is relatively uncommon, but is among the most productive wildlife habitats in the state.

In addition to perennial freshwater marshes, seasonal wetlands can be found in the study area. Seasonal wetlands dry up during the summer, but become saturated and take on the characteristics of a freshwater wetland during the rainy season.

Vernal pools are a distinctive type of seasonal freshwater wetland which are extremely rare in the area. The nearest verified vernal pools are just outside the study area on the northern rim of the Upper Santa Clara River Valley (at Cruzan Mesa and Plum Canyon). However, there are likely unrecognized ephemeral pools within the study area in suitable soil types. For example, there is at least one small documented seasonal pond with typical vernal pool characteristics in the Golden Valley Ranch portion of the upper Placerita-Sand Canyon watershed on the south side of the Upper Santa Clara River Valley. This small pool is surrounded by coastal sage scrub, with a band of native needlegrass and melic grass (*Melica* spp.) on its fringes. The Golden Valley pool supports vernal pool fairy shrimp, Riverside fairy shrimp and western spadefoot toad (Juhasz 2011, LADRP 2012a).

Salt Marsh

Similar to freshwater marsh, salt marsh requires perennially shallow water or saturated soils, but is subjected to tidal influence and mixing of salt and fresh water. Species associated with this community include cattails, pickleweed (*Salicornia virginica*), and saltgrass (*Distichlis spicata*). Salt marsh occurs along the coast in the study area (LADRP 2012a, CDFG 2008).

Other Types of Vegetation

Agricultural Lands

Agricultural lands in the study area include orchards, irrigated croplands and ranchlands. Most agricultural areas are located on the northern and western edges of the study area, as well as just south of the Conejo Valley (CDFG 2008).

Eucalyptus

Eucalyptus (*Eucalyptus globulus* and other species) are nonnative shrubs or trees originally from Australia, which can occasionally be found in the study area. Eucalyptus often occurs in dense stands near populated areas in valleys and lower elevation foothills. Many stands were planted by humans (CDFG 2008).

Urban

Urban areas occur throughout the San Fernando, Simi, and Conejo Valleys, as well as along the Malibu Coast. The vegetation in these areas is dominated by ornamental plants, largely of exotic origin (CDFG 2008).

Special Status Plants

Within the study area, 74 plant species considered sensitive, rare, threatened or endangered by the U. S. Fish and Wildlife Service (USFWS), the California Department of Fish and Wildlife, or the California Native Plant Society

Riparian vegetation is often found in canyon bottoms, with the sloped areas characterized by shrub-dominated communities such as chaparral and coastal sage scrub. This north-facing side of the Verdugo Mountains illustrates this vegetation pattern which is found in many portions of the study area. Photo: NPS.

Examples of Biodiversity: Upper Santa Clara River

The Santa Clara River has remained largely natural and as such, provides an exceptional example of a natural river system in southern California. Most other rivers in the region have been significantly altered for flood protection or water resource development resulting in the loss of approximately 96% of historic riparian communities. The Upper Santa Clara River is home to more sensitive plant community types (at least seventeen) than any other portion of the study area. In addition to the variety of riparian vegetation types along the Santa Clara River corridors, the tributaries that connect the Santa Clara River to the Santa Susana Mountains and San Gabriel Mountains illustrate some of the unique natural communities of the study area, particularly Riversidian alluvial fan sage scrub.

The Santa Clara River is considered a major biotic corridor, and nearly the entire river system, including the river beyond the study area, is designated by Audubon as a Globally Important Bird Area. This area functions as one of the important habitat linkages in the Los Angeles region, providing a connection between the San Gabriel Mountains and the Sierra Pelona.

Sources: Faber 1989, Santa Clara River Project Steering Committee 1996, LADRP 2012a, Stephenson and Calcarone 1999

Within the study area, 74 plant species are considered to be sensitive, rare, threatened or endangered (LADRP 2000, Cooper 2010, USFWS 2011, CDFG 2012, NASA 2013, Soza et al. in press). Left photo: Verity's dudleya is a narrow endemic found only along a discontinuous 4-mile range of volcanic rock in Ventura County and is designated as federally-threatened. Photo: NPS. Right photo: The San Fernando Valley spineflower was previously believe extinct but was rediscovered in the Simi Hills in 1999 and is now designated as endangered by the State of California. Photo: Anthony Valois.

(CNPS) have been observed (LADRP 2000, Cooper 2010, USFWS 2011, CDFG 2012, NASA 2013, Soza et al. in press). Of these 74 species, 48 are endemic to California, and of those, 40 are endemic only to southern California (*Table D-6: Rare Plants* in *Appendix D*). This count only includes observations recorded in the California Natural Diversity Database[3] and published plant surveys. Since the study area is large and varied, and no comprehensive biological surveys have been conducted for all areas of the study area, it is likely that other special status plants occur in appropriate habitat.

Twelve plant species considered federally threatened or endangered have been recorded in the study area. Six of these are federally endangered (FE), five are federally threatened (FT) species, and one is a candidate species (C) for which the USFWS has on file sufficient information on the biological vulnerability and threats to support proposals to list as endangered or threatened (USFWS 2011a, CDFG 2012).

- Braunton's milk vetch (*Astragalus brauntonii*), FE
- California Orcutt grass (*Orcuttia californica*), FE
- Lyon's pentachaeta (*Pentachaeta lyonii*), FE
- Nevin's barberry (*Berberis nevinii*), FE
- Salt marsh bird's beak (*Chloropyron maritimum* ssp. *maritimum*), FE
- Slender-horned spineflower (*Dodecahema leptoceras*), FE
- Santa Monica Mountains dudleya (*Dudleya cymosa* ssp. *ovatifolia*), FT
- Agoura Hills dudleya (*Dudleya cymosa* ssp. *agourensis*), FT
- Conejo dudleya (*Dudleya parva*), FT
- Marcescent dudleya (*Dudleya cymosa* ssp. *marcescens*), FT
- Verity's dudleya (*Dudleya verity*), FT
- San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*), C

The life history, habitat, status, and threats to these threatened and endangered plants are described in *Appendix D*. Observed locations and designated critical habitat for these species are shown in *Figure 2-6: Designated Critical Habitat,* and *Figure 2-7: Federally listed Threatened and Endangered Species*.

Wildlife

The study area supports a diverse, abundant wildlife community, reflecting the range of vegetation and habitat types available. The complex, interconnected mosaic of vegetation types in the study area provides rich habitat for wildlife, many species of which use more than one community type in their daily activi-

[3] The California Natural Diversity Database is maintained by the California Department of Fish and Wildlife, with input from scientists and other partners, to provide current information on rare and imperiled plants, animals, and communities.

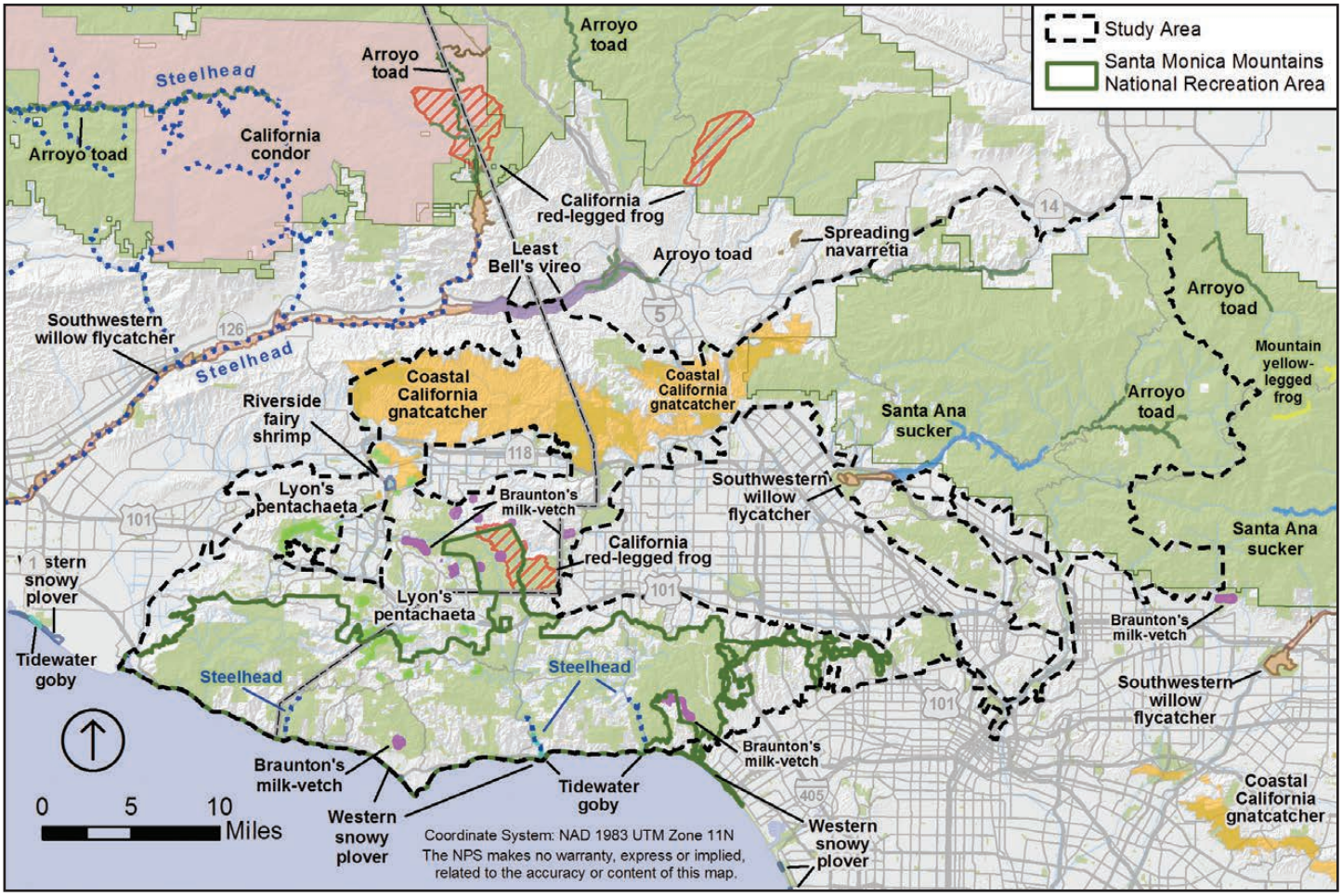

Figure 2-6: Designated Critical Habitat

ties. Many of the animal species endemic to Mediterranean habitats also rely on different communities seasonally or during different life cycle stages (NPS 2002, California Coastal Commission 2003, LADRP 2012a).

A wide variety of mammals are known to inhabit and use the study area. Mammalian diversity is influenced by habitat type and species sensitivity to human disturbance. Smaller, isolated patches of undeveloped habitat or areas close to housing or those used more heavily for recreation are primarily home to species tolerant of human disturbance. Species such as coyotes, raccoons, bobcats, skunks, deer mice, rabbits, and hares are often found in these areas, though these species also use and often prefer larger, more natural habitat areas. A variety of bats are also known to inhabit the study area. Large, wide-ranging mammals, such as black bears and mountain lions tend to spend more time farther from human development, but mountain lions are known to use most of the study area for foraging and dispersal. The presence of relatively stable populations of large carnivores (black bears and mountain lions) indicates that the food web in the study area is intact and resilient at all trophic levels (NPS 2002, Ventura County 2011, LADPW 2012, USACOE 2013).

The bird community in the study area is remarkably diverse due to the wide variety of coastal sage scrub, chaparral, forest, oak woodland and savanna, riparian, and grassland habitats which provide both forage and cover for year-round residents and migrants. Vegetation types are often interspersed, providing ideal opportunities for birds that require different habitats for foraging, nesting, and roosting. Many species of songbirds, waterfowl, and raptors are found in the study area. In addition, the southern edge of the study area, along the coast, is part of the Pacific Flyway, a major global migration route for birds (NPS 2002, LADPW 2012, USACOE 2013).

The study area supports robust populations of a variety of lizard and snake species. Preferred reptile habitat, in the form of open areas and rock outcrops for visibility and small mammal

Examples of Biodiversity: Santa Susana Mountains

The Santa Susana Mountains contain a variety of biological resources due in part to the convergence of coastal, montane and desert influences. The rare communities of the Santa Susana Mountains help to illustrate the distribution and evolution of flora, including plant species that are either ancient relics or have their northernmost or southernmost ranges in this area. For example, the uncommon Palmer's oak (*Quercus palmeri*), a desert species that can be very long lived, is found here. On the northfacing side of the mountains is the northwesternmost example of a Pleistocene/ Ice Age relic forest of bigcone Douglas-fir.

Also significant is the high diversity of oak woodlands documented in the Santa Susana Mountains including valley oak, coast live oak, interior live oak, and canyon live oak. Outstanding examples of valley oak savanna, a now-rare habitat type which was once emblematic of the Santa Clarita and San Fernando Valleys, are found on the north side of the mountains. Large areas of California black walnut woodlands include some of the most unusual mixed evergreen and hardwood forests in southern California.

Sources: pers. comm. Betsy Landis 2011, LADRP 2012a, pers. comm. David Magney 2011, pers. comm. Suzanne Goode 2011, Mullally 1992)

burrows for cover, is abundant throughout the study area. Southwestern pond turtles are also found in a number of places with permanent water (LADPW 2012, USACOE 2013).

Amphibians tend to be restricted to moister areas such as canyon bottoms, riparian areas, and surface water sources. A variety of native frogs, toads, and salamanders are found throughout the study area. Two nonnative amphibians, American bullfrog (*Lithobates catesbeinus*) and African clawed frog (*Xenopus laevis*), are widespread in the study area (NPS 2002, LADPW 2012, USACOE 2013). The American bullfrog is a known competitor and predator of the federally threatened California red-legged frog and other native species, and the African clawed frog may be responsible for the introduction of the virulent fungus *Batrachochytrium dendrobatidis* (chytrid) to California (Stebbins and McGinnis 2012).

The Los Angeles basin was once home to at least seven native species of freshwater fishes that have been declining or have been extirpated since the 1930s: the Southern California Distinct Population Segment of steelhead (*Oncorhynchus mykiss*), unarmored threespine stickleback, Santa Ana sucker (*Catostomus santaanae*), arroyo chub (*Gila orcuttii*), Pacific lamprey (*Lampetra tridentata*), Pacific brook lamprey (*Lampetra pacifica*) and Santa Ana speckled dace (*Rhinichthys osculus*) (USACOE 2013). Steelhead, Pacific lamprey, Pacific brook lamprey, and the unarmored threespine stickleback have been extirpated from the Los Angeles basin since the 1950s but are still found in other portions of the study area (Swift et al. 1993, USFWS 2004). Two fish surveys of the Los Angeles River in 2004 and 2007 did not find any native fish. The most common nonnative fish identified were mosquitofish (*Gambusia affinis*), green sunfish (*Lepomis cyanellus*), and tilapia (*Oreochromis* spp.) (USACOE 2013). However, the Santa Ana speckled dace, the arroyo chub, and the Santa Ana sucker are found in some Los Angeles River tributaries (Swift et al. 1993, USFWS 2004, The River Project 2006).

Waterways in SMMNRA host spawning populations of steelhead and Pacific lamprey (NPS 2002). The Santa Clara River also supports important habitat for native fish including steelhead, unarmored three-spine stickleback, tidewater goby, Santa Ana sucker, and arroyo chub (LADPW 2005). A number of marine species are known to use the beaches and lagoons of the SMMNRA coast, including a spawning population of California grunion (*Leuresthes tenuis*) (NPS 2002). Many nonnative fish have been introduced to the waterways of the study area, particularly those with recreational fishing value (LADRP 2012a).

Invertebrate surveys in the study area have been focused in relatively small areas and often on limited suites of species. However, these surveys have indicated that the diversity and abundance of both terrestrial and aquatic invertebrates in the study area is quite large, and numerous rare, imperiled, and endemic species are present (*Table D-7: Rare Animals* in *Appendix D*)(Stoms et al. 2012, pers. comm. David Magney 2011, Sikich et al. n.d.). The highly invasive nonnative New Zealand mudsnail (*Potamopyrgus antipodarum*) has also been detected in at least eight streams in the Santa Monica Mountains (Sikich et al. n.d.).

Special Status Wildlife

A high concentration of sensitive wildlife is present in the study area: 51 animal species considered sensitive, rare, threatened or endangered by the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Wildlife, and the USFS have been observed (*Table D-7: Rare Animals* in *Appendix D*). This count only includes observations recorded in CNDDB and published biological surveys. Since the study area is large and varied, and no comprehensive biological surveys have been conducted, it is likely that other special status animals occur in the study area in appropriate habitat.

Seventeen animals considered federally threatened or endangered have been recorded in the study area. Ten of these are federally endangered (FE), six are federally threatened (FT) species, and one is a candidate species (C) for which the USFWS has on file sufficient information on the biological vulnerability and threats to support proposals to list as endangered or threatened (USFWS 2011a).

- Arroyo toad (*Bufo californicus*), FE
- Mountain yellow-legged frog (*Rana muscosa*), FE
- California red-legged frog (*Rana draytonii*), FT

Federally-Listed Threatened and Endangered Species

Rim of the Valley Corridor Special Resource Study

National Park Service
U.S. Department of the Interior

California Natural Diversity Database (May 2014)
Occurrence centroid locations shown on map, along with polygons where linear or specifically mapped. Accuracy of mapping varies and points shown on map range 0-5 miles from actual occurrence locations.

0 1 2 4 6 8 Miles

Coordinate System: NAD 1983 UTM Zone 11N
The NPS makes no warranty, express or implied, related to the accuracy or content of this map.

Santa Monica Mountains NRA GIS, September 2014
Data Sources: California Natural Diversity Database 2013; Existing protected areas: CPAD 9.1, NPS, SMMC, MRCA; Roads: Streetmap Pro 7;

Study Area
Santa Monica Mountains National Recreation Area
Existing Protected Areas

Amphibians
- arroyo toad
- California red-legged frog
- southern mountain yellow-legged frog

Fish and Aquatic Intertebrates
- Riverside fairy shrimp
- Santa Ana sucker
- southern steelhead
- tidewater goby
- unarmored threespine stickleback
- vernal pool fairy shrimp

Birds
- California condor
- California least tern
- coastal California gnatcatcher
- least Bell's vireo
- light-footed clapper rail
- southwestern willow flycatcher
- western snowy plover
- western yellow-billed cuckoo

Plants
- Agoura Hills dudleya
- Braunton's milk-vetch
- California Orcutt grass
- coastal dunes milk-vetch
- Conejo dudleya
- Lyon's pentachaeta
- marcescent dudleya
- Nevin's barberry
- salt marsh bird's-beak
- San Fernando Valley spineflower
- Santa Monica dudleya
- slender-horned spineflower
- spreading navarretia
- Ventura Marsh milk-vetch
- Verity's dudleya

Figure 2-7: Federally-Listed Threatened and Endangered Species

Several animal species considered sensitive, rare, threatened or endangered are found in the study area, including (from top to bottom) California condor, least Bell's vireo, arroyo toad, and southern steelhead. Photos (top to bottom): Gary Kramer/ USFWS, B. Moose Peterson/USFWS, USFWS, NOAA.

- California condor (*Gymnogyps californicus*), FT
- Coastal California gnatcatcher (*Polioptila californica californica*), FT
- California least tern (*Sterna antillarum browni*), FE
- Southwestern willow flycatcher (*Empidonax trailii extimus*), FE
- Least Bell's vireo (*Vireo bellii pusillus*), FE
- Light-footed clapper rail (*Rallus longirostris levipes*), FE
- Western snowy plover (*Charadrius alexandrinus nivosus*), FT
- Western yellow-billed cuckoo (*Coccyzus americanus*), C
- Southern steelhead (*Oncorhynchus mykiss*), FE
- Tidewater goby (*Eucyclogobius newberryi*), FE
- Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), FE
- Santa Ana sucker (*Catostomuss antaanae*), FT
- Riverside fairy shrimp (*Streptocephalus woottoni*), FE
- Vernal pool fairy shrimp (*Branchinecta lynchi*), FT

The life history, habitat, status, and threats to these threatened and endangered animals are described in *Appendix D*. Observed locations and designated critical habitat for these species are shown in *Figure 2-6: Designated Critical Habitat,* and *Figure 2-7: Federally listed Threatened and Endangered Species*.

Wildlife Corridors

The South Coast Ecoregion is simultaneously one of the most biodiverse areas in the country, the second most populous area in the U.S., and the most populated area in California, making it the most threatened hotspot of biodiversity in the continental United States (Spencer et al. 2010). Considerable wildlife habitat remains, mostly in rugged mountains, but is often separated by roads or densely urbanized or agricultural lands on gentler terrain (Spencer et al. 2010, South Coast Wildlands 2008). When plant and animal populations are isolated through habitat fragmentation, consequences can be severe, including reduced populations, increased susceptibility to environmental change, potential genetic deterioration, and even extirpation from formerly occupied habitats. The situation is especially serious for larger animals, including mountain lions, which require larger home ranges (NPS 2002, Riley et al. 2014).

Offsetting habitat fragmentation requires protecting connections between existing areas of natural habitat to form a regional wildland network. Existing open space habitat areas, sometimes referred to as nodes or reserves, are connected by corridors, which may be narrow or comprised of less ideal habitat than the nodes themselves. When existing natural habitats are connected, plants and animals are able to move between them, allowing natural ecological processes to occur (such as finding food and mates, migration, interbreeding between populations, recolonization of unoccupied habitat, and potentially responding to climate change with range shifts). It is generally preferable to maintain connections where they exist, although it may be necessary to construct or improve corridors in some situations (Stoms et al. 2012, USACOE 2013, LADRP 2012a, South Coast Wildlands 2008).

California red-legged frog has been the focus of a reintroduction effort in Santa Monica Mountains National Recreation Area. Photo: NPS

Examples of Biodiversity: Griffith Park

Griffith Park, the largest park in the City of Los Angeles, is located at the eastern terminus of the Santa Monica Mountains (outside of SMMNRA) and consists of an extensive, relatively undisturbed natural island in an urbanized area. Though isolated, this area is important for preserving and documenting the geographic variability of plants and animals that formerly occurred throughout the region.

The park contains many sensitive natural communities including California bay forest, California brittle brush scrub, California sycamore woodlands, and holly leaf cherry chaparral. The northern part of the park includes coastal sage scrub and valley needlegrass grassland. Riparian forest ravines are easily seen along Griffith Park Drive. Oak woodlands along drainages transition into chaparral and grassland on the uppermost slopes. North-facing rocky outcrops in the park often have cliffside vegetation of lichens, mosses, liverworts and along with live-forever (*Dudleya* spp.), and other flowering plants.

Birds rely on these open space islands to rest and feed as they migrate. Griffith Park also serves as a corridor for species movement that may take place between the Santa Monica and San Gabriel mountains via the Verdugo Mountains.

Sources: LADRP 2012a.

Left photo: Rocky Peak Park stretches from the 118 freeway five miles north to Las Llajas Canyon and forms a critical wildlife habitat linkage between the Simi Hills and the Santa Susana Mountains. Right photo: NPS has been conducting ongoing studies of mountain lion movement in and around SMMNRA. Photos: NPS.

Although habitat linkages and corridors are key to wildlife movement, to be most effective, they must connect large, contiguous blocks of protected open space. Without the core habitats that include sufficient areas for foraging and breeding, the ability to maintain healthy populations is reduced. Evaluation of connectivity needs and potential linkage areas requires identifying which core areas the linkage would serve and which species would utilize and benefit from the connection(s). The required characteristics of a corridor (such as cover, visibility, and corridor width) will vary by species. Although some habitat linkages and wildlife movement corridors may be useful for some species they may be less valuable or important for others. Roadways are often the primary interruption to otherwise intact corridors, because they often divide otherwise undeveloped land. Some species may use under or overpasses, or attempt to cross the road itself, but others may be stuck on one side (NPS 2002). River corridors naturally serve as important wildlife corridors in much of the southwestern U.S. because they provide cover, water, and food not found in much of the surrounding upland habitat (USACOE 2013).

The South Coast Ecoregion has probably undergone more connectivity and conservation planning than many other regions in the country, due to its uniquely high levels of both biodiversity and human development (Spencer et al. 2010). Despite the development of significant portions of habitat, the remaining habitat reserves of the South Coast Ecoregion are substantial and remain a fundamentally interconnected system (South Coast Wildlands 2008). In and near the study area, major habitat blocks remain in the San Gabriel Mountains, the Sierra Pelona (Angeles National Forest north of the San Gabriel Mountains), the Topatopa Mountains (Los Padres National Forest), and, to a lesser extent, the Santa Monica Mountains. The effects of fragmentation in the region have been intensively studied over the past few decades, and multiple attempts at collaborative habitat connectivity planning have taken place at varying scales.

The most thorough and specific planning effort has been the South Coast Missing Linkages (SCML) project, which developed 15 detailed, feasible linkage designs representing a network connecting the entire region – from the southern Sierras to the coast to the Mojave and Sonoran deserts (*Figure 2-8: Habitat Linkages*). The SCML used a collaborative process, with involvement from local, state, and federal agencies (including the NPS), non-profit organizations, and academic scientists, to determine likely corridors between major protected areas by considering landscape permeability to selected focal species. The project identified a total over 50 missing linkages. The 15 corridor designs represent the highest priority linkages which must be maintained if the incredible biodiversity of the South Coast Ecoregion is going to be preserved. Corridors associated with the study area include two primary branches connecting the Santa Monica, Santa Susana and Sierra Madre mountains (via the Topatopa Mountains in the Los Padres National Forest) around the edges of Simi Valley. Another primary corridor links the San Gabriel Mountains to the Sierra Pelona to the north (both parts of the Angeles National Forest) across the Upper Santa Clara River valley. Outside of the high priority linkage designs, additional important corridors were identified

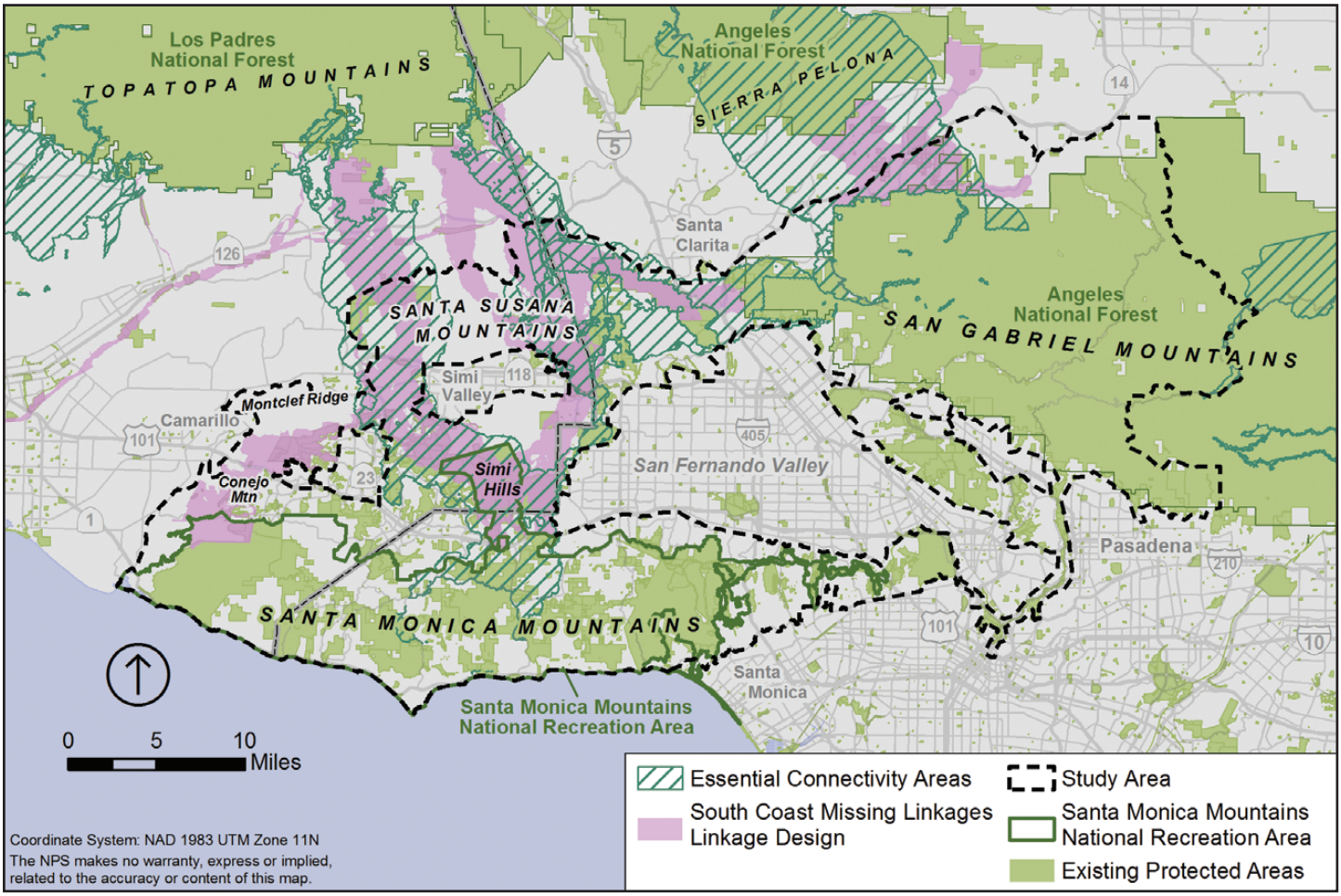

Figure 2-8: Habitat Linkages

that connect the Santa Susana Mountains to the San Gabriel Mountains, and another that connects the western Santa Monica Mountains to the Santa Susana Mountains via the Conejo Mountain / Mount Clef Ridge area (Penrod et al. 2006).

The California Essential Habitat Connectivity (CEHC) project was prepared by the California Department of Transportation and the California Department of Fish and Game to identify habitat linkages at a state-wide scale. The CEHC used a similar collaborative process to the SCML, but at a broader scale. Rather than building linkages based on the needs of focal species, it used a GIS based landscape analysis to connect 850 Natural Landscape Blocks (open-space and protected areas) throughout the state of California using 192 Essential Connectivity Areas (corridors). In the southern California region, the corridors identified by the CEHC have more than an 80% overlap with those identified by SCML. Corridors associated with the study area include a pair of corridors linking the Santa Monica to the Santa Susana to the Topatopa Mountains, a corridor linking the Santa Susana and San Gabriel Mountains, and a corridor linking the San Gabriel Mountains to the Sierra Pelona (Spencer et al. 2010). These corridors are very similar to the corridors identified by SCML.

Smaller-scale studies focused on maintaining connectivity to particular protected areas have also identified corridors similar to those in SCML and CEHC. For example, Los Angeles County has identified a set of significant ecological areas, which support valuable habitat for plants and animals. To maintain high levels of connectivity between core habitat areas, Los Angeles County has also identified networks of linkages and corridors for each SEA (LADRP 2012a). Santa Monica Mountains National Recreation Area has also identified connections to the Simi Hills and onwards to the Santa Susana, Sierra Madre, and San Gabriel Mountains as necessary to ensure the survival of large mammals in the recreation area (NPS 2002). The Santa Monica Mountains Con-

Examples of Biodiversity: Simi Hills

The biodiversity of the Simi Hills includes resources not found in neighboring mountains. Uplifted marine sediments form intermixed sandstone and carbonate beds resulting in soils supporting unique patterns of sensitive vegetation that contribute to a diverse ecological mosaic. Laskey Mesa in the Upper Las Virgenes Open Space Preserve represents one of the most outstanding examples of native grasslands in southern California. Before it was rediscovered at Laskey Mesa in 1999, the endemic San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*) was presumed extinct.

Ponds and seasonally wet areas in the Simi Hills support a diversity of rare species, including grasses and invertebrates more commonly associated with vernal pools and the southernmost population of the federally threatened California red-legged frogs (*Rana draytonii*). Surveys performed by NPS biologists have also found several rare amphibian and reptile species, including western spadefoot toad (*Scaphiopus hammondii*) and legless lizards (*Anniella pulchra*). The Chatsworth Reservoir area provides habitat for pond turtle, western spadefoot toad, as well as a variety of bird species.

Sources: LADRP 2012a, pers. comm. Suzanne Goode 2011, pers. comm. David Magney 2011, CNDDB 2011, pers. comm. Paul Edelman 2011

servancy comprehensive plan identified important corridors between the Simi Hills and Santa Susana Mountains, the Santa Monica Mountains and the Simi Hills, and between the Santa Monica and Santa Susana mountains via Montclef Ridge (Stoms et al. 2012). All of these corridors generally corroborate the corridors mapped by SCML and CEHC.

These key corridors are currently relatively undeveloped, but large portions consist of unprotected land in private ownership. Development or another use could block or eliminate these corridors and cause irreparable damage to animal movement in the South Coast ecosystem.

An additional corridor through a heavily urban area could also be achieved by the proposed restoration of the Los Angeles River and its tributaries, including Arroyo Seco. If restored, these riparian corridors would link the Santa Monica Mountains to the San Gabriel and Verdugo mountains. This corridor would provide a narrow linkage which could benefit species tolerant of nearby human development. In addition, even a partially restored river could provide a linkage for bird species which have the ability to fly between patches of suitable habitat (USACOE 2013). Although a corridor this narrow is unlikely to provide any benefit to large mammals, it could provide a linkage for populations of smaller species in the Santa Monica and San Gabriel mountains.

Fire History and Regime

The Mediterranean climate of southern California is dominated by shrubland vegetation types. These widespread and continuous stands of shrubs create "perfect fuels," much like the kindling in a campfire. There is an annual fire season in the fall as the vegetation dries out at the end of summer and hot, dry Santa Ana winds from the north or northeast become more frequent. Major wildfires often occur when a fire ignites in conjuntion with Santa Ana winds and low fuel moisture resulting from seasonal drought. High winds, heat, dry vegetation and terrain combine to facilitate rapidly moving, intense flames. Most of the study area has burned in large wildfires under these conditions. Chaparral fires consume most of the above ground vegetation and leave burned areas susceptible to postfire flooding and debris flows. Fires throughout the study area and southern California as a whole have a long history of causing major property damage and loss (*Figure 2-9: Fire Frequency*).

The conditions that lead to large wildfires are not a new phenomenon in southern California. The global circulation patterns that cause the Mediterranean climate and Santa Ana wind patterns have existed for millions of years. There have been many changes in vegetation and temperature patterns as ice ages have come and gone during that time, but Santa Ana winds and the Mediterranean climate with dry summers and moist winters have occurred for at least the past 5 – 10 million years (Axelrod 1973).

Large fires driven by Santa Ana winds have occurred in southern California as far back as there is evidence to assess. Analysis of charcoal in sediment cores collected in the Santa Barbara Channel suggest that large weather-driven fires have occurred more or less regularly throughout the last 600 years. Large wind-driven fires occurred through the Chumash Indian times, the Spanish, Mexican, and American ranching periods, and modern times. The fact that large fires continued to occur steadily through different historic periods with very different approaches to fire suppression suggests that the incidence of large fires is primarily determined by fire weather, and that it is a process substantially unaffected by modern attempts at fire suppression (Mensing, Michaelsen and Byrne 1999).

Recent fire regimes in the study area appear to be affected by several influences. These include increases in human-caused ignitions from increased vehicle traffic and human use, increased invasions of nonnative species that grow quickly and burn easily, other anthropogenic disturbances, and changing weather patterns (especially drought) associated with regional and global climate change.

Fire cycle

Southern California shrublands are adapted to a fire regime of infrequent, intense, stand-replacing crown fires that usually occur in the fall. These fires are often reported in the press to have "destroyed" thousands of acres of wildlands. However, native shrublands are

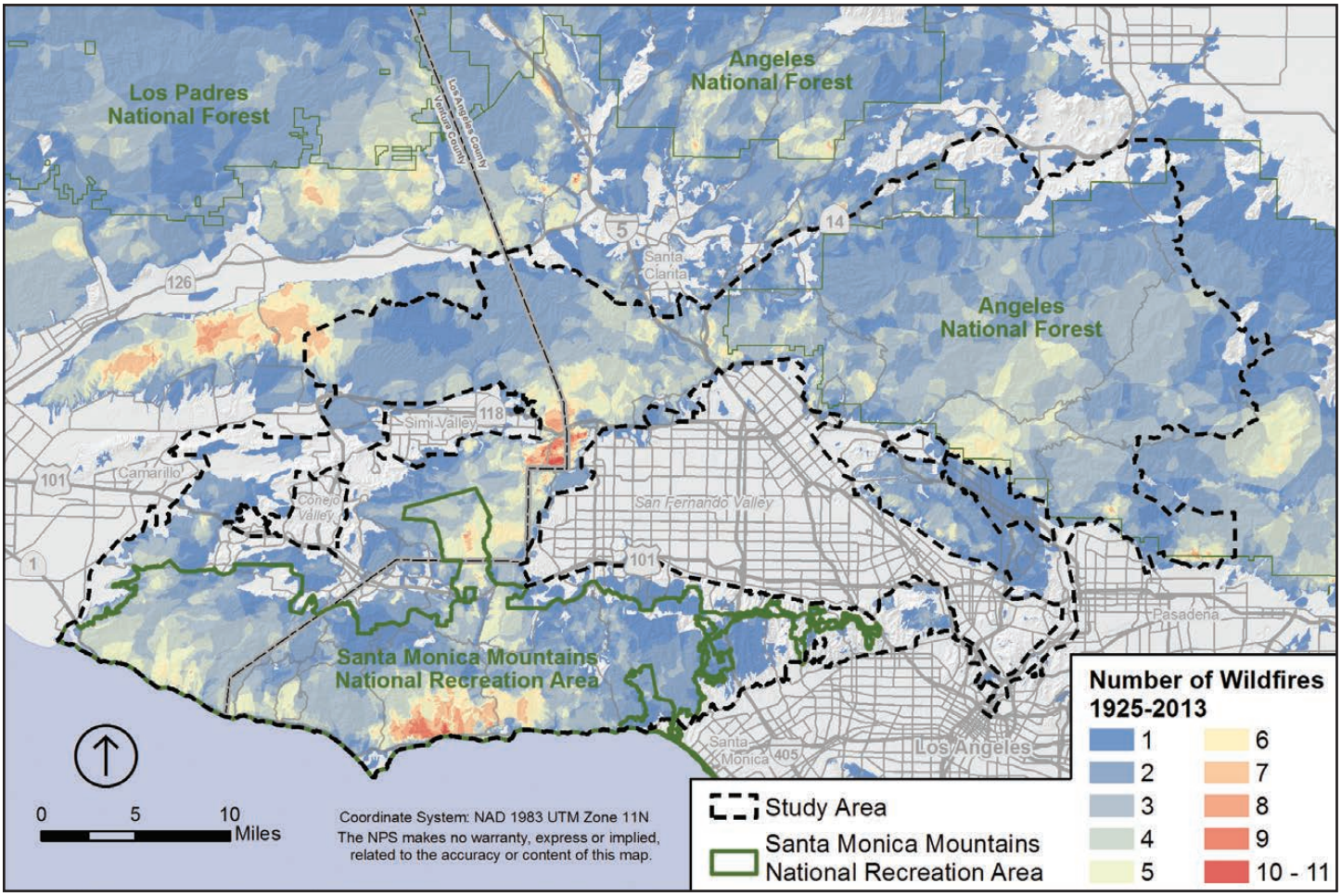

Figure 2-9: Fire Frequency

Southern California shrublands are adapted to a fire regime of infrequent, intense, stand-replacing crown fires that usually occur in the fall.

resilient to infrequent fires and have numerous traits that allow them to recover quickly. Often, even before any rain has fallen, the slopes become green as fire-tolerant shrubs respout from their root-crowns. With sufficient rainfall in the first spring following a fire, there is striking vegetation recovery on barren, blackened hillsides. New growth comes from resprouting shrubs and herbaceous perennials, germinating shrub seedlings, and an abundance of native annuals. Within about 10 years at coastal sites and 20 years at inland sites, the canopy of the dominant shrubs begins to close and short-lived fire-following annuals and perennials disappear and are present only in the soil seed bank.

Although chaparral and coastal sage scrub are fire adapted vegetation types, they are not fire-dependent ecosystems. Although a few chaparral species depend on fire to reproduce, such as the non-sprouting shrub species like bigpod ceanothus (*Ceanothus megacarpus*) and big-berry manzanita (*Arctostaphylos glauca*), most chaparral species resprout from underground parts and actually recruit in the intervals between fires. The term "fire-dependent ecosystem" is often used to imply a management need to provide fire that is absent in an ecosystem, however southern California is certainly not lacking in wildfire.

Fire Frequency and Ecosystem Threats from Wildfire

Scientists believe that fire intervals of less than 20 years may threaten the biodiversity of chaparral and coastal sage scrub (Keeley and Davis 2007). Although fire is part of the natural ecology of the study area, only the upper elevations of the San Gabriel Mountains have a history of natural lightning-caused fires. Over the last century, human activities have caused fire to occur much more frequently than it did historically. The estimated natural fire return interval for the chaparral types typical of this region is approximately 70-100 years (Safford and Van de Water 2013). However, the average amount of time between fires within the study area is currently far shorter than the natural fire return interval throughout most

The ecological threats related to fire in the study area are not from an insufficient amount of fire required in a fire-dependent ecosystem, but from fire occurring at such a high frequency that it exceeds the ability of the ecosystem to recover normally.

The 2009 Station Fire burned over 160,000 acres of the western San Gabriel Mountains and threatened foothill communities such as Altadena, La Canada Flintridge, La Crescenta, and Tujunga, and key facilities and infrastructure such as NASA's Jet Propulsion Laboratory. Photo: Merrilee Fellows/NASA.

of the 20th century. Analysis of fire history from 1925 through 2013 reveals average return intervals of 28-44 years for the study area, with Simi Hills having the shortest average return rate (28 years) and the Verdugo Mountains/ San Rafael having the longest average return rate (46 years) (NPS 2013c, CDF 2012, NPS 2014). Within the study area, the western Santa Susana Mountains, the Simi Hills, the ocean facing canyons of the Santa Monica Mountains above Malibu, and the foothills of the San Gabriel Mountains are especially prone to very short fire return intervals (too frequent fire).

The ecological threats related to fire in the study area are not from an insufficient amount of fire required in a fire-dependent ecosystem, but from fire occurring at such a high frequency that it exceeds the ability of the ecosystem to recover normally. When recovery is threatened by too-frequent fire, an area dominated by shrubs may be converted to nonnative grassland. This process of change from a native shrubland to nonnative grassland is known as type conversion. Type conversion leads not only to the loss of shrubs, but also to elimination of the native annuals that contribute to the rich species diversity of the postfire flora.

Climate change, fire and drought

Southern California is expected to experience among the most extreme shifts in climate in the United States in the 21st century. This is not just because of the absolute magnitude of temperature changes, but because of the enormous increase in variability expected in the climate system with increased severity and frequency of drought and increased severity of flooding.

When a drought year follows a fire, then vegetation recovery is at risk from drought-induced mortality. Increased drought frequency from climate change, combined with a high fire frequency, increases the probability of fire and drought coinciding and the potential for large shifts in plant community composition.

Additionally, large fires are more likely to occur during and after droughts (Davis and Michaelsen 1995). Fire-climate modeling predicts that relatively small increases in frequency and duration of droughts produce substantial increases in area burned by wildfires. Current future climate forecasts for southern California predict that rainfall will become more variable, with more droughts and more floods. Scientists expect the current Mediterranean-type fire regime to continue for the foreseeable future, but with increased potential for wildfires, especially in spring and summer, as the number and duration of droughts increase. As temperatures rise and drought increases, live fuel moisture will be at lower levels earlier in the year and for longer periods of time, potentially extending the length of the fire season (Dennison and Moritz 2009).

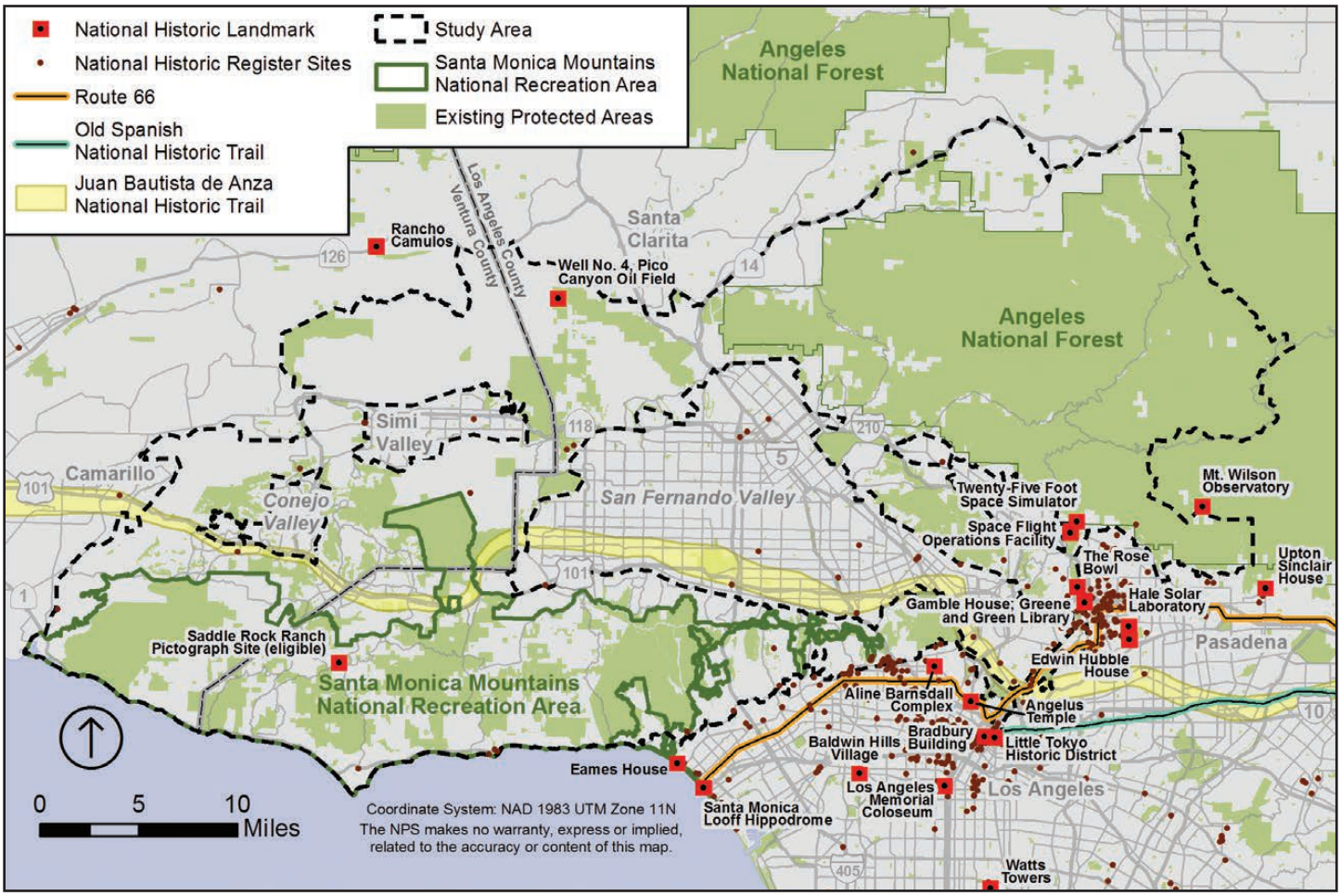

Figure 2-10: Cultural Resources

Cultural Resources

Introduction

The Rim of the Valley Corridor study area's rich history embraces the settlement of Native Americans, Spanish missionaries and colonialists, Mexican rancheros, and the wide range of cultures that reside in the area today. Cultural resources within the study area also depict the settlement and growth of southern California, a uniquely American story. A semiarid region facing an ocean, both encircled and bisected by mountains of the Transverse Range Province, the Los Angeles region would appear to be a difficult location for significant urban growth and settlement. Facilitated by innovations in engineering and infrastructure, Los Angeles transformed from an isolated settlement in 1781 to the second largest metropolitan area in the United States by the end of the 20th century (Kaplan 1987).

The study area contains an impressive collection of cultural resources of varying degrees of significance—from local landmarks to national historic landmarks. Resources include archeological resources, ethnographic resources, historic structures, cultural landscapes, and national historic trails (*Figure 2-10: Cultural Resources*).

Archeological resources are the physical evidence of past human activity, including the effects of these activities on the natural environment. Archeological resources are frequently conceptualized and managed as spatially discrete archeological sites. Sites are frequently clustered into larger units that can be defined as archeological districts, and sometimes archeological resources are obscured by vegetation or post-occupational soil deposition, or simply are too sparse to warrant site status. Ethnographic resources are basic expressions of human culture that are the basis for continuity of cultural systems. Ethnographic resources encompass both the tangible and the intangible, and include traditional arts and native languages, beliefs, and subsistence activities, as well as artifacts that were made and/or used by traditional groups and collected directly from them rather than recovered from archeological context.

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Structures are constructed works built to serve some human activity and are usually immobile. They can be of either prehistoric or historic age. Examples include buildings and monuments, trails, roads, dams, canals, fences, and structural ruins. Broadly defined, cultural landscapes reflect human adaptation, use of natural resources, and modification of the area through various land-use practices. Cultural landscapes are often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, the types of structures that are present, and the layout of structures with respect to other features of the physical and built environment. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by uses that reflect cultural values and traditions.

The following section identifies and describes the historic context and associated resources for the study area. *Tables D-8* through *D-11* in *Appendix D* summarize historic properties and archeological resources (organized by historic context) within the study area, including those properties listed, or determined eligible for listing, in the National Register of Historic Places, national historic landmarks, national historic trails, and California state landmarks. The NPS used existing resources from a wide range of sources to compile these resources for the study area. These resources include:

- National Register of Historic Places (NRHP) nomination forms
- California Historical Landmark Register
- Cultural resource records provided by the South Central Coastal Information Center at California State University, Fullerton, in June 2011
- Properties determined eligible for listing in the NRHP through Survey L.A. (comprehensive historic surveys conducted by the City of Los Angeles)
- Sites identified in, "Five Views Survey: An Ethnic Historic Site Survey," conducted by California Department of Recreation and Parks, State Historic Preservation Office
- Individual studies where available
- NPS archeological records and data for Santa Monica Mountains National Recreation Area

Historic sites on local historic registers have not been included because the numbers are quite numerous for the study area. However, it should be noted that such properties also contribute to the rich cultural history of the study area. Associated resource tables in *Appendix D* also include the geographic subregion(s) in which the property is located, and the associated theme represented by the site. The NPS uses the *National Park Service Thematic Framework* to organize historic properties by major themes that help to conceptualize American history. The framework is used to assist in the identification of cultural resources that embody America's past and to describe and analyze the multiple layers of history represented by each resource. Through eight concepts that encompass the multi-faceted and interrelated nature of human experience, the thematic framework reflects an interdisciplinary, less compartmentalized approach to American history. *Appendix F* includes a description of the thematic framework.

Geographic Scope

The geographic scope of the cultural resource description primarily corresponds to the 650,000-acre study area. However, the historic context is relevant to the broader southern California region. In some cases, the resource description references significant cultural resources adjacent to or just outside of the study area if those resources relate to cultural themes represented by study area resources.

Historic Context and Associated Resources

Prehistoric Period (Prior to 1542)

The prehistoric chronology presented here was developed primarily from research in the Santa Monica Mountains (King and Parsons 2010). The territories of groups that occupied the San Gabriel Mountains extended to both the desert and the coast. Archeological evidence in the Angeles National Forest dates to at least 6,000 years ago (USFS 1986, USFS 2005).

The prehistory of the area revolves around Native American occupation that is represented exclusively by archeological resources. The oral history maintained by modern-day descendants and written versions that were collected after Euroamerican contact provide