freshwater marshes that are used by marsh birds, migratory waterfowl, and shore birds. The HTC study area provides abundant foraging, perching, and nesting habitat for birds of prey. A California spotted owl (*Strix occidentalis occidentalis*) took refuge in the shaded canopy of lower Cottonwood Canyon in October 2014, and was photographed and video-taped eating a woodrat (pers. comm. M. Long and http://www.arroyosfoothills.org/cottonwood/). Natural communities in the HTC study area are important to resident, over wintering, and migratory birds, in addition to providing year-round habitat and critical resources for resident species

The HTC study area supports a diversity of amphibians and reptiles. The large number of perennial drainages, seeps and springs within the moister woodland areas and canyon bottoms provide potential habitat for amphibians and reptiles such as Pacific chorus frog (*Pseudacris hypochondriaca*), California toad (*Anaxyrus halophilus*), black-bellied slender salamander (*Batrachoseps nigriventris*), arboreal salamander (*Aneides lugubris*), coast range newt (*Taricha torosa*), western pond turtle (*Emys marmorata*), and the two-striped garter snake (*Thamnophis hammondii*). The HTC study area also provides essential elements for reptiles dependent on upland habitats such as rock outcroppings for thermoregulation and small mammal burrows for escape cover. The variety of habitat types in the HTC study area has the potential to support reptiles such as coast horned lizard (*Phrynosoma blainvillei*), silvery legless lizard (*Anniella pulchra pulchra*), alligator lizard (*Elgaria multicarinata*), ring-necked snake (*Diadophis punctatus*), and California mountain kingsnake (*Lampropeltis zonata*).

Mammal diversity is high. The natural communities support enough prey species for both large and small carnivores, including mountain lion (*Puma concolor*), bobcat (*Felis rufus*), gray fox (*Urocyon cinereoargenteus*), striped and spotted skunks (*Mephitis mephitis and Spilogale gracilis*), long-tailed weasel (*Mustela frenata*), among others. Other mammals include mule deer (*Odocoileus hemionus*), San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), Western gray squirrel (*Sciurus griseus*), Merriam's Chipmunk (Tamias merriami), southern grasshopper mouse (*Onychomys torridus ramona*), and numerous other small rodents.

2.3.2. Endangered, threatened, rare, and/or declining species or habitats

Many of the species found within the HTC study area are listed as endangered, threatened, or sensitive by natural resource agencies (Table 2 and Figure 6. The coastal California gnatcatcher (*Polioptila californica californica*) is one of the best-known species dependent on coastal sage scrub communities. The region's wetland and riparian communities are important to a number of imperiled species for breeding habitat, including endangered songbirds such as least Bell's vireo (*Vireo bellii pusillus*; USFWS 1998) and southwestern willow flycatcher (USFWS 2002). Big Tujunga Wash is designated as critical habitat for the flycatcher (USFWS 2013).

The HTC study area includes designated critical habitat for the federally threatened Santa Ana sucker along Big Tujunga Wash (USFWS 2014, USFWS 2010) and supports two other native freshwater fish,

the arroyo chub and Santa Ana speckled dace. The southern mountain yellow-legged frog (*Rana muscosa*) and western pond turtle are a few of the special status herpetofauna that have been recorded in Big Tujunga Creek. Sensitive reptiles that prefer drier habitats and sparser vegetative cover, such as coast horned lizard, silvery legless lizard and coastal whiptail (*Aspidoscelis tigris stejnegeri*) have been recorded within the HTC study area.

The study area provides habitat for numerous imperiled plant species, such as Nevin's barberry (*Berberis nevinii*), Davidson's bush-mallow (*Malacothamnus davisonii*), San Fernando Valley spineflower (*Chorizanthe parryi var. fernandina*), and slender-horned spineflower (*Dodecahema leptoceras*). The slender-horned spineflower is an endemic species restricted to alluvial fans on the coastal side of the Transverse and Peninsular Ranges and is considered one of the most critically endangered plant species in southern California (USFWS 1987, Croft 1989, Stephenson and Calcarone 1999, California Native Plant Society 2001, USFS 2002).

Table 2 provides a summary of threatened, endangered and sensitive species and sensitive natural communities that have been recorded within the HTC, while Appendix A-3 provides this information by parcel. Those species denoted with ** are Draft Species of Greatest Conservation Need for CDFW South Coast Region (pers. Comm. D. Blankenship). Roughly 1,452 acres in the HTC area are designated as critical habitat for southwestern willow flycatcher and Santa Ana sucker (Figure 6 and Appendix A-3). Maintaining habitat connectivity can help prevent additional species from becoming endangered, can stabilize existing populations, and can prevent costly long-term recovery efforts.

Table 2. Threatened, Endangered and Sensitive Species and Sensitive Natural Communities

Species	ESA	CESA	Rank	Other Status
Mammals				
hoary bat (*Lasiurus cinereus*)	None	None	G5 S4	IUCN:LC WBWG:M
San Diego black-tailed jackrabbit (*Lepus californicus bennettii*)**	None	None	G5T3T4 S3S4	CDFW:SSC
southern grasshopper mouse (*Onychomys torridus ramona*)**	None	None	G5T3 S3	CDFW:SSC
Birds				
coastal California gnatcatcher(*Polioptila californica californica*)**	Threatened	None	G3T2 S2	CDFW:SSC NABCI:YWL
least Bell's vireo (*Vireo bellii pusillus*)	Endangered	Endangered	G5T2 S2	IUCN:NT NABCI:YWL
southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered	Endangered	G5T2 S1	NABCI:RWL
Reptiles and Amphibians				
silvery legless lizard (*Anniella pulchra pulchra*)	None	None	G3G4T3T4Q S3	CDFW:SSC USFS:S
coastal whiptail (*Aspidoscelis tigris stejnegeri*)	None	None	G5T3T4 S2S3	

western pond turtle (*Emys marmorata*)**	None	None	G3G4 S3	BLM:S CDFW:SSC IUCN:VU USFS:S
coast horned lizard (*Phrynosoma blainvillii*)**	None	None	G3G4 S3S4	BLM:S CDFW:SSC IUCN:LC
southern mountain yellow-legged frog (*Rana muscosa*)**	Endangered	Endangered	G1 S1	CDFW:SSC IUCN:EN USFS:S
Fish				
Santa Ana sucker (*Catostomus santaanae*)	Threatened	None	G1 S1	AFS:TH CDFW:SSC IUCN:VU
arroyo chub (*Gila orcuttii*)	None	None	G2 S2	AFS:VU CDFW:SSC USFS:S
Santa Ana speckled dace (*Rhinichthys osculus* ssp. 3)	None	None	G5T1 S1	AFS:TH CDFW:SSC USFS:S
Plants				
western spleenwort (*Asplenium vespertinum*)			G4 S4	RPR:4.2
Nevin's barberry (*Berberis nevinii*)	Endangered	Endangered	G1 S1	RPR:1B.1
Brewer's calandrinia (*Calandrinia breweri*)	None	None	G4 S34	RPR:4.2
slender mariposa-lily (*Calochortus clavatus* var. *gracilis*)	None	None	G4T2T3 S2S3	RPR:1B.2 BLM:S USFS:S
Plummer's mariposa-lily (*Calochortus plummerae*)	None	None	G4 S4	RPR:4.2
Lewis' evening-primrose (*Camissoniopsis lewisii*)	None	None	G2G3 S1S3	RPR:3
southern tarplant (*Centromadia parryi* subsp. *australis*	None	None	G3T2 S2	RPR:1B.1
San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*)	Candidate	Endangered	G2T1 S1.1	RPR:1B.1 USFS:S
Parry's spineflower (*Chorizanthe parryi* var. *parryi*)	None	None	G3T3 S2	RPR:1B.1 BLM:S USFS:S
California saw-grass (*Cladium californicum*)	None	None	G4 S2	RPR:2B.2 USFS:S
monkey-flower savory (*Clinopodium mimuloides*)	None	None	G3 S3	RPR:4.2
slender-horned spineflower (*Dodecahema leptoceras*)	Endangered	Endangered	G1 S1	RPR:1B.1
Palmer's grapplinghook (*Harpagonella palmeri*)	None	None	G4 S34	RPR:4.2
mesa horkelia (*Horkelia cuneata ssp. puberula*)	None	None	G4T1 S1	RPR:1B.1 USFS:S
California satintail (*Imperata brevifolia*)	None	None	G3 S3	RPR:2B.1 USFS:S
southern California black walnut (*Juglans californica*)	None	None	G3 S3	RPR:4.2
fragrant pitcher sage (*Lepechinia fragrans*)	None	None	G3 S3	RPR:4.2 BLM:S
ocellated humboldt lily (*Lilium humboldtii* subsp. *Ocellatum*)	None	None	G4T3 S3	RPR:4.2
Davidson's bush-mallow (*Malacothamnus davidsonii*)	None	None	G1 S1.1	RPR:1B.2

California spineflower (*Mucronea californica*)	None	None	G3 S3	RPR:4.2
Hubby's phacelia (*Phacelia hubbyi*)	None	None	G4 S4	RPR:4.2
chaparral rein orchid (*Piperia cooperi*)	None	None	G3 S3	RPR:4.2
Michael's rein orchid (*Piperia michaelii*)	None	None	G3 S3	RPR:4.2
white rabbit-tobacco (*Pseudognaphalium leucocephalum*)	None	None	G4 S2S3.2	RPR:2B.2
San Gabriel oak (*Quercus durata* var. *gabrielensis*)	None	None	G4T3 S3	RPR:4.2
Engelmann oak (*Quercus engelmannii*)	None	None	G3 S3	RPR:4.2
Parish's gooseberry (*Ribes divaricatum* var. *parishii*)	None	None	G4TH SH	RPR:1A
Greata's aster (*Symphyotrichum greatae*)	None	None	G3 S3	RPR:1B.3 BLM:S
Sonoran maiden fern (*Thelypteris puberula* var. *sonorensis*)	None	None	G5T3 S2	RPR:2B.2 USFS:S
Sensitive Natural Communities				
Riversidian Alluvial Fan Sage Scrub	None	None	G1 S1.1	
Southern Coast Live Oak Riparian Forest	None	None	G4 S4	
Southern Mixed Riparian Forest	None	None	G2 S2.1	
Southern Sycamore Alder Riparian Woodland	None	None	G4 S4	

Global Rank: G1 = Critically Imperiled; G2 = Imperiled; G3 = Vulnerable; G4 = Apparently Secure; G5 = Secure. Subspecies Level Taxa which are subspecies or varieties receive a taxon rank (T-rank) attached to their G-rank. Where the G-rank reflects the condition of the entire species, the T-rank reflects the global situation of just the subspecies. State Rank: S1 = Critical Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; S5 = Secure. Other Status: AFS:EN = Endangered; AFS:TH = Threatened; AFS:VU = Vulnerable; BLM:S = Sensitive; CDF:S = Sensitive; CDFW:FP = Fully Protected; CDFW:SSC = Species of Special Concern; CDFW:WL = Watch List; IUCN:CR = Critically Endangered; IUCN:EN = Endangered; ICUN:LC = Least Concern; IUCN:NT = Near Threatened; IUCN:VU = Vulnerable; NABCI:RWL = Red Watch List; NABCI:YWL = Yellow Watch List; USFS:S = Sensitive; USFWS:BCC = Bird of Conservation Concern; WBWG:H = High Priority; WBWG:M = Medium Priority; Rare Plant Rankings: 1A. Presumed extirpated in California and either rare or extinct elsewhere; 1B. Rare or Endangered in California and elsewhere; 2A. Presumed extirpated in California, but more common elsewhere; 2B. Rare or Endangered in California, but more common elsewhere; 3. Plants for which we need more information - Review list; 4. Plants of limited distribution - Watch list. CRPR use a decimal-style threat rank, an extension added onto the CRPR with 1 being the most threatened and 3 being the least threatened.

2.3.3. Presence of non-native and/or invasive species

No comprehensive assessment of the distribution and abundance of invasive plant and animal species has been conducted in the proposed HTC study, although most of the land's habitat is relatively intact. However, a recent floristic study (Soza et al. 2013) identified 163 non-native plant taxa in the Verdugo Mountains and San Rafael Hills, including invasive, naturalized and ornamental plant species. Surveys of the flora and fauna on individual properties conducted during site-level planning and implementation of the HTC study should identify the presence of non-native and/or invasive species to develop a plan for their control or eradication, as needed. Section 4.1.3. provides a few examples of local cooperative efforts underway to address invasive species in the HTC study area.

2.3.4. Site and Resource Viability

Significant conservation investments already exist in the Verdugo Mountains, San Rafael Hills and San Gabriel Mountains, but the resource values they support could be irreparably harmed by further loss of habitat connectivity. The Hahamongna to Tujunga Wildlife Corridor Biological Study identifies parcels (i) that if conserved can restore connectivity between the San Rafaels, Verdugos, and San Gabriel Mountains (ii) that are essential to maintain the viability of existing conservation lands, (iii) that are critical to enhance depleted corridors, and (iv) needed to secure and expand other conservation investments in the Verdugo Mountains and San Rafael Hills. Maintaining and restoring habitat connectivity is essential for

safeguarding resource viability and ensuring the ecological integrity of our existing conservation investments, especially with climate change.

Disruption of movement patterns by roads, development and other impediments can alter essential ecosystem functions, such as predator-prey relationships, gene flow, pollination and seed dispersal, competitive or mutualistic relationships among species, resistance to invasion by alien species, energy flow, and nutrient cycling. Without the ability to move among and within natural habitats, species become more susceptible to fire, flood, disease and other environmental disturbances and show greater rates of local extinction (Soulé and Terborgh 1999). Numerous scientific studies predict that isolated populations are more susceptible to extinction than connected populations (MacArthur and Wilson 1967, Levins 1970, Shaffer 1981, Schonewald-Cox 1983, Soulé 1987, Taylor 1990, Hanski and Gilpin 1991, Mills and Smouse 1994). Thus, establishing connections among natural lands has long been recognized as important for sustaining natural ecological processes and biodiversity (Noss 1987, Harris and Gallagher 1989, Noss 1991, Beier and Loe 1992, Noss 1992, Beier 1993, Forman 1995, Beier and Noss 1998, Crooks and Soulé 1999, Soulé and Terborgh 1999, Penrod et al. 2001, Crooks et al. 2001, Tewksbury et al. 2002, Forman et al. 2003, Beier et al. 2006, Spencer et al. 2010, NPS 2015).

2.4. Landscape values

2.4.1. Juxtaposition and relationship to other conservation lands

This HTC study serves to build upon and connect already conserved lands in the Verdugo Mountains and San Rafael Hills with almost a half million acres of conserved wildlands in the San Gabriel Mountains unit of the Angeles National Forest. The HTC study area encompasses 22,098 acres, of which 62% (13,698 acres) is protected in fee or conservation easements on land overseen by California Department of Parks and Recreation, Santa Monica Mountains Conservancy, Mountain Recreation and Conservation Authority, Los Angeles County, and the cities of Burbank, Glendale, La Cañada-Flintridge, Los Angeles and Pasadena, Fond Land Preservation Foundation and the Arroyos & Foothills Conservancy (Figure 7). This HTC study serves to connect the Verdugo Mountains and San Rafael Hills to almost a half million acres of land in the San Gabriel Mountains of the Angeles National Forest. Strategically conserving and restoring essential connections between our existing conservation investments is an effective and cost- efficient measure to reduce the adverse effects of habitat loss and fragmentation.

2.4.2. Contribution to wildland connectivity and corridors

The primary premise of the Hahamongana to Tujunga Wildlife Corridor Biological Study is to contribute to wildland connectivity and corridors by linking the Verdugo Mountains and San Rafael Hills to the San Gabriel Mountains. The HTC study also ties into the larger South Coast Wildland Network (SC Wildlands 2008), which is largely considered the backbone of a regional conservation strategy for southern California.

The Hahamongna to Tujunga Wildlife Corridor Biological Study provides live-in and move-through habitat for multiple species. NPS scientists are engaged in numerous studies and monitoring programs (see Section 4.1.1.) related to habitat fragmentation, wildlife corridors, and landscape linkages in the region and recently collared an approximately eight-year old male mountain lion (P-41) in the Verdugo

Mountains in early May of 2015 http://www.latimes.com/local/california/la-me-verdugo-puma-20150529-story.html. This is the first large carnivore to be studied in the Verdugo Mountains, which at just 19 square miles were previously thought too small to support the species, as typical home range sizes for male lions cover as much as 250 square miles. Yet a male mountain lion (P-22) in Griffith Park, has thrived since 2012 in an even smaller space -- just eight square miles. Since NPS scientists have been following P-41 he has stayed in the Verdugo Mountains and has not crossed either State Route 2 or Interstate 210 (pers. comm. S. Riley, NPS 8/18/2015). Recently, P-41 was photographed mating (pers.comm. J. Howell). NPS is quite certain that P-41 crossed 210 to enter the Verdugos, since there are several reports and photos of a lion they are confident is P-41 north of Interstate 210 near Tujunga in early 2015 (pers. comm. S. Riley). This would indicate that wildlife can and do use Big Tujunga Wash as a movement corridor between the San Gabriel and Verdugo Mountains.

Toward the east end of the HTC study area, the Arroyos & Foothills Conservancy has been working diligently to preserve Cottonwood Canyon, a critical choke-point that links the San Rafael Hills to the Arroyo Seco and Millard Canyon in the San Gabriel Mountains. The Conservancy and its advisors have conducted two surveys to confirm permeability through Devil's Gate Dam in the upper Arroyo Seco and to identify opportunities to enhance and improve landscape permeability both at the dam and to the south of the dam (http://www.arroyosfoothills.org/cottonwood-wildlife-corridors/). Their findings are supported by several existing studies (U.S. Army Corps of Engineers 2011, Camp Dresser & McKee 2011, National Park Service 2012, Northeast Trees 2006). The Conservancy also has several wildlife cameras on-site in Cottonwood Canyon and has recorded several species moving through the area and utilizing the perennial spring that flows year-round into the Arroyo Seco (See photos in Appendix A-2). This HTC study can help influence regional development and land-management patterns in a manner that best preserves landscape level processes and ensures the greatest protection for our essential natural areas.

2.4.3. Relationship of area to existing or planned conservation planning efforts

Several existing planning efforts can influence conservation of natural resources in the Hahamongna to Tujunga Wildlife Corridor Biological Study area (Figure 8). A number of studies have recognized the importance of maintaining habitat connectivity here (Penrod et al. 2001, Spencer et al. 2010, National Park Service 2015) and regionally (SC Wildlands 2008). As such, the National Park Service's Rim of the Valley Corridor Study (2015) recommends that 95% of the land in the HTC study area (20,948 acres) be included in a boundary adjustment to the Santa Monica Mountains National Recreation Area, due to its significance for maintaining habitat connectivity and opportunities for scientific research and recreation. In addition, this HTC study area links to and complements the existing approved Altadena Foothills Conservation Plan.

The Santa Monica Mountains Conservancy's Rim of the Valley Trail Corridor Master Plan (1990) guides priorities for management and acquisition in the study area. Los Angeles County's 2035 General Plan includes three Significant Ecological Areas (SEAs: Verdugo Mountains, Tujunga Valley/Hansen Dam, and Altadena Foothills and Arroyos) covering 61% (13,395 acres) of the HTC study area. The Nature Conservancy identifies Big Tujunga Wash as an eco-regional priority and Tujunga Valley/Hansen Dam are also identified as an Important Bird Area by Audubon.

Other key planning efforts include Common Ground: From Mountains to the Sea (The Resources Agency, San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy, and Santa Monica Mountains

Conservancy 2001); the Arroyo Seco Watershed Restoration Feasibility Study (North East Trees and the Arroyo Seco Foundation 2002), the Arroyo Seco Master Plans (Hahamongna Watershed Park Master Plan, Central Arroyo Master Plan and Lower Arroyo Master Plan; City of Pasadena 2003), the Arroyo Seco Watershed Ecosystem Restoration Study currently underway by the U.S. Army Corps of Engineers and County of Los Angeles; the Los Angeles River Revitalization Master Plan (City of Los Angeles 2007); and the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP 2014).

Recovery plans for the southwestern willow flycatcher (USFWS 2002) and Santa Ana Sucker (USFWS 2014) can also influence linkage conservation. The cities of Burbank, Glendale, Pasadena, La Cañada- Flintridge and Los Angeles all administer significant open space in the HTC study area (Figure 7) for watershed integrity, as well as scenic and recreational opportunities. This HTC study will promote the conservation goals of many plans that have the potential to influence connectivity conservation, and it will support collaborative conservation planning among several agencies and organizations that administer land in the region.

2.4.4. WCB-funded acquisition and restoration funding in area

The Wildlife Conservation Board (WCB) has made significant conservation investments in the Los Angeles River Watershed (Table 3), providing over $156 million through their Land Acquisition, Habitat Enhancement and Restoration, and Public Access programs. The Board has contributed over $152 million towards acquisitions and easements covering 5,708 acres in the watershed, and in excess of $3 million on restoration, enhancement and public access projects. Two of these WCB projects are at critical locations for maintaining and restoring connectivity within or adjacent to the HTC study area.

The Millard Canyon Acquisition, owned and stewarded by the Arroyos & Foothills Conservancy, is just upstream of the easternmost strand of the HTC study in the foothills of the San Gabriel Mountains and flows into the Arroyo Seco, which connects to the priority Cottonwood Canyon parcel in the San Rafael Hills. The Big Tujunga Canyon Restoration effort covers 40,000 acres along this critical riparian zone and stretches from just north of Interstate 210 upstream on Forest Service Lands to just below Big Tujunga Dam, all within the HTC study, and will contribute to improving connectivity function between the San Gabriel and Verdugo Mountains. This HTC Biological Study will build upon these existing conservation investments.

Table 3. Wildlife Conservation Board Projects in the Los Angeles River Watershed

Acquisitions/Easements	**Acres**	**WCB Funding**	**Total Cost**
Joughin Ranch	1733.00	$ 5,005,000	$ 7,180,000
Monrovia Wilderness Preserve	429.00	$ 9,035,000	$ 18,631,593
Ahmanson Ranch	2959.00	$ 135,000,000	$ 170,000,000
Cahuenga Peak	137.75	$ 705,000	$ 11,705,000
Cold Creek Ecological Area	118.00	$ 425,000	$ 750,000
Rubio Canyon	18.00	$ 545,000	$ 635,000
Millard Canyon	13.00	$ 375,200	$ 475,200
Gateway Ranch	300.00	$ 1,660,000	$ 4,810,000
Acquisitions/Easements Subtotal	**5707.75**	**$ 152,855,200**	**$ 214,191,793**

Habitat Enhancement/Restoration and Public Access	Acres	WCB Funding	Total Cost
Whittier-Narrows (Legg) Lake	0.00	$ 50,000	$ 50,000
Whittier-Narrows (Legg) Lake	0.00	$ 139,674	$ 139,674
Whittier-Narrows (Legg) Lake	0.00	$ 311,000	$ 311,000
Whittier-Narrows Fishing Lakes Expansion	0.00	$ 358,500	$ 717,000
Peck Lake	0.00	$ 293,500	$ 291,411
Sepulveda Basin Wildlife Area	11.00	$ 479,800	$ 479,800
Rio de Los Angeles State Park, Taylor Yard Public Access	4.40	$ 77,000	$ 1,727,000
Southern California Coastal Wetland and Riparian Restoration	0.00	$ 400,000	$ 1,500,000
Big Tujunga Canyon Restoration	40000.00	$ 1,245,000	$ 2,571,500
Restoration, Enhancement and Public Access Subtotal	**40015.40**	**$ 3,354,474**	**$ 7,787,386**
Grand Total	**45723.15**	**$ 156,209,674**	**$ 221,979,179**

2.5. Water - Sources, availability, reliability, quality, rights

The Hahamongna to Tujunga Wildlife Corridor lies entirely within the Los Angeles River Watershed. Major drainages include portions of Big Tujunga Wash, Little Tujunga Canyon, Verdugo Wash, Arroyo Seco, and Rubio Canyon. There are also numerous blue-line and intermittent creeks and perennial springs and seeps in the Verdugo Mountains and San Rafael Hills, such as the perennial spring on the priority Cottonwood Canyon acquisition. These riparian habitats provide habitat and essential resources for numerous native species and are key wildlife movement corridors. Perennial or intermittent streams cover roughly 106 miles within the HTC study area. Appendix A-3 provides parcel level information for named and unnamed tributaries. Water availability and rights can influence land conservation and restoration activities. Such issues should be evaluated along with other encumbrances or rights associated with individual properties during site-level planning for implementation of this HTC study.

2.6. Climate change

2.6.1. Potential of area to help facilitate adaptation of species, habitats and communities to climate change

Enhancing connectivity and linking natural landscapes has been identified as the single most important adaptation strategy to conserve biodiversity during climate change (Heller and Zavaleta 2009). All of California's climate adaptation strategies (CNRA 2009, 2014), frameworks (Gov. Brown, CEPA, ARB 2014), and action plans (CDFG 2011; CNRA, CDFA, CEPA 2014) identify maintaining connectivity as one of the most important adaptation strategies to conserve biodiversity and support ecological functions during climate change. The natural areas in the Hahamongna to Tujunga Wildlife Corridor are topographically diverse and support a multitude of soils and microclimates, features that are important for supporting biodiversity and for allowing movement of species that must shift their ranges in response to climate change. Riparian systems, such as Little Tujunga, Big Tujunga and the Arroyo Seco, will be especially important to allow species to respond and adapt to climate change because they provide connectivity between habitats and across elevation zones (Seavy et al. 2009).

2.6.2. Potential of climate changes to diminish key wildlife and habitat values

California is expected to experience higher air and water temperatures, altered precipitation patterns, more severe El Niño climate events, increased storm frequency and intensity, and greater fire intensity and frequency under a warming climate (Safford 2007, Parry et al. 2007, CDFG 2011, CNRA 2014), all of which have the potential to diminish key wildlife and habitat values in the HTC study area. Maintaining connectivity to the South Coast Regional Wildland Network (SC Wildlands 2008) is the best chance for maximizing retention of biodiversity in the Hahamongna to Tujunga Wildlife Corridor in light of climate change. Isbell et al. (2015) offer the strongest evidence yet that biodiversity strengthens ecosystems, increasing their resistance to extreme climate events and improving their capacity to stem climate change.

3. Other attributes

3.1. Cultural resources

Historically, the Hahamongna to Tujunga Wildlife Corridor study area was part of the indigenous Tongva people's ancestral territory and ethnographic studies indicate that the Verdugo Mountains contained villages at some springs in the canyons (Gumprecht 1999). The Arroyo Seco has for thousands of years been a highway of travel and trade. The village of Hahamog'na (currently the site of Hahamongna Watershed Park) was the largest Tongva village in the Arroyo Seco, and was strategically located below the mouth of Millard Canyon, which was the access point to a trade route over the range and into the desert. According to Robinson (2005), "To obtain... materials, and to visit and trade with other peoples across the range, American Indians made the first footpaths into the mountains." The main Shoshone trail across the range ascended Millard Canyon, traversed behind Mount Lowe to Red Box Saddle, descended the West Fork of the San Gabriel River to Valley Forge Canyon, climbed up that canyon to Barley Flats, went down and across the head of Big Tujunga Canyon and up to Pine (Charlton) Flat, and continued on to the west end of Chilao (Robinson 2005). Here, the trail forked; one branch followed the high country northeast to Buckhorn, and then went down the South Fork of Little Rock Creek to the desert; the other branch dropped northwest into upper Alder Creek, and then ascended Indian Ridge (where traces of the old footpath can still be seen) to Sheep Camp Spring on the west slope of Mount Pacifico, and dropped down Santiago Canyon to Little Rock Creek and along it to the desert" (Robinson 2005).

The Spanish Portolá expedition of 1769-1770 passed through the village of Hahamog'na, where expedition leader Gaspar de Portolá gave the Arroyo Seco its name, which means "dry wash" in Spanish. During the Spanish and Mexican period, the area was part of the San Rafael land grant (Kielbasa 1998) and two historic dwellings have been preserved, the Casa Adobe De San Rafael in the southern San Rafael Hills and Catalina Verdugo Adobe in the southeastern Verdugo Mountains, just west of Highway 2.

The above information indicates a strong likelihood that cultural resources are present within areas of the HTC study, however no comprehensive assessment has been located. Historic and cultural resources should be taken into consideration as specific projects are implemented pursuant to the HTC study. This may include records searches with the information centers affiliated with the California Office of Historic Preservation and coordination or consultation with Tribal Councils and historical societies throughout the region, which may lead to archeological studies. For example, the Arroyos & Foothills Conservancy has identified artifacts in Cottonwood Canyon, including a water pipe system for spring water that was used to irrigate crop land in the Arroyo, and that the water was bottled for sale in Los Angeles. Upon acquisition

the Conservancy intends to have an archeology study done to better understand the waterworks and its significance to early Pasadena history.

3.2. Physical modifications and improvements

The great majority of land within the proposed HTC study area consists of intact habitat. However, the condition of parcels ranges between intact to highly-modified. Managers will need to consider bold actions in some areas of the HTC study, for example restoring areas of a golf course to natural habitats to improve wildlife connectivity between the Verdugo and San Rafael mountains. Physical improvements will have to be evaluated for suitability and feasibility of conversion to re-establish linkage(s) for wildlife. Such physical modifications and improvements should be evaluated during site-level assessments to determine their value to connectivity conservation and the implications for management. In addition, occupants of residential and commercial properties within the HTC study area should be targeted for stewardship outreach to mitigate impacts and enhance permeability.

3.3. Contaminants

No historical usage or dumping of hazardous materials is known for parcels within the HTC study area. Some level of assessment, up to Phase I hazardous materials assessments, should be conducted prior to acquisition of any property within the proposed HTC study area.

3.4. Threats

The conservation value of lands in the proposed HTC study area may be threatened by a variety of factors that cause habitat loss, fragmentation and degradation. Industrial, commercial and residential development is by far the most severe threat. The Verdugo Mountains and San Rafael Hills are virtual islands surrounded by a sea of development with tenuous connections between them and the San Gabriel Mountains. Development is sprawling and threatening to degrade or even sever these linkages. Of particular note are the two narrow strands of remaining habitat across State Route 2 from the Verdugo Mountains to the San Rafael Hills. The northern route extends from Eaglehead Canyon down to Verdugo Canyon Wash and Oakmont Country Club west of the highway to Glorietta Park owned by City of Glendale east of the highway. The southern route takes in remaining open space just north of Dead Horse Canyon down to Verdugo Park west of State Route 2 to Kirby Canyon in the San Rafael Hills. The northern route is under the most immediate threat. There are about 300 parcels in 2 dense clusters on either side of the 2 that are still undeveloped, south of Los Encinos Ave W of the 2 and Fox Hill Drive E of the 2, near the Fern Lane underpass. This area, along with the other cluster of larger parcels along Bayberry Drive, likely provides the best potential connection across this highway and should be targeted for immediate conservation action.

Development decreases abundance and diversity of native species, and promotes displacement of natives by non-native species. In California, these trends were evident for small mammals, birds, and butterflies (Blair 1996, Blair and Launer 1997, Sauvajot et al. 1998, Blair 1999, Rottenborn 1999, Strahlberg and Williams 2002) as the loss of native species increased as housing density increased. Conservation Biology Institute (2005) found negative effects of urbanization evident at housing densities as low as one dwelling unit per 40-50 acres. In general, housing densities below this threshold had little impact on birds and small

mammals. Although some lizards and small mammals occupy residential areas, most large carnivores, small mammals, and reptiles cannot occupy or even move through urban areas. Urban and industrial development also creates edge effects that reach well beyond the development footprint (e.g., pet cats travel considerable distances into wildlands and kill millions of wild animals each year), impacting wildlife movement in several ways (Minton 1968, Liddle 1997, Singer 1978, Churcher and Lawton 1987, Van der Zee et. al 1992, May and Norton 1996, Findlay and Houlihan 1997, Crooks and Soule 1999, May and Norton 1996, Suarez et al. 1998, Demaynadier and Hunter 1998, Courchamp and Sugihara 1999, Bolger et al. 2000, Hall et al. 2000, Viegas et. al 2003, Woodroffe and Frank 2005, Knickerbocker and Waithaka 2005, Hetherington 2005, Rich and Longcore 2006, Beier 2006, Perry and Fisher 2006, Riley et. al 2006).

Unlike road barriers (which can be modified with fencing and crossing structures), urban and industrial developments create barriers to movement, which cannot easily be removed, restored, or otherwise mitigated. Once a development is built, it is unlikely that its footprint will be reconfigured or that perimeter fences will be re-aligned or modified. Avoidance and careful site selection are the best ways to manage industrial, commercial and residential impacts in a wildlife linkage. Entities involved in implementing this HTC study should engage in early consultation with lead agencies on proposed development plans to recommend mitigation measures to reduce impacts to natural resources (e.g., incorporating measures into CCRs or deed restrictions).

3.5. Other issues, encumbrances and/or rights

Acquisitions in the HTC study could improve public access and access for management activities to existing conservation lands. No significant deeded right of ways are known in the HTC study area, however, whether special entitlements exist and the likelihood of them being exercised need to be considered when individual parcels are evaluated for acquisition including but not limited to road and utility rights-of-way, and mineral and water rights

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4. Management objectives and needs

4.1. Habitat and wildlife management

A variety of management activities will be necessary to provide live-in and move-through habitat for native species, such as habitat restoration, improving permeability across transportation barriers, and implementing outreach programs in communities at the urban-wildland interface. It is expected that various conservation partners will work with CDFW to develop a comprehensive HTC management plan from which more detailed management plans will pare off for each parcel acquisition or parcels with similar management needs. Specific management objectives and needs will vary depending on the resource values present. A HTC wide management plan will help to assure that management principles and practices are consistent throughout the entire HTC study area and reduce potential management conflicts. Collaborative inventorying and monitoring will be essential to evaluate conservation actions and improve adaptive management plans.

4.1.1. Critical inventory and monitoring needs

Monitoring the current status of species and ecosystems and the results of conservation actions is central to true adaptive management. Relatively few studies have been published on the natural and cultural resources of the Verdugo Mountains and San Rafael Hills, which have high potential for scientific study (NPS 2015). If Congress votes to approve the expansion of the Santa Monica Mountains National Recreation Area as described in the Preferred Alternative of the Rim of the Valley Corridor Study (NPS 2015), National Park Service (NPS) monitoring programs combined with US Forest Service monitoring programs could provide methodologies for use on newly acquired lands within the HTC study area and NPS would likely help conduct these monitoring efforts. The National Park Service's Mediterranean Coast Network (MEDN) Inventory & Monitoring (I&M) program conducts natural resource inventories and monitoring in the Santa Monica Mountains National Recreation Area. The mission of the MEDN I&M Program is to collaboratively develop and conduct scientifically credible inventories and long-term monitoring of sixteen park "vital signs" and to distribute this information for use by park staff, partners and the public. NPS has also been tracking mountains lions and other carnivores and monitoring culvert use in the Santa Monica Mountains National Recreation Area and surrounding region for over a decade and recently collared their first mountain lion (P-41) in the Verdugo Mountains in May of 2015. Nothing substitutes for scientifically rigorous studies that result in real data on the distribution and abundance of species in complex landscapes.

4.1.2. Ongoing habitat and wildlife management requirements

It is anticipated that the great majority of land acquired will be passively managed, minimizing operational and personnel costs. Detailed habitat and wildlife management activities will be identified during site-specific planning to implement the HTC study and will be developed through collaboration with the CDFW and the partnering agencies involved in each transaction.

4.1.3. Major habitat restoration needs and programs

Maintaining and restoring habitat connectivity requires identifying barriers to movement, including land uses that may hinder or prevent species from moving through the landscape. This section reviews the potential impacts of these features on ecological processes and suggests where and how their effects may be minimized to improve habitat connectivity and linkage function.

4.1.3.1. Mitigating the Impacts of Development

Mitigation for existing development focuses on reducing penetration of undesirable effects into natural areas (Marzluff and Ewing 2001). This requires the development of innovative programs that respect the property rights of the many people already living in the Eastern Rim of the Valley Corridor and enlists them as stewards that manage for wildlife permeability. Landowners should be encouraged to landscape with natural vegetation, minimize water runoff into streams, manage fire risk with minimal alteration of natural vegetation, keep pets indoors or in enclosures (especially at night), accept depredation on domestic animals as part of the price of a rural lifestyle, maximize personal safety with respect to large carnivores by appropriate behaviors, use pesticides and rodenticides carefully or not at all, and direct outdoor lighting toward houses and walkways and away from natural areas. Other recommendations to reduce the barrier effects of development include:

- Develop an outreach campaign on the importance of maintaining ecological connectivity that encourages residents at the urban wildland interface to become active stewards of the land. Topics

addressed may include: living with wildlife, predator-safe enclosures for livestock and pets, landscaping, water conservation, noise and light pollution.

Discourage residents and visitors from feeding or providing water for wild animals, or otherwise encouraging wildlife to lose their fear of people.

Install wildlife-proof trash and recycling receptacles, and encourage people to store their garbage securely.

Promote the use of drought tolerant native plants in landscaping and discourage the use of invasive, non-native plants that can supplant native plants and reduce habitat integrity.

Discourage the use of pesticides, insecticides, herbicides, and rodenticides, and educate residents and local business owners about the effects these chemicals have throughout the ecosystem.

Encourage homes abutting natural areas to have minimal outdoor lighting, directed toward the home and yard and away from natural habitats. Homeowners should use fences to keep dogs and domestic livestock from roaming into natural areas. Residents should be encouraged to keep cats indoors at all times.
Do not install artificial night lighting on rural roads, and reduce vehicle speeds in sensitive locations by speed bumps, curves, artificial constrictions, and other traffic calming devices.

Promote the use of wildlife-friendly fencing on property and lease boundaries. Developments within the HTC Study area should be encouraged to have permeable perimeters, not walls and wildlife-proof fencing should be used to keep wildlife out of areas that are dangerous to them.

Discourage the killing of 'threat' species such as rattlesnakes.

Pursue specific management protections for threatened, endangered, and sensitive species and their habitats.

Assist interested landowners with habitat enhancement projects to improve habitat quality and functional connectivity through cooperative programs such as Partners in Restoration.

Protect the Eastern Hahamongna to Tujunga Wildlife Corridor from further large-scale development. Integrate linkage designs into county and city general plans, local land use plans, and conservation plans of governments and nongovernmental organizations. Specifically, use zoning and other tools to retain open space and natural habitat and discourage further urbanization. Work with local planning agencies to discourage further subdivision of large parcels in the HTC Study area. Where development is permitted, encourage small building footprints on large parcels with a minimal road network. Any new roads in the HTC Study area should be built to standards described below. Stipulate as many of the above conditions as possible as part of the code of covenants and restrictions for individual landowners whose lots abut or are surrounded by natural habitat. Even if some clauses are not rigorously enforced, such stipulations can promote land stewardship and awareness of connectivity conservation.

4.1.3.2. Mitigating the Effects of Recreation

Recreational use is not inherently incompatible with wildlife movement, although, intense recreational activities have been shown to cause significant impacts to wildlife and plants (Knight and Cole 1995). Areas with high levels of off-road vehicle use show altered habitat use by vertebrates (Brattstrom and Bondello 1983, Nicolai and Lovich 2000). Even such relatively low-impact activities as wildlife viewing, hiking, and horseback riding have been shown to displace wildlife from nutritionally important feeding areas and prime nesting sites (Anderson 1995, Knight and Cole 1995). The increased time and energy spent avoiding humans can decrease reproductive success and make species more susceptible to disease (Knight and Cole 1995). However, if recreational activities are effectively planned, developed, managed, and monitored, most negative impacts can be avoided or minimized.

Connectivity conservation can be combined with compatible public goals such as recreation and protection of water quality. Trail systems should be planned to minimize resource damage and disturbance of wildlife. Clevenger (1998) found grizzly bears, black bears, cougars, and wolves avoided areas of high human use and used underpasses in these areas less frequently. To reduce the risk of species avoidance of crossing structures due to human presence, trails should be relocated when possible or human use of underpasses should be restricted (Clevenger and Waltho 2000). People should be encouraged to stay on trails, keep dogs on leashes, and travel in groups in areas frequented by mountain lions or bears. Visitors should be discouraged from collecting reptiles and harassing wildlife. Other recommendations to help prevent or mitigate the negative effects of recreation include:

- Monitor trail development and recreational use to provide a baseline and ongoing information for decisions regarding levels, types, and timing of recreational use.
- Work with the agencies and non-governmental organizations to develop and conduct on-the-ground, multi-lingual outreach programs to recreational users on how to reduce impacts.
- Limit off-road vehicles and off-trail activities to those that are consistent with maintaining functional habitat connectivity.
- Close, obliterate, and restore to natural habitat any unauthorized off-road vehicle routes and enforce closures.

4.1.3.3. Mitigating Impediments to Riparian Connectivity

Nearly all riparian systems in the west have been altered by human activity (Stromberg 2000) in ways that increase fragmentation. For animals associated with streams or riparian areas, impediments are presented by road crossings, vegetation clearing, invasion of non-native species, accumulation of trash and pollutants in streambeds, farming in channels, gravel mining, and high intensity livestock grazing. Groundwater pumping, upland development, water recharge basins, dams, and concrete structures to stabilize banks and channels change natural flow regimes which negatively impacts riparian systems. Increased runoff from urban development not only scours native vegetation but can also create permanent flow or pools in areas that were formerly ephemeral streams. Invasive species such as giant reed can displace native species in some permanent waters. Restoring riparian systems will enhance wildlife movement.

Riparian systems are one of the rarest habitat types in North America. About 80% of all animals use riparian resources and habitats at some life stage, and more than 50% of breeding birds nest chiefly in

riparian habitats (Krueper 1992). They are of particular value in lowlands (below 5,000 feet) as a source of direct sustenance for diverse animal species (Krueper 1992). Organisms moving through rugged landscapes often use riparian areas as travel routes. For example, many butterflies and frogs preferentially move along stream corridors (Orsack 1977, Kay 1989, USGS 2002). Although western pond turtles are capable of overland movements of up to 0.5 km (0.3 mi) (Holland 1994), they preferentially move along stream courses (Bury 1988). Even large, mobile vertebrates, such as mountain lions, have shown preferences for moving along riparian corridors (Beier 1995, Dickson et al. 2004). Riparian systems, because they provide connectivity between habitats and across elevation zones, will be especially important to allow species to respond and adapt to climate change (Seavy et al. 2009).

Measures to minimize development impacts on aquatic habitats often focus on establishing riparian buffer zones but research suggests that current regulations are inadequate to protect populations of many aquatic and semiaquatic organisms (Barton et al. 1985, Allan 1995, Wilson and Dorcas 2003). We suggest the following management recommendations to restore natural hydrologic functions and enhance connectivity along riparian corridors:

Maintain or restore riparian vegetation. Healthy riparian vegetation can protect and improve water quality, provide habitat and connectivity for a disproportionate number of species (compared to upland areas), and provide numerous social benefits including improving quality of life for residents and increasing nearby property values (Fisher and Fischenich 2000, Parkyn 2004, Lee et al. 2004). Continuous riparian corridors provide important wildlife connectivity but recommended widths to sustain riparian plant and animal communities vary widely, from 30 to 500 m (Wenger 1999, Fisher and Fischenich 2000, Wenger and Fowler 2000, Environmental Law Institute 2003). At a minimum, buffers should capture the stream channel and the terrestrial landscape affected by flooding and elevated water tables (Naiman et al. 1993). Where possible and historically appropriate, maintain or restore a continuous strip of native vegetation on each side of the channel at least 200 m wide measured perpendicular to the channel starting from the annual high water mark. Pursue cooperative programs to improve riparian conditions on private land in the Eastern Rim of the Valley Corridor.

Continuity between upland and riparian vegetation is also important to maintaining water quality and healthy riparian communities (Brosofske et al.1997, Wilson and Dorcas 2003). Many species commonly found in riparian areas depend on upland habitats during some portion of their lifecycle. Examples include butterflies that use larval host plants in upland habitat and drink water as adults and toads that summer in upland burrows. Buffers of sufficient width protect edge sensitive species from negative impacts like predation and parasitism. While the width of upland habitats needed beyond the stream's edge is unknown for many species, information on the western pond turtle suggests that a 1 km (0.6 mi) upland buffer (Holland 1994) is needed to sustain populations of this species.

Retain natural fluvial processes. Maintaining or restoring natural timing, magnitude, frequency, and duration of surface flows is essential for sustaining functional riparian ecosystems (Shafroth et al. 2002, Wissmar 2004).

- Maintain natural channel-floodplain connectivity—do not harden riverbanks and do not build in the floodplain (Wissmar 2004).
- Industrial or urban development contributes to a "flashier" (more flood-prone) system. Check dams and settling basins should be required in industrial and urban areas to increase infiltration and reduce the impact of intense flooding (Stromberg 2000).

- Release of treated municipal waste water in some riparian corridors can help restore some riparian ecosystems. Habitat quality is generally low directly below the release point but improves downstream (Stromberg et al. 1993). However in an intermittent reach with native amphibians or fishes, water releases should not create perennial (year-round) flows. Bullfrogs can and do displace native amphibians from perennial waters (Kupferberg 1997, Kiesecker and Blaustein 1998, Maret et al. 2006).

Eradicate non-native invasive plants and animals. Many native riparian plants are pioneer species that establish quickly following soil disturbance by floods (Ohmart 1994), as long as threats like invasive species are controlled and fluvial processes restored. Hundreds of exotic species have become naturalized in riparian corridors, with a few becoming significant problems like arundo, tamarisk and Russian olive. Removing stressors and reestablishing natural flow regimes can help bring riparian communities back into balance, however some exotics are persistent and physical eradication is necessary to restore degraded systems (Stromberg 2000, Savage 2004, but see D'Antonio and Meyerson 2002). Elimination of unnatural perennial surface pools can eradicate water-dependent invasive species like bullfrogs, crayfish, and mosquitofish.

Promote base flows and maintain groundwater levels within the natural tolerance ranges of native plant species. Subsurface water is important for riparian community health. Willows require water levels within 9 feet (2.6 m) below ground level (Lite and Stromberg 2005). Groundwater can be sustained more efficiently by reducing groundwater pumping near rivers and streams and providing municipal water sources to homes (Stromberg 1997, Colby and Wishart 2002).

Increase and maintain high water quality standards. Non-point sources of pollution should be identified and minimized. Work with Resource Conservation Districts to help establish use of Best Management Practices for agricultural and rural communities in the HTC Study area and in surrounding communities.

Enforce existing regulations. We recommend aggressive enforcement of existing regulations restricting dumping of soil, agricultural waste, and trash in streams, and of regulations restricting farming, gravel mining, and building in streams and floodplains. Restricted activities within the buffer should include OHV use which disturbs soils, damages vegetation, and disrupts wildlife (Webb and Wilshire 1983).

4.1.3.4. Mitigating the Impacts of Roads on Wildlife

While the physical footprint of the nearly 4 million miles of roads in the United States is relatively small, the *ecological* footprint of the road network extends much farther. Wildland fragmentation by roads is recognized as one of the greatest threats to biodiversity (Noss 1983, Harris 1984, Wilcox and Murphy 1985, Wilcove et al. 1986, Noss 1987, Reijnen et al. 1997, Trombulak and Frissell 2000, Forman and Deblinger 2000, Jones et al. 2000, Forman et al. 2003). Roads kill animals in vehicle collisions, create discontinuities in natural vegetation, alter animal behavior (due to noise, artificial light, human activity), promote invasion of exotic species, and pollute the environment (Lyon 1983, Noss and Cooperrider 1994, Forman and Alexander 1998). Railroads share many of the deleterious effect of highways (Messenger 1968, Niemi 1969, Klein 1971, Stapleton and Kiviat 1979, Muehlenbach 1979, Lienenbecker and Raabe 1981, Forman 1995).

Direct effects include road mortality, habitat fragmentation and loss, and reduced connectivity. The

severity of these effects depends on the ecological characteristics of a given species (Table 4), context (vegetation and topography near the road), road type, and level of traffic (Clevenger et al. 2001). Direct roadkill affects most species, with severe documented impacts on wide-ranging predators such as the cougar in southern California (Forman et al. 2003). In a 4-year study of 15,000 km of road observations in Organ Pipe Cactus National Monument, Rosen and Lowe (1994) found an average of at least 22.5 snakes per km per year killed by being run over by vehicles. A single freeway (typical width = 50 m, including median and shoulder) crossing diagonally across a 1-mile section of land results in the loss of 4.4% of habitat area for any species that cannot live in the right-of-way. Roads cause habitat fragmentation because they break large habitat areas into small, isolated habit patches which support fewer individuals; these small populations lose genetic diversity and are at risk of local extinction.

Table 4. Characteristics that make species vulnerable to the three major direct effects of roads.

Characteristics that make species vulnerable (from Forman et al. 2003).	**Effect of Roads**		
	Road mortality	Habitat loss	Reduced connectivity
Attraction to road habitat	★		
High intrinsic mobility	★		
Habitat generalist	★		
Multiple-resource needs	★		★
Large area requirement/low density	★	★	★
Low reproductive rate	★	★	★
Behavioral avoidance of roads			★

Roads fragment populations by acting as semi-permeable to impermeable barriers for non-flying animals (e.g., insects, fish, amphibians, reptiles, and mammals) and even some flying species (e.g., butterflies and low-flying birds). The resulting demographic and genetic isolation increases extinction risks for populations (Gilpin and Soulé 1986). For example, a road on a stream terrace can cause significant population declines in amphibians that move between uplands and breeding ponds (Stephenson and Calcarone 1999). Ernest et al. (2003) documented little flow of mountain lion genes between the Santa Ana and Palomar Mountains (where I-15 is the most obvious barrier). Riley et al. (2006) documented genetic isolation of bobcats and coyotes in subpopulations separated by Highway 101. Smaller populations are more susceptible to extinction due to demographic and environmental stochasticity.

In addition to these obvious effects, roads create noise and vibration that can interfere with the ability of reptiles, birds, and mammals to communicate, detect prey, or avoid predators. Roads also increase the spread of exotic plants, promote erosion, create barriers to fish, and pollute water sources with roadway chemicals (Forman et al. 2003). Highway lighting also has important impacts on animals (Rich and Longcore 2006). Most documented impacts on animal movement concern paved roads. Dirt roads may actually facilitate movement of some species, such as mountain lions (Dickson et al. 2004), while adversely impacting other species, such as snakes that sun on them and may be crushed even by infrequent traffic.

Wildlife crossing structures to facilitate movement through landscapes fragmented by roads include wildlife overpasses and green bridges, bridges, culverts, and pipes. Although many of these structures

were not originally constructed with ecological connectivity in mind, many species benefit from them (Clevenger et al. 2001, Forman et al. 2003). No single crossing structure will allow all species to cross a road. For example, a concrete box culvert may be readily accepted by a mountain lion or bear, but not by deer. Deer prefer vegetated overpasses or open terrain below high bridges. Small mammals, such as deer mice and voles, prefer pipes and small culverts to wildlife overpasses (McDonald and St Clair 2004). Transportation improvement projects provide opportunities to improve wildlife permeability across these barriers.

Standards and Guidelines for Wildlife Crossing Structures

Existing structures can be substantially improved with little investment by installing wildlife fencing, earthen berms, and vegetation to direct animals to passageways (Forman et al. 2003). Based on the small but increasing number of scientific studies on wildlife use of highway crossing structures, we offer the following standards and guidelines for *all* existing and future crossing structures intended to facilitate wildlife passage across highways, railroads, and canals.

On highways, multiple crossing structures should be constructed to provide connectivity for all species likely to use a given area (Little 2003). Different species prefer different types of structures (Clevenger et al. 2001, McDonald and St Clair 2004, Clevenger and Waltho 2005, Mata et al. 2005). For deer or other ungulates, an open structure such as a bridge is crucial. For medium-sized mammals, black bear, and mountain lions, large box culverts with natural earthen substrate flooring are optimal (Evink 2002). For small mammals, pipe culverts from 0.3 m – 1 m in diameter are preferable (Clevenger et al. 2001, McDonald and St Clair 2004).

At least one crossing structure should be located within an individual's home range. Because most reptiles, small mammals, and amphibians have small home ranges, metal or cement box culverts should be installed at intervals of 150-300 m (Clevenger et al. 2001). For ungulates and large carnivores, larger crossing structures such as bridges, viaducts, or overpasses should be located no more than 1.5 km (0.94 miles) apart (Mata et al. 2005, Clevenger and Wierzchowski 2006). Inadequate size and insufficient number of crossings are two primary causes of poor use by wildlife (Ruediger 2001).

Suitable habitat for species should occur on both sides of the crossing structure (Ruediger 2001, Barnum 2003, Cain et al. 2003, Ng et al. 2004). This applies to both *local* and *landscape* scales. On a local scale, vegetative cover should be present near entrances to give animals security, and reduce negative effects such as lighting and noise associated with the road (Clevenger et al. 2001, McDonald and St Clair 2004). A lack of suitable habitat adjacent to culverts may prevent their use as potential wildlife crossing structures (Cain et al. 2003). On the landscape scale, "Crossing structures will only be as effective as the land and resource management strategies around them" (Clevenger 2005).

Whenever possible, suitable habitat should occur within the crossing structure. This can best be achieved by having a bridge high enough to allow enough light for vegetation to grow under the bridge, and by making sure that the bridge spans some upland habitat that is not regularly scoured by floods. Where this is not possible, rows of stumps or branches under large span bridges can provide cover for smaller animals such as reptiles, amphibians, rodents, and invertebrates; regular visits are needed to replace artificial cover removed by flood. Within culverts, earthen floors are preferred by mammals and reptiles.

Structures should be monitored for, and cleared of, obstructions such as detritus or silt blockages that

impede movement. Small mammals, carnivores, and reptiles avoid crossing structures with significant detritus blockages (Yanes et al. 1995, Cain et al. 2003, Dodd et al. 2004). In the southwest, over half of box culverts less than 8 x 8 ft. have large accumulations of branches, Russian thistle, sand, or garbage that impede animal movement (P. Beier, pers. comm.). Bridged undercrossings rarely have similar problems.

Fencing should never block entrances to crossing structures, and instead should direct animals towards crossing structures (Yanes et al. 1995). In Florida, construction of a barrier wall to guide animals into a culvert system resulted in 93.5% reduction in roadkill, and also increased the total number of species using the culvert from 28 to 42 (Dodd et al. 2004). Fences, guard rails, and embankments at least 2 m high discourage animals from crossing roads (Barnum 2003, Cain et al. 2003, Malo et al. 2004). One-way ramps on roadside fencing can allow an animal to escape if it is trapped on a road (Forman et al. 2003).

Raised sections of road discourage animals from crossing roads, and should be used when possible to encourage animals to use at-grade or below-grade crossing structures. Clevenger et al. (2003) found that vertebrates were 93% less susceptible to road-kills on sections of road raised on embankments, compared to road segments at the natural grade of the surrounding terrain.

Manage human activity near each crossing structure. Clevenger and Waltho (2000) suggest that human use of crossing structures should be restricted and foot trails relocated away from structures intended for wildlife movement. However, a large crossing structure (viaduct or long, high bridge) should be able to accommodate both passive recreational and wildlife use. Furthermore, if passive recreational users are educated to maintain utility of the structure for wildlife, they can be allies in conserving connectivity. Separate crossing structures for humans and wildlife should be considered. At a minimum, nighttime human use of crossing structures should be restricted.

Design culverts specifically to provide for animal movement. Most culverts are designed to carry water under a road and minimize erosion hazard to the road. Culvert designs adequate for transporting water often have pour-offs at the downstream ends that prevent wildlife usage. At least 1 culvert every 150-300 m of road should have openings flush with the surrounding terrain, and with native land cover up to both culvert openings.

Minimize artificial night lighting. On freeways and other paved roads, minimizing artificial night lighting, and directing the light onto the roadway and away from adjacent wildlands can help increase wildlife use of crossing structures.

Speed reduction in key crossing areas. Where wildlife crossing is expected, reduce traffic speeds and install signage to alert drivers to watch for wildlife.

Roads as Ephemeral Barriers: Structures designed for wildlife movement are increasingly common. In southern California, 26 wildlife crossing structures were installed along 22-miles of SR-58 in the Mojave Desert specifically for desert tortoise movement (Evink 2002). The Coal Canyon interchange on SR-91 has been converted, through a partnership with Caltrans, California State Parks, and Hills for Everyone, from a vehicle interchange into a wildlife underpass to facilitate movement between the Chino Hills and the Santa Ana Mountains. About eight wildlife underpass bridges and viaducts were installed along SR-241 in Orange County, although urbanization near this toll road has compromised their utility (Evink 2002). Several crossing structures, including three vegetated overpasses, have been built to accommodate movement across the Trans-Canada Highway in Banff National Park (Clevenger et al. 2001). In south Florida, 24 underpasses specifically designed for wildlife were constructed along 64 km (38 mi) of

Interstate 75. The structures are readily used by endangered Florida panthers and bears, and have reduced panther and bear roadkill to zero on that route (Lotz et al. 1996). Almost all of these structures were retrofitted to existing highways rather than part of the original road design. This demonstrates that barrier effects of existing roads are reversible with well-designed improvements.

Implementing these recommendations will take cooperation among transportation agencies, land managers, planners, land conservancies and other non-profits. A long-term coordinated plan is needed to ensure that wildlife-crossing structures are aligned in a way that maximizes their utility to animals. However, crossing structures represent only small portions, or choke points, within an overall habitat linkage or movement corridor. Investing in specific crossing structures may be meaningless if other essential components of the linkage are left unprotected. Thus, it is essential to keep the larger landscape context in mind when discussing existing or proposed structures to cross movement barriers. This broader context also allows awareness of a wider variety of restoration options for maintaining functional connectivity to promote movement over broad spatial and temporal scales.

4.1.4. Existing restoration efforts

There are a few major habitat restoration efforts already happening in the HTC study area of the Arroyo Seco and Big Tujunga Wash. These existing projects, described below, are focused on restoring riparian and alluvial fan sage scrub communities that have been impacted by development and flood management practices. Habitat restoration along the Arroyo Seco will help to improve connectivity between the San Gabriel Mountains and the San Rafael Hills, while efforts along Big Tujunga will improve connectivity between the San Gabriel and Verdugo Mountains. Entities, like the Arroyos & Foothills Conservancy, working to implement this HTC study should assist interested landowners with habitat enhancement projects to improve habitat quality and functional connectivity through cooperative programs, such as Partners in Restoration, which provides an efficient permitting process for accomplishing needed restoration work on private land.

The Arroyo Seco Foundation is restoring stream and habitat values in two ten-acre patches of the Arroyo south of Devil's Gate Dam. In the fall of 2014 both stretches were cleared of non-native invasive trees to allow the restoration of native habitat, including sycamores, willows and oaks. This project is one of the first Arroyo Seco Master Plan (City of Pasadena 2003) projects to be implemented; it is supported by the California Resources Agency with funds from the Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act of 2000 (Proposition 13). The Foundations' Arroyo Seco Stream Team trains volunteers to assist with these efforts, by mapping habitat, invasive plants and other stream conditions, removing exotic plants, propagating native plants for habitat restoration efforts, and sampling water quality.

Hahamongna Watershed Park is home to the Arroyo Seco Foundation's Hahamongna Cooperative Nursery. The Hahamongna Cooperative Nursery is a restoration nursery that is located within the HTC study area and can provide locally-sourced native plants for habitat restoration within the HTC. The nursery is a grassroots habitat restoration initiative led by the Arroyo Seco Foundation in partnership with Pasadena Water and Power and Pasadena Public Works Department. Volunteers are working with ASF to propagate local native plant species for habitat restoration. In the process, volunteers learn about the Arroyo's native flora and ecology, horticultural technique, nursery management, and local ethnobotany. The central role of native plants in the Arroyo's ecology is widely known. Local species have adapted to the unique climate, soil, and other conditions in our watershed, and provide the necessary habitat for

hundreds of other species. However, habitat restoration needs to take into account the unique genome of local populations. Growing from stock from the locale in addition to planting the right species is important. Propagating plants from the project site helps to ensure the long-term sustainability of our restoration plantings and neighboring wildlife areas. Located in Hahamongna Watershed Park on the banks of the Arroyo Seco as it leaves the San Gabriel Mountains, the Hahamongna Nursery is favorable to the species being propagated (http://www.arroyoseco.org/nursery.htm).

Habitat restoration efforts have been completed and are underway in Big Tujunga Wash at the western end of the HTC study area. The Big Tujunga Wash Mitigation Bank Project, a public works project south of the 210 freeway, encompassed 100 acres of willow riparian, oak/sycamore woodland and coastal sage scrub habitat overrun with arundo and other non-native plant species. Two one-acre ponds overgrown with water hyacinth were restored by Los Angeles County Department of Public Works. Further upstream, the National Forest Foundation is working to restore Big Tujunga watershed by replanting native species and removing invasive plants, including arundo, rerouting trails, and removing small dams.

Another key riparian connection in need of restoration is Verdugo Wash, which is currently channelized for much of its length. Restoration of the stretch of the wash from Verdugo Mountains Open Space Preserve through Oakmont Country Club down to Glorietta Park would improve opportunities for wildlife movement between the Verdugo Mountains and San Rafael Hills. Healthy riparian vegetation provides habitat and connectivity for a disproportionate number of species compared to upland areas (Fisher and Fischenich 2000, Parkyn 2004, Lee et al. 2004). Organisms moving through rugged landscapes often use riparian areas as travel routes. For example, many butterflies and frogs preferentially move along stream corridors (Orsack 1978, Kay 1989, USGS 2002). Although western pond turtles are capable of overland movements of up to 0.5 km (0.3 mi) (Holland 1994), they preferentially move along stream courses (Bury 1988). Even large, mobile vertebrates, such as mountain lions, have shown preferences for moving along riparian corridors (Beier 1995, Dickson et al. 2004).

Maintaining and restoring habitat connectivity in the Hahamongna to Tujunga Wildlife Corridor will also require innovative outreach programs in communities at the urban-wildland interface to reduce edge effects from existing development (Marzluff and Ewing 2001). The outreach program should endeavor to respect the property rights of the many people already living in the Hahamongna to Tujunga Wildlife Corridor and enlist them as stewards that manage for wildlife permeability. For example, structures will often be subject to compliance with fire fuel reduction requirements; working with owners to comply while at the same time preserving and restoring native habitat by using appropriate fuel modification strategies and techniques can result in major fire-safe habitat benefits.

Restoring habitat permeability across transportation barriers is another major need. The HTC is bordered on the north by US Highway 210, which crosses over Big and Little Tujunga Wash and the Arroyo Seco in the HTC study area; State Route 2 divides the San Rafaels from the Verdugos; Chevy Chase Drive bisects the San Rafaels; and State Route 118 also crosses over Big Tujunga Wash further up the watershed. Several existing state and local bridges and culverts are associated with these transportation features that were primarily designed to either convey water or traffic, though these types of structures can also facilitate wildlife movement across transportation barriers (Veenbaas and Brandjes 1999, Jackson and Griffin 2000, Clevenger et al. 2001, Forman et al. 2003 Ng et al. 2004). Structures intended to facilitate wildlife movement should be monitored for, and cleared of, obstructions that impede movement. Small mammals, carnivores, and reptiles avoid crossing structures with significant detritus blockages (Yanes et

al. 1995, Cain et al. 2003, Dodd et al. 2004). In the southwest, over half of box culverts less than 8 x 8 ft. have large accumulations of branches, Russian thistle, sand, or garbage that impede animal movement (P. Beier, pers. comm.). In some cases, wildlife specific crossing structures will need to be installed. Transportation improvement projects provide opportunities to improve wildlife permeability across these barriers. See Spencer et al. 2010 and Penrod et al. 2013 for standards and guidelines for *all* existing and future crossing structures intended to facilitate wildlife passage across highways, railroads, and canals.

4.2. Outreach Program at the Urban-Wildland Interface

Another goal of the HTC study and the Arroyos & Foothills Conservancy is to enhance community engagement in the preservation and public education surrounding the value of connectivity and wildlife corridors. Maintaining and restoring habitat connectivity in the Hahamongna to Tujunga Wildlife Corridor will require innovative outreach programs in communities at the urban-wildland interface and improving permeability across transportation barriers. Reducing penetration of undesirable effects into natural areas from existing development (Marzluff and Ewing 2001) will require an outreach program that respects the property rights of the many people already living in the Hahamongna to Tujunga Wildlife Corridor and enlists them as stewards that manage the land for wildlife permeability.

We suggest a direct mail campaign to all parcels not already protected in fee or conservation easement focused on the importance of maintaining and restoring landscape connectivity and their role as land stewards. This could be in the form of a tri-fold brochure or a more comprehensive booklet like Living Lightly in Our Watershed (Resource Conservation District of the Santa Monica Mountains 2005). The role of the direct mail campaign is two-fold: 1) to draw out willing sellers or landowners interested in conservation easements; and 2) to provide guidance to landowners living at the urban-wildland interface. Landowners should be encouraged to landscape with drought tolerant native plants, minimize water runoff into streams, manage fire risk with minimal alteration and/or restoration of natural vegetation, keep pets indoors or in enclosures (especially at night), maximize personal safety with respect to large carnivores by appropriate behaviors, and direct lighting away from natural areas. For example, structures will often be subject to compliance with fire fuel reduction requirements; working with owners to comply while at the same time preserving and restoring native habitat by using appropriate fuel modification strategies and techniques can result in major fire-safe habitat benefits. The materials should also discourage the use of pesticides, insecticides, herbicides, and rodenticides, and educate residents and local business owners about the effects these chemicals have throughout the ecosystem. For example, in January 2016 a puma was found dead in Mugu State Park killed by rat poison (http://www.latimes.com/local/lanow/la-me-ln-puma-point-mugu-state-park-died-rat-poisons-20151110-story.html). Entities like the Arroyos & Foothills Conservancy, working to implement this HTC study should assist interested landowners with habitat enhancement projects to improve habitat quality and functional connectivity through cooperative programs, such as Partners in Restoration, which provides an efficient permitting process for accomplishing needed restoration work on private land.

4.3. Public Use

The benefits of maintaining and restoring connectivity go beyond just conserving biodiversity. Maintaining ecological function is also critical to sustaining our human communities and protecting things we all value – a healthy, functioning natural environment provides clean air, clean water, recreational opportunities, and access to nature for our children

Passive recreational use, such as hiking, photography, bird watching, and wildflower observations, is not inherently incompatible with wildlife movement, although, unregulated recreational activities have been shown to cause significant impacts to wildlife and plants (Knight and Cole 1995). Areas with high levels of off-road vehicle use show altered habitat use by vertebrates (Brattstrom and Bondello 1983, Nicolai and Lovich 2000). Even such relatively low-impact activities as wildlife viewing, hiking, and horseback riding have been shown to displace wildlife from nutritionally important feeding areas and prime nesting sites (Anderson 1995, Knight and Cole 1995). The increased time and energy spent avoiding humans can decrease reproductive success and make species more susceptible to disease (Knight and Cole 1995). However, if passive recreational activities are effectively planned, developed, managed, and monitored, most negative impacts can be avoided or minimized.

Connectivity conservation can be combined with compatible public goals such as nature education and protection of water quality, which can foster appreciation of and support for linkage conservation. If passive recreational activities are effectively planned, developed, managed, and monitored, most negative impacts can be avoided or minimized by limiting types of use, directing recreational activities away from particular locations, sometimes only for particular seasons, and with reasonable precautions. For example, trail systems should be planned to minimize resource damage and disturbance of wildlife. Clevenger (1998) found bears, cougars, and wolves avoided areas of high human use and used underpasses in these areas less frequently. To reduce the risk of species avoidance of crossing structures due to human presence, trails should be relocated when possible or human use of underpasses should be restricted (Clevenger and Waltho 2000). People should be encouraged to stay on trails, leave dogs at home or keep them on leashes, and travel in groups in areas frequented by mountain lions or bears. Visitors should be discouraged from collecting reptiles and harassing wildlife. Other recommendations to help prevent the negative effects of recreation include:

- Monitor trail development and recreational use to provide a baseline and ongoing information for decisions regarding levels, types, and timing of recreational use.
- Where existing trails exist, determine what improvements are desirable and whether any trails should be decommissioned, and proceed with in a manner that reduces negative impacts to and restores natural habitat.
- Where new trails are under consideration, first consider the impacts to wildlife and the habitat, of the trails and their prospective users; then if proceeding is prudent, engage in the process, with professionals as appropriate, to determine user groups and to ensure that trails are sited, designed, constructed and maintained pursuant to best practices to minimize negative impacts to their surroundings.
- Work with the agencies and non-governmental organizations to develop and conduct on-the-ground, multi-lingual outreach programs to passive recreational users on how to reduce impacts.
- Limit off-road vehicles and off-trail activities to those that are consistent with maintaining habitat health and functional habitat connectivity.
- Close, obliterate, and restore to natural habitat any unauthorized off-road vehicle routes and enforce closures.

4.3.1. Historic and current public uses

The HTC area features almost 14,000 acres of land at least partially open for public use (Figure 7). Most of the parks, open space and recreational areas are open for mostly passive recreation but there are a few more developed facilities. Section 4.2.3 below provides a list of the existing parklands and describes the types of public uses currently available.

4.3.2. Opportunities and objectives for wildlife dependent public use

Conservation of land within the HTC can increase public access and expand opportunities for passive recreational activities, such as hiking, photography, bird watching, and wildflower observations. Some areas of the HTC may provide fishing and hunting opportunities. However, some targeted parcels with sensitive species or communities may exclude access to areas where hunting and fishing may presently be allowed on unincorporated Los Angeles County lands in order to protect resource values. The specific type and extent of public use will be determined through site-level planning conducted during implementation of the HTC and will be consistent with wildlife connectivity, habitat integrity and species recovery plans. As such, there will likely be some circumstances where no public access is desirable (e.g., sensitive habitat areas).

4.3.3. Public access and infrastructure – existing and needed

A number of facilities and associated infrastructure currently exist on public and private conservation lands throughout the HTC area. The specific infrastructure needs for properties targeted in the HTC will be determined through site-level planning that identifies public uses that are compatible with maintaining habitat connectivity. For example, trails, trailheads and some parking facilities may be compatible as well as nature centers and kiosks, which can educate users and promote conservation of resource values in the HTC. Existing public access and infrastructure in the Hahamongna to Tujunga Wildlife Corridor Biological Study area from north to south include:

Hansen Dam Recreation Area has extensive day-use facilities; including golf and riding stables and a 40-acre Aquatic Center that includes a 9-acre recreation lake for fishing and boating, and a 1.5-acre swimming lake with water slides, a sand volleyball court and several picnic areas. Activities available include fishing, boating, picnicking, jogging/walking, and bird watching. In fact, the area is identified as an Important Bird Area by Audubon and is designated as critical habitat for the southwestern willow flycatcher. Address: Intersection of I-210 Freeway and Foothills Blvd.

Verdugo Mountain Park is a 500-acre preserve on the north slope of the Verdugo Mountains that connects to thousands of acres of public parkland. The park provides access to miles of trails throughout the Verdugo Mountains including the popular Verdugo Mountainway which is a dirt road that follows the crest of the range to Glendale. Address: East of Sunland South of La Tuna Canyon Road.

La Tuna Canyon Park is a 1,100-acre park located on the north slope of the Verdugo Mountains that provides trail access into the steep upper reaches of the mountains. There is parking and picnic tables at the trailhead and another picnic area at "The Grotto" a bit further up the canyon. La Tuna Canyon Trail is

a moderate 2.2 mile trail that connects with the Verdugo Fire Road, also called the Backbone Road, which offers thirteen miles of trails across almost the whole length of the Verdugo Mountains. Address: 8000 La Tuna Canyon Road, Sun Valley.

Stough Canyon Nature Center has an exhibit hall with educational and interpretive displays about the natural history of the area and its plant life and features a small library, a classroom, and an outdoor amphitheater. The Center offers nature workshops, classes and seasonal day camps and local docents provide ongoing hiking activities in the park. The fire road near the nature center leads to the Verdugo Mountainway Trail, an extensive trail system which extends from the Sun Valley area south to Glendale's Brand Park and to the northeast leading to Tujunga and La Crescenta. Hiking and mountain biking are permitted on the fire roads. The smaller trails are for hiking only and along with the fire roads lead to spectacular views of the San Fernando Valley. Address: 2300 Walnut Avenue, Burbank.

Wildwood Canyon Park offers a variety of outdoor activities and many of the Burbank Nature Programs hikes and activities are conducted in Wildwood Canyon. There is a 2-mile trail system for hiking only which traverses the Burbank side of the Verdugo Mountains; the moderately strenuous Link Trail which connects to the Verdugo Mountainway Trail; and picnic sites in well-maintained park areas off of Wildwood Canyon Road. Address: 1701 Wildwood Canyon Drive, Burbank.

Verdugo Mountains Open Space Preserve is a 244-acre lushly-vegetated preserve on the north-facing flank of the Verdugo Mountains that contains more than 2,300 mature coast live oaks, sycamores, big leaf maples, bay laurels, and other indigenous trees and numerous springs and blue-line streams. There is an extensive network of existing trails on the property that start beyond the fire gate. Address: End of Oakmont View Drive, Glendale.

Brand Park is located in the Verdugo Mountains in the City of Glendale and provides picnic areas, hiking, as well as a window into local history. Leslie C. Brand, often referred to as the "father of Glendale," purchased 1,000 acres in the Verdugo Mountains at the turn of the twentieth century and built the 5,000-square foot mansion named El Mirador at the base of the mountains. Brand's property and elegant home were deeded to the city of Glendale after his wife's death in 1945 to become Brand Park and El Mirador is now Brand Library. The park also contains a historic home known as the "Doctors House," that was moved to the site in 1979. Brand Trail is a fire road that offers a moderately steep ascent from El Mirador to the ridge of the Verdugos and connects to a network of trails that criss-cross the range. Address: 1601 W. Mountain Street, Glendale.

Henderson Canyon Park is located in the eastern Verdugo Mountains in the City of Glendale and provides trail access to the lush northeast-facing slopes of the Verdugo Mountains. The trail begins in a shady canyon and winds high up into the range where it joins a network of trails leading in all directions, with access to Verdugo Mountain Open Space Preserve, and Brand Park to the south, and La Tuna Canyon Park to the west. Address: Western end of Mesa Lila Road, Glendale.

Cherry Canyon Park is a 131-acre park on the north face of the San Rafael Hills in the City of La Cañada Flintridge that includes several scenic trails, including the Owl Trail, Liz's Loop Trail, Cerro Negro Trail, Flint Canyon Trail, and the Ultimate Destination Trail. Address: 4157 Hampstead Road, La Cañada Flintridge.

Descanso Gardens is a 165-acre park in the San Rafael Hills that boasts an abundance of celebrated floral gardens in a unique and natural setting, including the world's largest outdoor planting of camellias, two renowned rose gardens, a Japanese garden, and a native plant garden, among others. There is also a pond, a Bird Observation Station on the lakeshore and a Tea House. Address: 1418 Descanso Drive, La Cañada Flintridge.

Lower Scholl Canyon Park is a 6.2-acre city park located in the San Rafael Hills in the eastern part of the City of Glendale. This beautiful shady park features picnic pavilions, a playground, and walking paths. Address: 2849 E Glenoaks Blvd., Glendale.

Alatorre-Eagle Rock View Park is a one-acre nature park at the southern extent of the San Rafael Hills that provides strolling paths, park benches, and views of Eagle Rock. Address: End of Eagle Rock View Drive, Eagle Rock

Hahamongna Watershed Park is a 300-acre park located between the Angeles National Forest and the Rose Bowl on the Arroyo Seco. The lower eastern portion of the park is currently a sediment and debris basin due to the topography of the area, and also contains Johnson Field, an inactive spreading basin, which is used for informal recreational activities, as well as a series of active spreading basins. The western portion contains the Oak Grove area (formerly Oak Grove Park), which is divided into two areas. The Upper Oak Grove facilities include picnic tables, restrooms, a maintenance building and the equestrian staging area. The Lower Oak Grove facilities include picnic areas, a multi-purpose play field, rest rooms and a disc golf course. Address: Oak Grove Drive & Foothill Blvd., Pasadena.

The Hahamongna to Tujunga Wildlife Corridor Biological Study also provides an opportunity to expand the Rim of the Valley Trail (Santa Monica Mountains Conservancy 2010) to include a loop through the Verdugo Mountains and San Rafael Hills that ties in with the trail segment along the foothills of the San Gabriel Mountains, which passes over Big Tujunga Wash and the Arroyo Seco.

4.4. Law enforcement

Rangers in several public agencies in the region, such as State Parks, City and County Parks, conduct law enforcement activities on lands within their jurisdiction. Law enforcement may be needed to facilitate public safety and safeguard the conservation values within some areas of the HTC, particularly where public access is allowed. The specific law enforcement needs will be identified based on aspects of the property evaluated during site-specific planning, such as ownership, type and level of public access, occurrence of sensitive biological and/or cultural resources, and public safety concerns.

4.5. Management implementation

Due to the large spatial extent of the Hahamongna to Tujunga Wildlife Corridor, the resource values on the targeted parcels vary wildly (Appendix A-3). As such, management requirements on lands conserved through this HTC study should be determined through site-specific planning and include estimates for long-term management needs.

4.5.1. Proposed responsible party, management partners, cooperative management agreements, endowments

Conserving connectivity at this scale will require agencies, organizations and individuals from across diverse sectors to work together. No single entity can do it alone. All local, state and federal agencies with jurisdictions in the HTC area, private landowners, organizations and academic institutions with a conservation interest are potential partners for implementation of the proposed HTC study. Table 5 provides a list of federal, state, and local agencies as well as conservancies, land trusts and universities that administer land in or near the Hahamongna to Tujunga Wildlife Corridor that are potential parties for management, cooperative agreements and endowments. It will take a concerted effort among a diverse set of players to implement this HTC study and we expect that numerous conservation partnerships for acquisition, management and restoration will develop as a result.

Numerous agencies, organizations and individuals throughout the region can each play a unique role in conserving ecological connectivity while pursuing their own missions. For example, wildlife agencies, such as the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife, actively plan for conservation while also serving as regulators and land managers. Public land management agencies, like the National Park Service, California State Parks, the Santa Monica Mountains Conservancy and the Mountains Recreation and Conservation Authority, seek to maintain functional connectivity to meet their charge of managing our public lands for natural resource values, recreation and other uses. The California Department of Transportation has stewardship goals to protect and enhance ecological resources while serving the transportation needs of the state's growing population. Local and regional planning agencies, such as city and county planning departments, work to conserve open space and natural resources through land use policies. Numerous organizations throughout the region have missions connected to land conservation, habitat restoration, endangered species protection, environmental planning, and environmental advocacy that all play a role in conserving ecological connectivity. While each agency and organization may have very different missions, they can all benefit from and contribute to connectivity conservation.

Table 5. Agencies and Organizations working in the area that may contribute to implementation

Local Agencies	**Federal Agencies**
Burbank, City of	United States Bureau of Land Management
Glendale, City of	United States Fish and Wildlife Service
La Cañada-Flintridge, City of	United States Forest Service
Los Angeles, City of	United States National Park Service
Pasadena, City of	**State Agencies**
Los Angeles, County of	California Department of Fish and Wildlife
Non Profits and Educational Institutions	California Department of Parks and Recreation
Arroyos & Foothills Conservancy	California State Coastal Conservancy
Fond Land Preservation Foundation	Santa Monica Mountains Conservancy
The Nature Conservancy	**Special Districts**
Glendale Community College	Mountains Recreation and Conservation Authority
Arroyo Seco Foundation	Los Angeles County Flood Control District
Trust for Public Land	**Neighborhood and Town Councils**

4.5.2. Management capacity of responsible party

Several agencies and organizations that may contribute to implementation of the HTC study (Table 5) own and successfully manage conservation lands in the linkage in fee or administer conservation easements. These agencies and organizations have a range of revenue sources that support their management activities, from public agencies funded through federal, state and local budgets; special tax assessments; government grant programs; non-profit grants and non-profits supported by grant programs; community funding, to philanthropic investments. Funding capacity needed for long-term management should be factored into site-specific planning during implementation of the HTC study.

5. Community outreach

The Arroyos & Foothills Conservancy is acquiring and stewarding natural open spaces both in the foothills of the San Gabriel Mountains and within the HTC area. The Conservancy has already begun to collaborate with agencies and organizations that are interested in establishing a viable wildlife corridor or are already administering land in the HTC area to determine: *Who* -- is working on what; *Where* -- is activity happening; *What* -- is happening (acquisition, land use planning, restoration, easements, regulatory actions, mitigation); *Why* -- is activity occurring (i.e. what are motivating factors); *When* – timeline and urgency for activity; and *Gaps* – what is still needed, where, and why.

In acquiring properties, the Arroyos & Foothills Conservancy engages the community in which the property is located to learn about it, to donate toward its acquisition and management, and to volunteer to steward it. The Conservancy invites the community to take guided tours of targeted properties and holds events to show how acquiring the land will benefit nature and the community. The Conservancy creates a campaign to raise community funds from residents and conservation and education-minded non-profits and foundations (e.g., $151,953 raised for the Millard Project from 239 donors; $377,065 raised for the Cottonwood and Corridors Project to date from 251 donors). These funds are used for acquisition costs, as matching funds for government grants, for land management and stewardship programs, and in the case of the Cottonwood and Corridors Project for on-going efforts to secure the Hahamongna to Tujunga Wildlife Corridor.

Arroyos & Foothills Conservancy has preserves in Rubio and Millard Canyons in Altadena, Goss Canyon in La Crescenta, and Cottonwood Canyon (pending acquisition) in Pasadena and has created volunteer friends groups to help steward each property. The Conservancy regularly offers programs to engage the community on its properties. Some examples include: docent-led tours and hikes on topics like native plants and wildlife; historical use by Native Americans of native plants for food and medicine; the effects of the Station Fire on wildlife; tracking wildlife from scat and prints; local and regional geology; and where does the creek water go? They engage schools, scouts and volunteers in invasive plant removal and reforestation. Partnering with professional wildlife photographers, they load content onto the internet with curriculum for classroom use to provide an interactive learning experience for students who are unable to visit these natural open spaces. They partner to host a-careers-in-conservation program with Outward Bound Adventures and the City of Pasadena. They also partner with Pasadena Unified School District and other local public schools to present educational and community service opportunities at their science fairs and STEAM conferences and host free docent-led field trips at all their properties. The Conservancy's website is regularly updated with news on existing projects and community events http://www.arroyosfoothills.org.

In addition, community outreach for the greater Rim of the Valley Corridor (Figures 1 and 9) Special Resources Study began in 2010 with public scoping. The NPS released the Rim of the Valley Corridor Draft Special Resource Study and Environmental Assessment for public review on April 14, 2015 and the public comment period closed on June 30, 2015. During this time, the NPS hosted a series of public meetings, including 5 meetings in the local area and one online meeting. NPS is currently analyzing the public comments received and making revisions to the report before submitting a final recommendation to Congress. It is anticipated that the final study and recommendation will be made available to the public in 2016 after the study has been transmitted to Congress.

5.1. Acquisition partnership opportunities

Acquisition partnership opportunities could be realized through public, private and philanthropic investments and may vary depending on the geographic location of the targeted parcels and the resource values present on site. For example, for parcels with designated critical habitats, matching funds could be sought through USFWS Section 6 grants. Federal and State agencies whose congressional or jurisdictional boundaries overlap targeted parcels in the linkage could seek matching funds through the Land and Water Conservation Fund. Parcels with water conservation and enhancement opportunities might qualify for California Proposition 1 Water Bond (2014) funds. Los Angeles County and the Cities of Burbank, Glendale, La Cañada-Flintridge and Pasadena all administer land in the HTC area funded through various open space initiatives that may provide matching funds. The Arroyos & Foothills Conservancy, Santa Monica Mountains Conservancy, Mountains Recreation Conservation Authority and Fond Foundation and are already actively engaged in the HTC area and are therefore potential partners in working to achieve a viable wildlife corridor in the conservation area. Other conservation organizations, like the Trust for Public Lands, have also expressed interest in partnering.

5.2. Known opposition or support

The Arroyos & Foothills Conservancy has already garnered tremendous support for the Hahamongna to Tujunga Wildlife Corridor with their colleagues in conservation (e.g., SMMC, TNC, TPL) and outreach activities to the local community and local government (e.g., current and previous Mayors). This HTC study was discussed at a Linkage Implementation Alliance meeting in early 2015, whose members include but are not limited to NPS, CSP, SMMC, Caltrans, Los Angeles and Ventura Counties, TNC, and all members present at that meeting support implementation of this HTC study. We are not aware of any agencies, organizations or entities that are in opposition to this HTC study.

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Appendix A-1 Hahamongna to Tujunga Wildlife Corridor Map Series

Los Padres National Forest

Sierra Madre Range

Angeles National Forest

Piru

Fillmore

Santa Paula

Santa Susana Mountains

SANTA CLARITA

Angeles National Forest

San Gabriel Mountains

Simi Valley

Camarillo

Thousand Oaks

Simi Hills

Reseda

North Hollywood

Burbank

Verdugo Mountains

San Rafael Hills

Altadena

GLENDALE

PASADENA

San Monica Mountains National Recreation Area

N

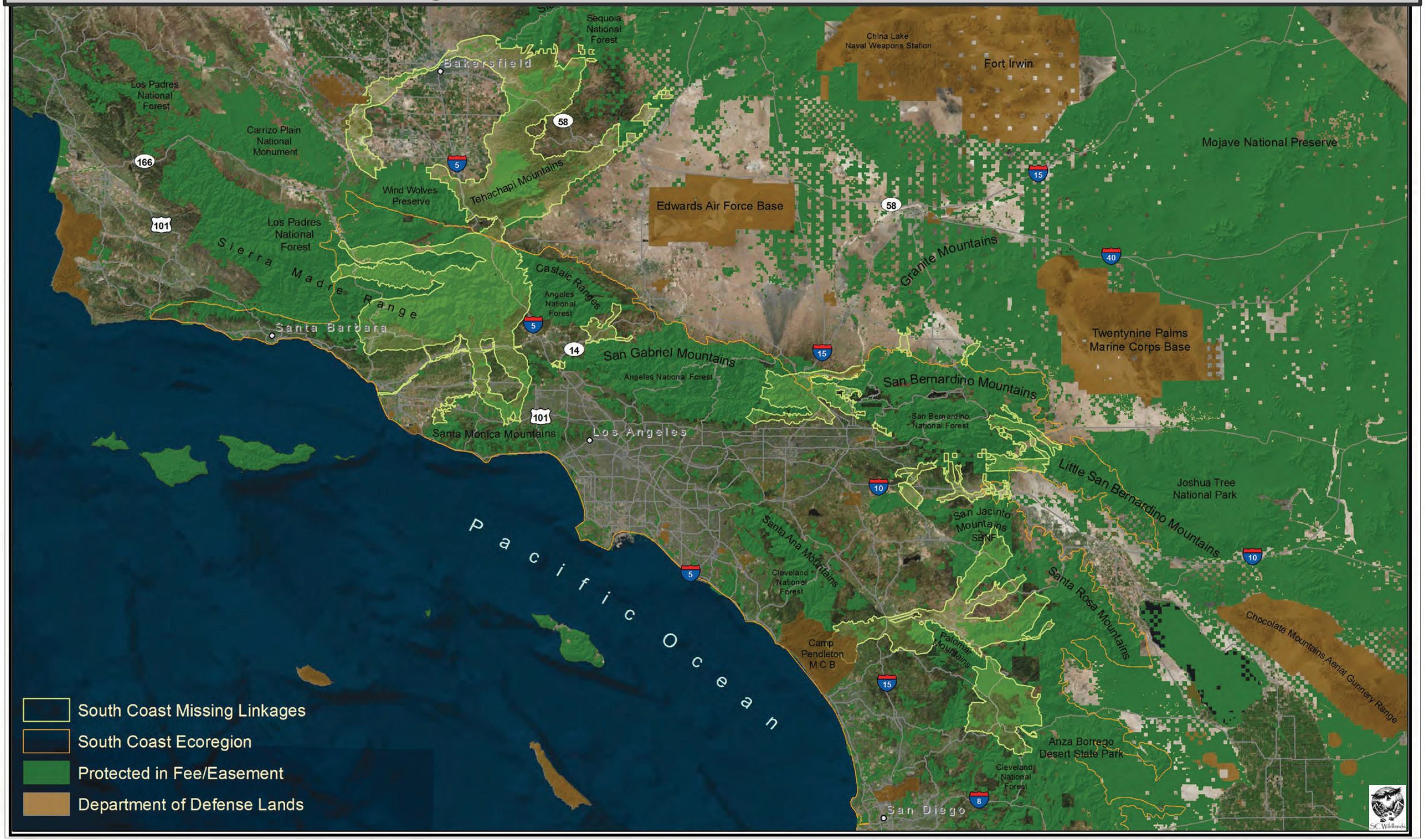
0 2 4 8 12 16

Miles

Figure 1. Hamongna to Tujunga Corridor Context

- Hahamongna to Tujunga Corridor Area
- Rim of the Valley Corridor (NPS)
- Existing Conservation Investments

Figure 2. South Coast Wildlands Network



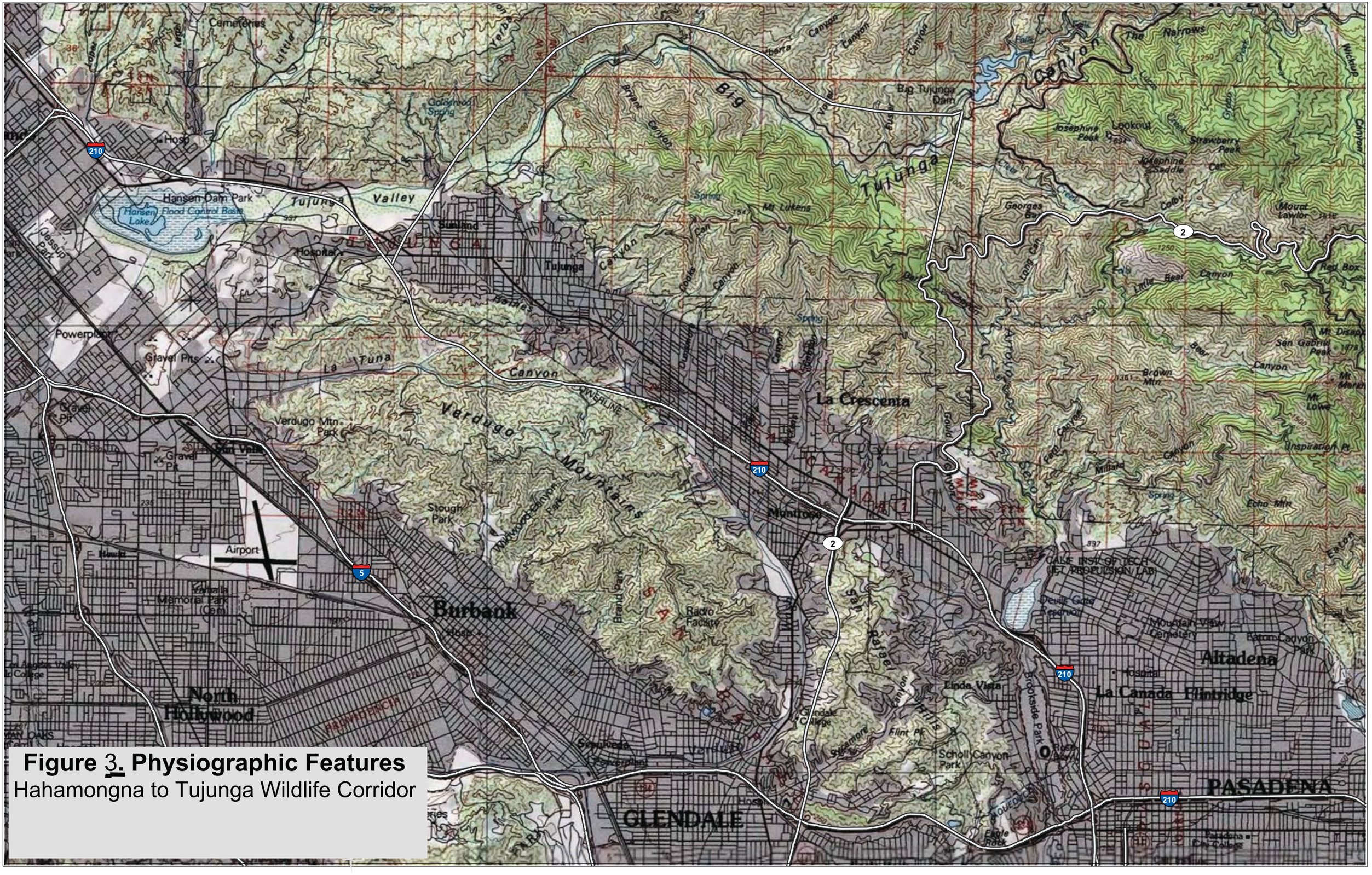


Figure 3. Physiographic Features
Hahamongna to Tujunga Wildlife Corridor

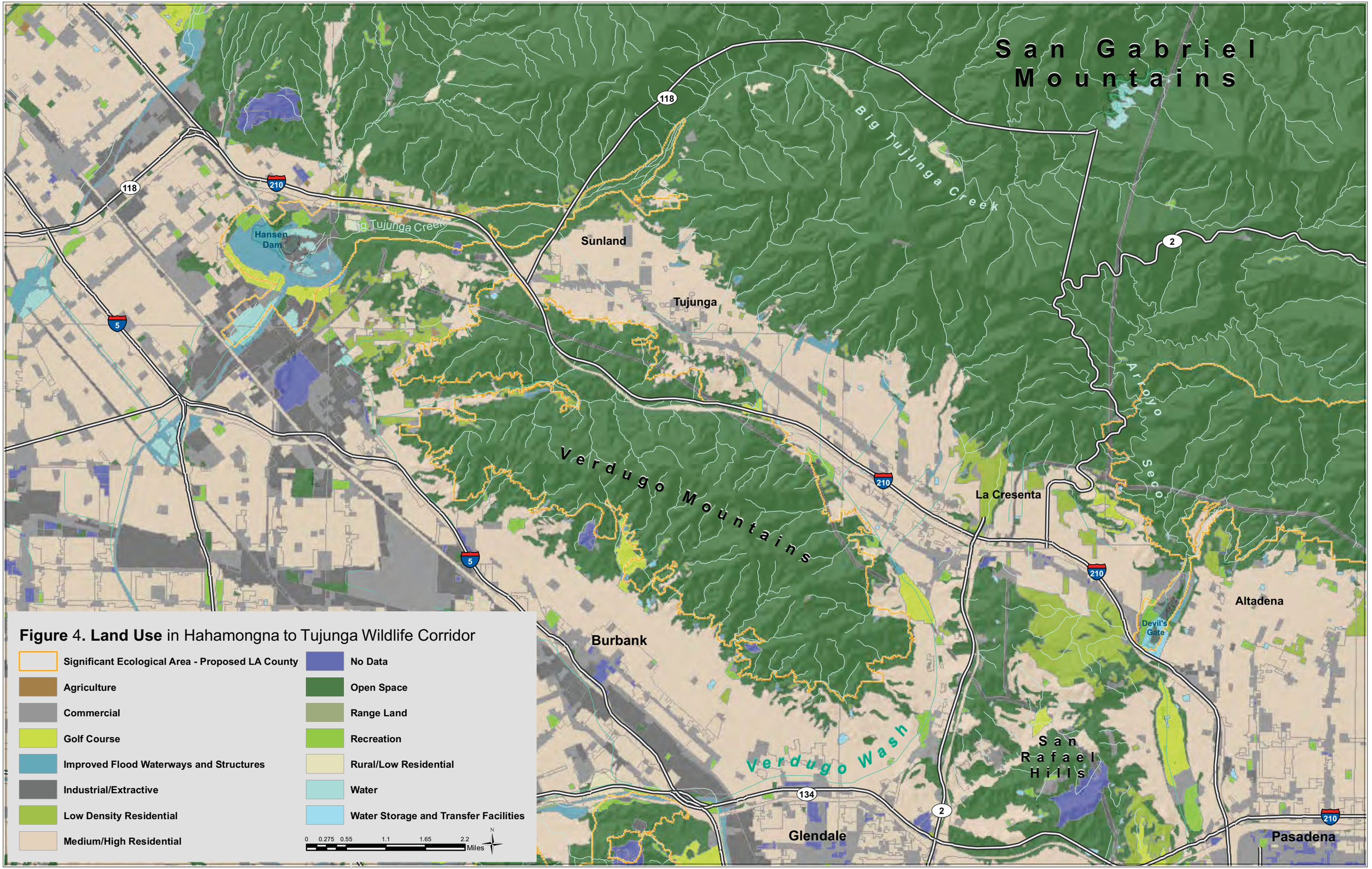


Figure 4. **Land Use** in Hahamongna to Tujunga Wildlife Corridor

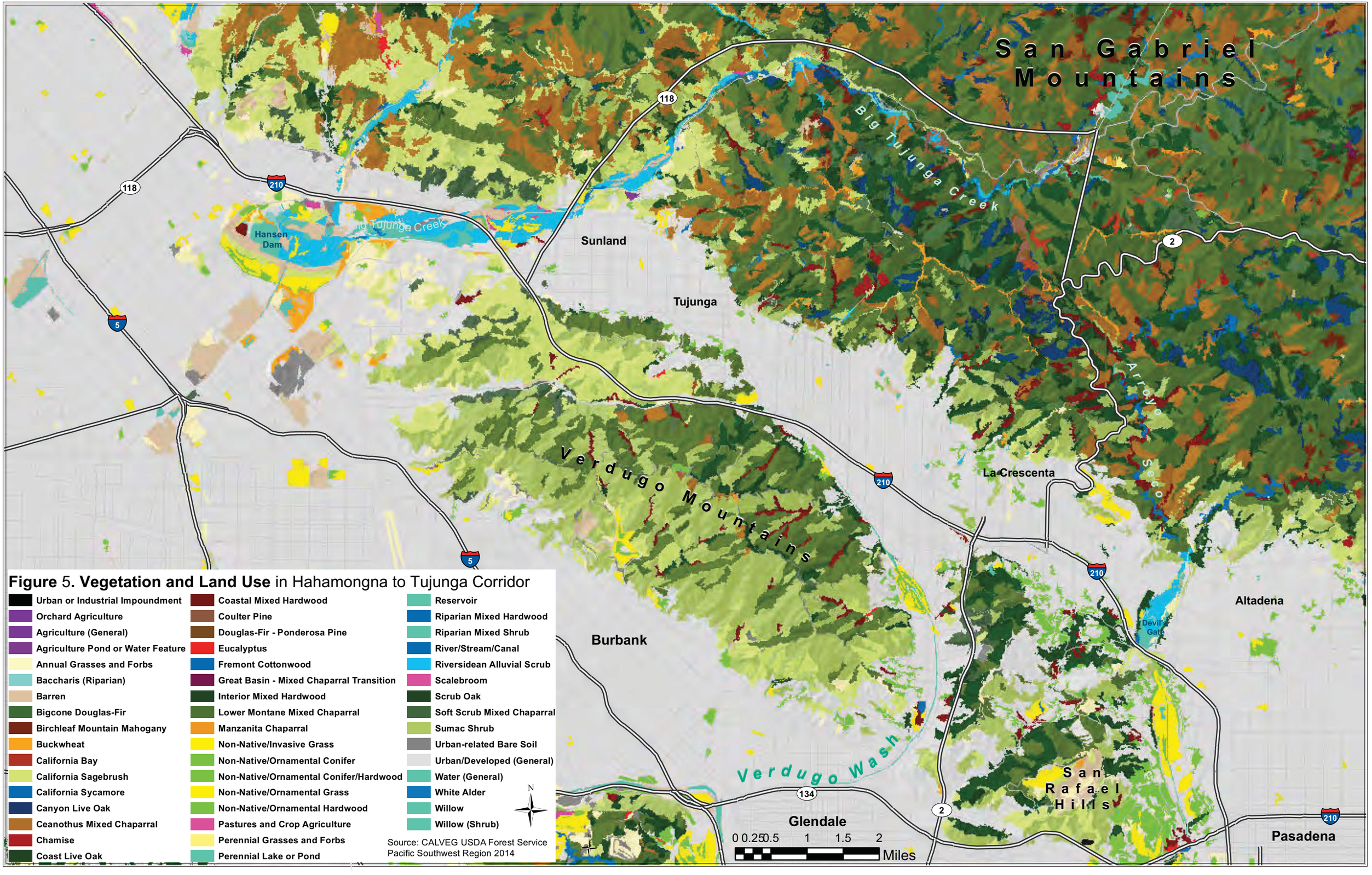


Figure 5. **Vegetation and Land Use** in Hahamongna to Tujunga Corridor

Source: CALVEG USDA Forest Service Pacific Southwest Region 2014

Figure 6. Hahamonga to Tujunga Corridor: Critical Habitat & TES Species Occurrences

Designated Critical Habitat
- Arroyo toad
- Santa Ana Sucker
- Southwestern willow flycatcher
- No Conservation Status
- Existing Conservation Investments
- Plant
- Animal
- Terrestrial Community
- Aquatic Community
- arroyo chub
- Santa Ana speckled dace
- Santa Ana sucker
- Arroyo Chub/Santa Ana Sucker Stream
- Coast Range newt
- southern mountain yellow-legged frog
- coast horned lizard
- coastal whiptail
- silvery legless lizard
- two-striped garter snake
- western pond turtle
- bank swallow
- coastal California gnatcatcher
- least Bell's vireo
- southwestern willow flycatcher
- western yellow-billed cuckoo
- American peregrine falcon
- Swainson's hawk
- burrowing owl
- Los Angeles pocket mouse
- San Diego black-tailed jackrabbit
- San Diego desert woodrat
- southern grasshopper mouse
- big free-tailed bat
- hoary bat
- pallid bat
- silver-haired bat
- Townsend's big-eared bat
- western mastiff bat
- western yellow bat
- California muhly
- California satintail
- Coulter's goldfields
- Davidson's bush-mallow
- Greata's aster
- mesa horkelia
- Nevin's barberry
- Parish's brittlescale
- Parish's gooseberry
- Parry's spineflower
- Plummer's mariposa-lily
- Robinson's pepper-grass
- round-leaved filaree
- San Fernando Valley spineflower
- slender mariposa-lily
- slender-horned spineflower
- southern tarplant
- white rabbit-tobacco
- Riversidian Alluvial Fan Sage Scrub
- Southern Cottonwood Willow Riparian Forest
- Southern Mixed Riparian Forest
- Southern Sycamore Alder Riparian Woodland
- California Walnut Woodland
- Southern Coast Live Oak Riparian Forest

0 0.25 0.5 1 1.5 2 Miles

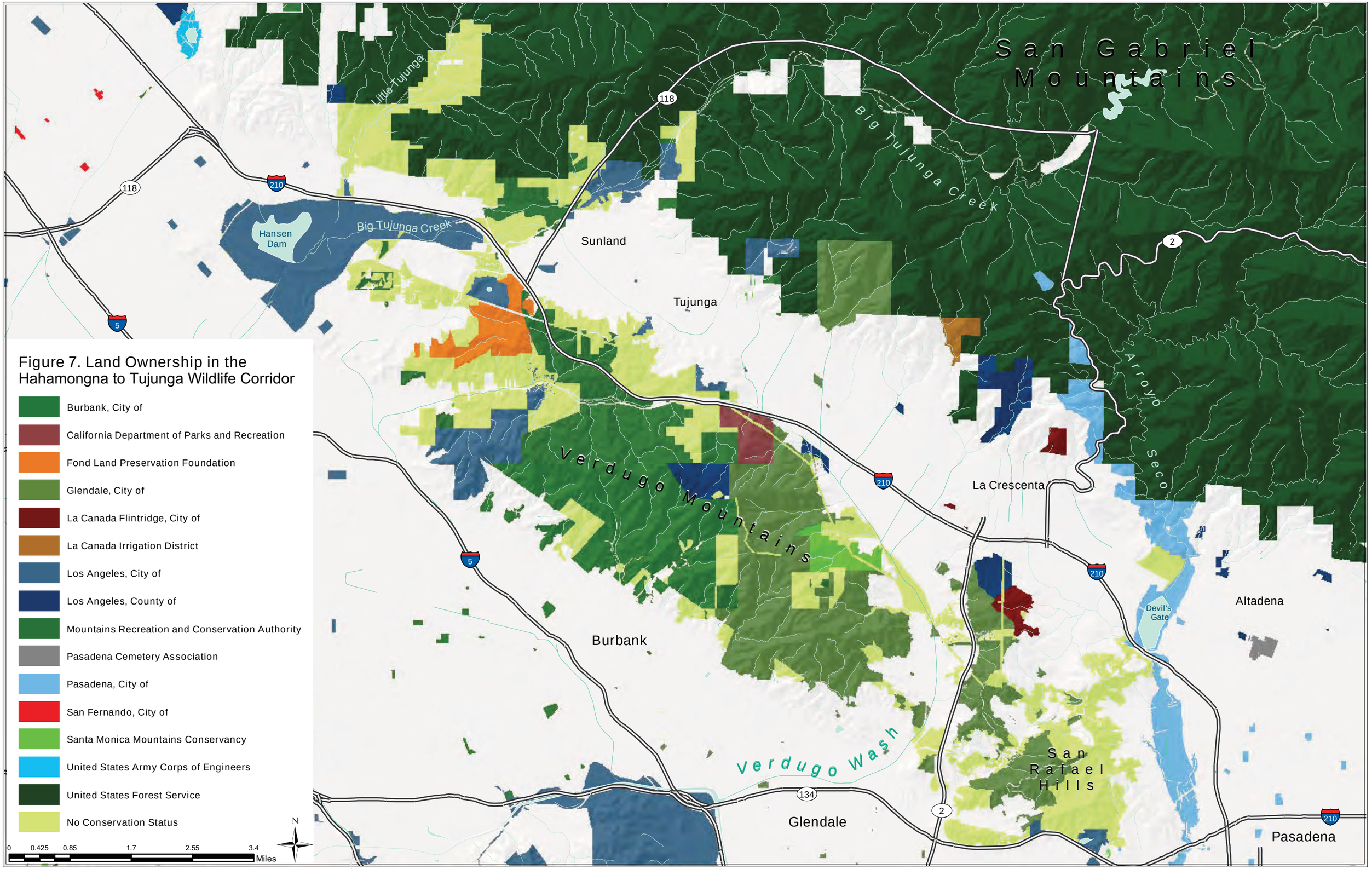
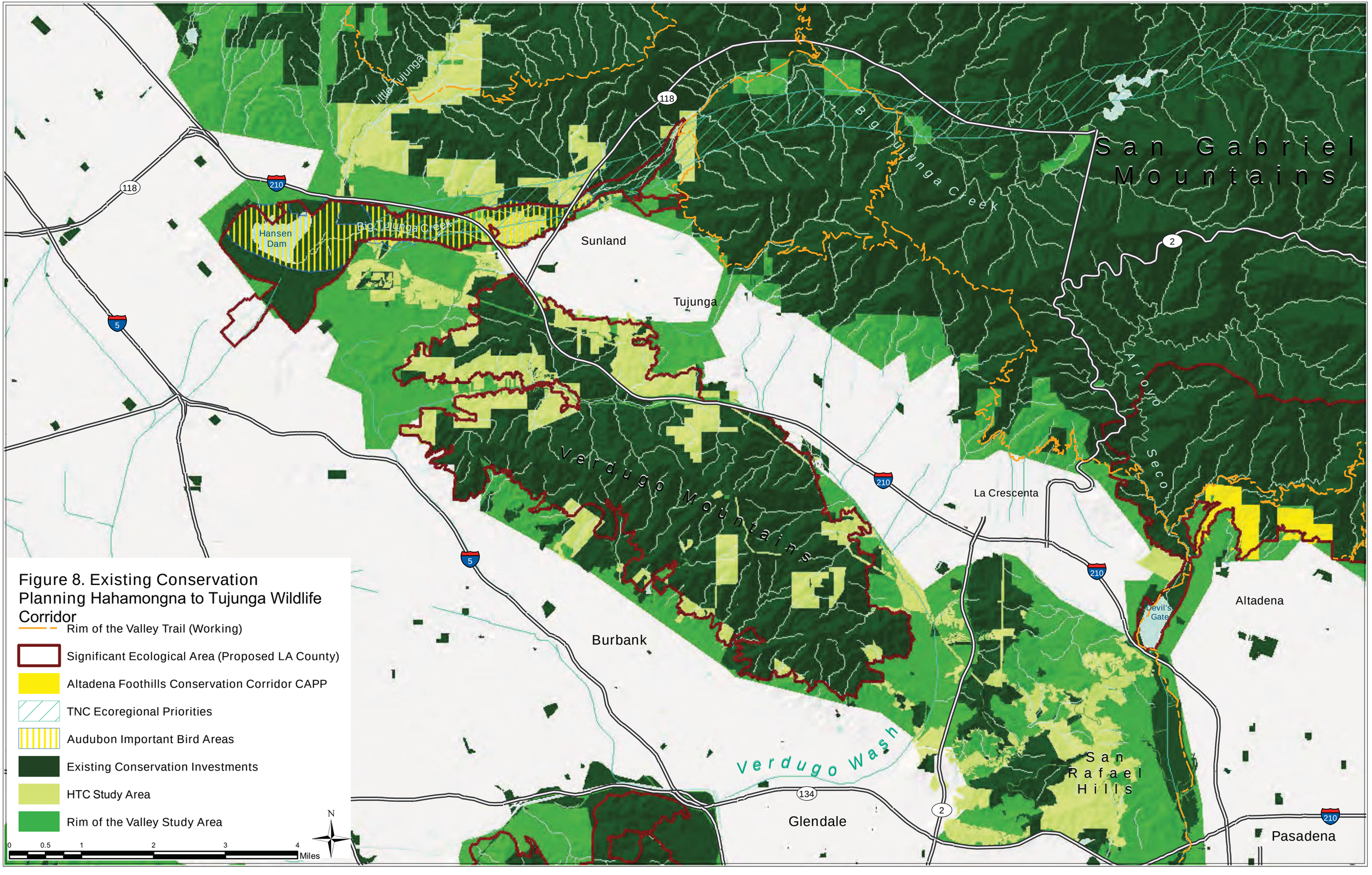


Figure 7. Land Ownership in the Hahamongna to Tujunga Wildlife Corridor


Little Tujunga
Big Tujunga Creek
San Gabriel Mountains
Hansen Dam
Big Tujunga Creek
Sunland
Tujunga
Verdugo Mountains
La Crescenta
Arroyo Seco
Devil's Gate
Altadena
Burbank
Verdugo Wash
San Rafael Hills
Glendale
Pasadena
118
210
5
2
134
Figure 8. Existing Conservation Planning Hahamongna to Tujunga Wildlife Corridor
Rim of the Valley Trail (Working)
Significant Ecological Area (Proposed LA County)
Altadena Foothills Conservation Corridor CAPP
TNC Ecoregional Priorities
Audubon Important Bird Areas
Existing Conservation Investments
HTC Study Area
Rim of the Valley Study Area
N
0 0.5 1 2 3 4
Miles

Appendix A-2 Hahamongna to Tujunga Wildlife Corridor Photos

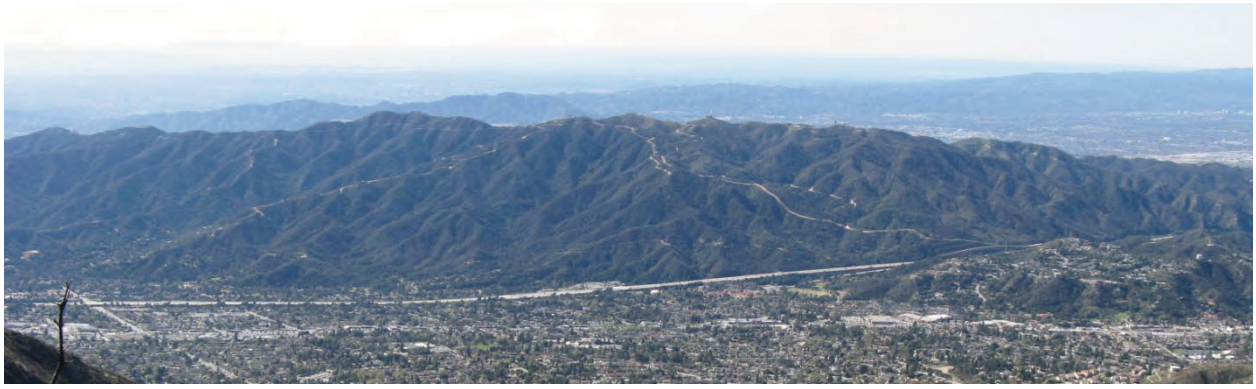
P-41 is a male mountain lion that makes the Verdugo Mountains his home. Photo: www.deniscallet.com

A remote camera installed by Denis Callet has captured many photos of P-41. Photo: deniscallet.com

Appendix A-2 Hahamongna to Tujunga Wildlife Corridor Photos

The approximately 8-year old, 130 pound male (P41) is the first carnivore to be studied in the Verdugo Mountains. Photo: Johanna Turner

Jeff Sikich, National Park Service, uses a radio antenna to try to pick up a signal from collar on P-41. Photo: Marcus Yam, Los Angeles Times



View of the Verdugo Mountains. Photo: Roy Anderson, summitpost.org

Wildlife movement routes at Cottonwood Canyon and the Arroyo Seco. Map: Arroyos and Foothills Conservancy.

Motion detected camera captures bobcat at Cottonwood Canyon. Photo: Arroyos and Foothills Conservancy

Appendix A-2 Hahamongna to Tujunga Wildlife Corridor Photos

Motion detected camera captures coyote at Cottonwood Canyon. Photo: Arroyos and Foothills Conservancy

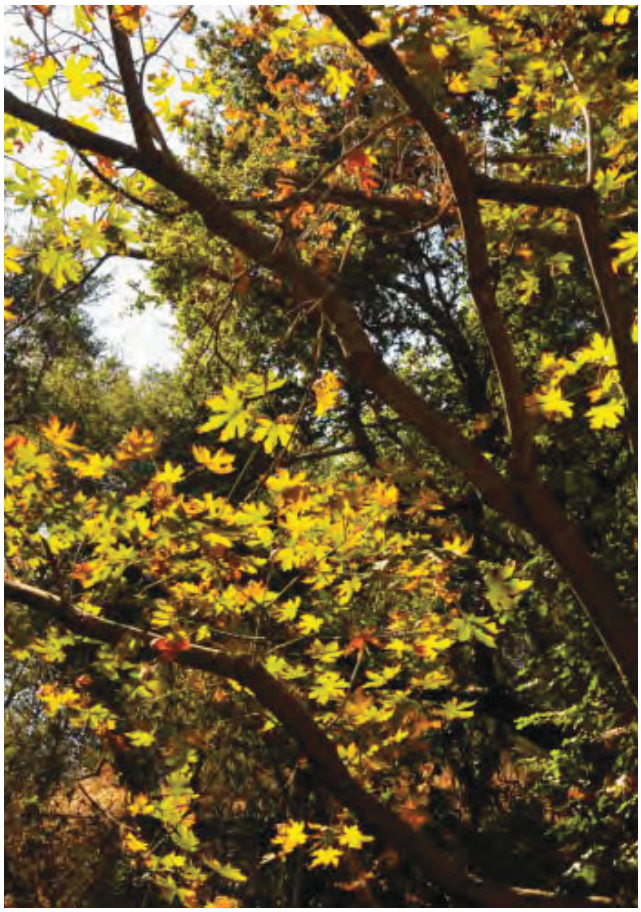
Appendix A-2 Hahamongna to Tujunga Wildlife Corridor Photos

Motion detected camera captures mule deer at Cottonwood Canyon. Photo: Arroyos and Foothills Conservancy

A California spotted owl (*Strix occidentalis occidentalis*) took refuge in the shaded canopy of lower Cottonwood Canyon in October 2014, and was photographed and video-taped eating a woodrat. Photo: Mickey Long

Appendix A-2 Hahamongna to Tujunga Wildlife Corridor Photos

Angeles National Golf Club in the Big Tujunga Wash (angelesnational.com).



Sycamore (above) and Coast live oak woodland (below) in Cottonwood Canyon (Arroyos and Foothills Conservancy).

Appendix A-3 Hahamongna to Tujunga Wildlife Corridor Land Prioritization

The analysis extent for the Hahamongna to Tujunga Wildlife Corridor (HTC) encompassed a total of 2,652 Parcels covering 22,098 acres. At the time of this analysis, approximately 13,698 acres of the parcels analyzed (479 parcels) are protected in fee or conservation easement, leaving 8,400 acres on 2,173 parcels to be prioritized (Figure A.3-1 and A.3-2). The accompanying spreadsheet and GIS data provide several attributes for each of the parcels analyzed (e.g., size class, critical habitat, CNDDB occurrences, rivers and streams, Audubon Important Bird Areas, The Nature Conservancy's ecoregional priorities, Rim of the Valley Trail Alignment, LA County Significant Ecological Areas, vegetation type) that can be queried for evaluating projects during implementation.

Priority	# of Parcels in Tier	Total Acreage in Tier
Tier 1 – key choke-points and largest parcels	508	2,908
Tier 2 – larger parcels that buffer Tier 1/protected	62	1,284
Tier 3 – smaller open space parcels, mostly <20 ac	611	2,266
Tier 4 – smaller parcels with some residential development and open space	992	1,942
Totals	2,173	8,400

Priority Tier 1

There are a total of 508 Parcels covering 2,908 acres in Tier 1. Priority 1 parcels were selected to build upon our existing conservation investments and maintain connectivity between and within the targeted ranges. The bulk of the parcels in this tier (431) are smaller parcels located at critical choke-points and highway crossings. These includes choke-points within the San Rafael Hills in upper Cottonwood Canyon and across Sycamore Canyon in two areas linking existing protected lands; south of the 210 freeway between Tujunga Valley and the Verdugo Mountains; and at Highway 2 just north of the Fern Lane underpass linking the San Rafael Hills to the Verdugo Wash at Glorietta Park. This tier also incorporates the majority of

Size Class	# Parcels Tier 1
6 = > 150 acres	1
5 = 80 to 150 acres	7
4 = 40 to 80 acres	18
3 = 20 to 40 acres	15
2 = 5 to 20 acres	36
1 = < 5 acres	431

the largest parcels in the Study in Size Class 4 or greater. Tier 1 includes 24 parcels that contain critical habitat for the Santa Ana sucker including one parcel also designated as critical habitat for the southwestern willow flycatcher. A staggering 95% (483 parcels) of the parcels in Tier 1 intersect the polygon feature class of recorded occurrences of sensitive and listed species and communities from the California Natural Diversity Database (2015). Tier 1 also captures 60 parcels proposed as Significant Ecological Areas (SEA) in Los Angeles Counties general plan update (i.e., 24 parcels in Tujunga Valley/Hansen Dam SEA; and 36 parcels in Verdugo Mountains SEA). In addition, Tier 1 captures 89 parcels that contain rivers or streams; 11 parcels in Tujunga Canyon identified by The Nature Conservancy as conservation priorities; 26 parcels identified as an Important Bird Area by Audubon, and 3 large parcels along the Rim of the Valley Trail Alignment.

Priority Tier 2

There are 62 parcels in Tier 2 covering 1,284 acres. Priority 2 parcels were selected to build upon and buffer Priority 1 parcels and key riparian connections, provide more live-in and move-through habitat for the target species, and to make existing conservation lands in the Verdugo Mountains less prone to edge effects from the surrounding urban areas. This tier includes the bulk of the parcels in Size Class 3 covering 1,045 acres. Priority Tier 2 includes 10 parcels that contain designated critical habitat and 39 parcels that intersect the polygon feature class of recorded occurrences of sensitive and listed species and communities from the California Natural Diversity Database (2015). In addition, 28 parcels in Tier 2 are proposed as SEAs in LA County's general plan update (i.e., 24 parcels in Verdugo Mountains SEA and 4 parcels in Tujunga Valley/Hansen Dam SEA); 13 of the parcels are identified as conservation priorities by The Nature Conservancy; 1 parcel identified as an Important Bird Area by Audubon; 4 parcels in the Rim of the Valley Trail Alignment, and 41 parcels that contains rivers or streams.

Size Class	# Parcels Tier 2
3 = 20 to 40 acres	35
2 = 5 to 20 acres	18
1 = < 5 acres	9

Priority Tier 3

Priority Tier 3 includes 611 parcels covering 2,266 acres. This tier primarily includes smaller parcels that are entirely covered by natural habitats. Virtually all of the parcels in this tier are 20 acres or less and 77% are 5 acres are less. The largest parcel in this tier is the 158.71 acre Scholl Canyon Landfill (portion of parcel 5666001904), which will eventually be restored as required by the Bureau of Reclamation. The three parcels in Size Class 3 in this tier are somewhat isolated by existing development in the San Rafael Hills. Priority Tier 3 includes 4 parcels that contain designated critical habitat for the Santa Ana sucker and 394 parcels that intersect the polygon feature class of recorded occurrences of sensitive and listed species and communities from the California Natural Diversity Database (2015). In addition, 29 parcels are

Size Class	# Parcels Tier 3
6 = > 150 acres	1
3 = 20 to 40 acres	3
2 = 5 to 20 acres	139
1 = < 5 acres	468

identified as conservation priorities by The Nature Conservancy; 194 parcels are proposed as SEAs by LA County (i.e., 193 parcels in Verdugo Mountains SEA and 1 parcel in Tujunga Valley/Hansen Dam SEA); 9 parcels in Tujunga Valley are designated as an Important Bird Area; 1 parcel in the Rim of the Valley Trail Alignment; and 116 parcels in this tier contain rivers or streams.

Priority Tier 4

Priority Tier 4 includes roughly 46% of the parcels in this HTC Study area on about ¼ of the land (1,942 acres). Virtually all of the parcels in Priority Tier 4 are rural residential lots, where the bulk of the parcel is in natural habitats (see photo Tier 4 parcels outlined in white), often abutting several similar parcels that together provide choke-points of natural habitat between larger habitat areas. These parcels should be targeted for stewardship and outreach rather than acquisition or easements to reduce edge effects in the Eastern Rim of the Valley Corridor. This tier contains 13 parcels with designated critical habitat and 795 parcels that intersect the polygon feature class of recorded occurrences of sensitive and listed species and communities from the California Natural Diversity Database (2015). In addition, Tier 4 contains 40 parcels identified as conservation priorities by The Nature Conservancy; 149 parcels proposed as SEAs (i.e., 139 parcels in Verdugo Mountains SEA, 9 parcels in Tujunga Valley/Hansen Dam SEA, and 1 parcels in Altadena Foothills and Arroyos SEA); 11 parcels identified as an Important Bird Area; 1 parcel in the Rim of the Valley Corridor Trail Alignment, and 150 parcels that contain rivers or streams.

We suggest a direct mail campaign to all parcels within the analysis extent not already protected in fee or conservation easement focused on the importance of maintaining and restoring

landscape connectivity and their role as land stewards. The role of the direct mail campaign is two-fold: 1) to draw out willing sellers or landowners interested in conservation easements on larger parcels; and 2) to provide guidance to landowners living at the urban-wildland interface. For the Tier 4 parcels, in particular, the campaign could use the beloved American idiom "Back forty" for Wildlife. This could be in the form of a tri-fold brochure or a more comprehensive booklet like Living Lightly in Our Watershed. Example topics may include:

Reduce traffic speed. Be alert and reduce speed when traveling through wildlands to minimize wildlife mortality and vehicle collisions.

Don't feed wildlife. Don't give food to wildlife directly and don't leave pet food outside. Both can attract predators by attracting their prey.

Don't Plant Escape Artists. Some ornamental plants, such as pampas grass, tamarisk & giant cane have a propensity for spreading, and can out compete native plant species.

Keep children safe. Don't let small children wander in wildlands unattended or play near dense vegetation.

Keep pets safe. Do not allow pets to roam in or near wildlands. Free roaming cats have decimated songbird populations, and they can also become easy prey for coyotes and other predators. Keep dogs leashed to protect your pet and wildlife. Feed pets indoors and lock pet doors at night.

Keep livestock secure. Install predator-safe enclosures for livestock and outdoor pets to avoid conflicts with wildlife.

Keep trash secure. Dispose of garbage in wildlife-proof containers.

Limit nighttime lighting. Homes abutting wildlands should have minimal outdoor lighting, always directed toward the home and yard.

Don't use pesticides. They can directly kill many species and cause secondary poisoning in predators and scavengers, such as coyotes, hawks, and owls.

Don't abandon unwanted pets. Releasing pets such as turtles, frogs, or fish in or near wildlands can seriously alter natural community dynamics. Some frogs sold in pet stores (e.g., bullfrogs and African clawed frogs) have devastated populations of many native aquatic and semi-aquatic species (e.g., red-legged frog and southwestern pond turtle.

Limit noise. Loud noises can deter wildlife movement and alter habitat use patterns.

Minimize use of irrigation. Excessive irrigation can provide habitat for non-native invasive species such as Argentine ants and bullfrogs. If using ornamental plants for landscaping, use non-invasive drought tolerant species.

Limit fencing. Large properties should minimize fencing to allow wildlife movement through wildlands.

Participate in local community planning. It is critical to have well planned communities that incorporate designs that slow and clean run off and respect natural ecological and physical processes.

Become an active steward of the land. Learn more about our watershed and the wildlife that inhabits it to reduce penetration of undesirable effects into wildlands.