6 EFFECTS ASSESSMENT AND LEVEL OF TAKE

6.1 Introduction

This chapter estimates and analyzes the effects of the South Sacramento Habitat Conservation Plan (SSHCP) Covered Activities (see Chapter 5) on land cover types and Covered Species and their habitats. The analysis presented in this chapter is programmatic to address all SSHCP Covered Activities that will be implemented within the SSHCP Plan Area over the proposed 50-year Permit Term. This chapter analyzes effects programmatically rather than with a site-specific approach. Consequently, the effects presented in this chapter represent the maximum effects of the SSHCP Covered Activities on land cover types, Covered Species, and their habitats. Therefore, the acres of land cover conversion presented in this chapter represent the total allowable under the Plan's permits.

This effects analysis includes the eight major categories of Covered Activities described in Section 5.2:

- Urban Development in the Urban Development Area (UDA)
- Mining in the UDA
- Rural Transportation Projects
- Recycled Water Projects
- Covered Activities in Preserve Setbacks in the UDA
- Covered Activities in Stream Setbacks in the UDA
- SSHCP Preserve System Covered Activities
- Covered Activities in the Laguna Creek Wildlife Corridor of the Preserve System.

6.2 Species Effects Definitions

Covered Activities result in environmental stressors (see Section 6.3) that affect Covered Species and species habitat. Species effects can be permanent or temporary.

Permanent Effects

Permanent effects can be direct or indirect. Direct effects are caused by the activity and occur at the same time and place (50 CFR 402.02). Indirect effects are those effects that are caused by or will result from the activity and are later in time, but are still reasonably certain to occur (50 CFR 402.02).

Environmental stressors resulting from Covered Activities can permanently affect species by directly harming, harassing, killing, or injuring an individual of any Covered Species, or by directly removing, modifying, or degrading a land cover type that provides habitat for a SSHCP Covered Species.

Environmental stressors resulting from Covered Activities can also indirectly affect species when they modify or degrade species habitat over time, eventually causing a significant modification fully removing the value of the habitat for breeding, feeding, or sheltering. While more difficult to quantify and track, indirect impacts can substantially affect species habitat, especially if multiple indirect or direct impacts work cumulatively to degrade the habitat. All indirect effects are permanent.

Temporary Effects

All temporary effects are direct (i.e., are caused by the Covered Activity and occur at the same time and place as the Covered Activity). Temporary effects alter a land cover or species habitat for less than 1 year, and the disturbed area recovers or is restored to pre-project habitat conditions within 1 year of completing the ground disturbance (e.g., prescribed burning, construction staging areas, and construction dust). Permanent effects analyzed include (1) effects from Covered Activities that have a duration exceeding 1 year, and (2) effects from ground-disturbing Covered Activities with a duration of less than 1 year but the disturbed land cover or species modeled habitat require more than 1 year to restore to pre-activity condition (restoration begins immediately following end of the ground disturbance).

Incidental Take

Direct and indirect effects of Covered Activities will result in the incidental take of Covered Species. "Incidental take" is the take of fish or wildlife species that results from, but is not the purpose of, carrying out otherwise lawful activity (50 CFR 17.3). The federal Endangered Species Act (ESA) defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. 1532(3)(9)). Take is defined under the California Endangered Species Act (CESA) as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (California Fish and Game Code Section 86). Unlike federal law, the CESA does not include "harm" or "harass" in the definition of take.

"Harm" in the federal ESA definition of "take" means an act that actually kills or injures wildlife. Such acts may include significant habitat modifications or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" in the ESA definition of "take" means an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). The effects analysis in this chapter considers a significant modification to be removal of an SSHCP natural land cover type and conversion to another land cover type; for example, vernal pool converted to a developed land cover type, cropland, or vineyard would be a significant modification. This effects analysis considers significant degradation to an SSHCP land cover type to be when the land cover type remains, but an ecological function is adversely affected to the extent that the land cover type is unlikely to provide modeled Covered Species habitat. For example, damage to a vernal pool micro-watershed can change filling, depth, water chemistry, and period of ponding of the vernal pool.

Section 6.3 discusses specific environmental stressors for each of the major categories of Covered Activities that will temporarily or permanently affect species and result in "take."

Effects on Critical Habitat

As discussed in Section 3.6, the U.S. Fish and Wildlife Service (USFWS) designates Critical Habitat in specific areas that are essential to the conservation of a listed species. In addition to regulating "take" of listed species, the ESA also prohibits the "destruction or adverse modification" of designated Critical Habitat. Section 3(5)(A) of the ESA defines "Critical Habitat," in part, as "the specific areas within the geographical area occupied by the species, at the time it is listed…, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection." ESA Critical Habitat rules use the term "constituent elements" of Critical Habitat to define features "that are essential to the conservation of the species," including, but not limited to, "roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types" (50 CFR 424.12). Thus, to issue an Incidental Take Permit (ITP), the USFWS must ensure that the constituent elements of designated Critical Habitat will not be altered or destroyed by HCP proposed activities to the extent that the species' designated Critical Habitat (range-wide) would no longer remain functional to service its intended recovery role. Therefore, all HCPs must be reviewed by the USFWS to determine whether they are likely to cause adverse modification to designated Critical Habitat. It is possible for the USFWS to permit an HCP that authorizes land use or development activities within an area designated as Critical Habitat, provided the HCP proposed activities will not appreciably diminish the capability of the designated Critical Habitat to fulfill its intended role in the recovery of listed species. As discussed in Section 3.6, six SSHCP Covered Species have one or more designated Critical Habitat units located within the SSHCP Plan Area. Therefore, this chapter also quantifies the acres of Critical Habitat affected by the proposed Covered Activities.

6.3 Environmental Stressors from Covered Activities

This section describes how environmental stressors resulting from a Covered Activity affect land covers, species habitat, and individuals of Covered Species. The effects of these environmental stressors on Covered Species, species habitat, and land covers are analyzed in Section 6.5 and in Section 6.6, which identifies the amount of take the Permittees are requesting under the ITPs. Twenty-four environmental stressors are described below, organized by: (1) environmental stressors that would occur on an ongoing and permanent basis during operation of a Covered Activity over the Permit Term, and (2) those that would be temporary and occur only during and immediately after construction of a Covered Activity.

Permanent Environmental Stressors of Covered Activities

- Loss of land covers and Covered Species habitat
- Permanent alterations to watershed hydrographs and downstream water quality effects
- Habitat fragmentation
- Increased wildfire
- Vernal pool hydrologic alterations
- Chronic ground vibration and noise
- Lighting
- Increased human activity
- Wildlife community alterations
- Invasive plants
- Invasive animals
- Mesopredators
- Wildlife disease
- Pesticides and fertilizers
- Vehicle and aircraft collisions with wildlife
- Aboveground electrical utilities collision and electrocution

Temporary Environmental Stressors during Construction of Covered Activities

- Temporary alterations to hydrographs and construction water quality effects
- Laydown or trampling of vegetation

- Construction noise
- Construction ground vibration
- Construction lighting
- Construction dust
- Increased human presence during construction
- Construction trash and debris.

Table 6-1 presents a matrix identifying which environmental stressors could result from the various categories of Covered Activities. Table 6-2 provides a matrix for which species are affected by each environmental stressor.

6.3.1 Permanent Environmental Stressors of Covered Activities

Loss of Land Covers and Covered Species Habitat

The major effect of new urban development, transportation, and utility projects is conversion from undeveloped to developed land cover types. In addition to the net loss of undeveloped land cover in the Plan Area, such conversion may further isolate remaining natural habitat rendering it less suitable or unsuitable for Covered Species.

Natural land covers would be permanently converted to developed uses from construction of residential, commercial, and industrial structures, park and recreation facilities, some public and private utilities, solid waste management facilities, urban and rural transportation, and wastewater facilities. Construction of the Capital Southeast Connector would result in permanent direct effects within its footprint, temporary direct effects during construction, and potential indirect effects on Covered Species by creating barriers or hazards to movement and dispersal and fragmenting habitat. The Capital Southeast Connector is described in Section 5.2.1.1.

Habitat Fragmentation

Fragmentation and isolation of plant and wildlife populations can affect wildlife movement and dispersal as well as seed dispersal and movement and dispersal of plant pollinators. These may cause extinction of local populations as a result of two processes: (1) reduction in total habitat area, which reduces effective population sizes; and (2) isolation of local populations, which affects dispersal and immigration rates (Wilcox and Murphy 1985; Wilcove et al. 1986). Because of complex community-level interactions (e.g., mutualistic species, habitat guilds, and keystone species), the loss of one or a few species from a habitat patch as a direct result of habitat fragmentation ("primary" extinctions) also may result in multiple "secondary" extinctions within the habitat patch (Wilcox and Murphy 1985). At the larger landscape scale, change in regional abundance and distribution of habitat may change the migration and habitat use patterns of some wildlife species, which in turn affects the metapopulation dynamics of numerous organisms and alters multiple landscape-scale ecological functions. For example, many species will either not cross roads, drainages, disturbed lands, and urbanized areas or do so infrequently or unsuccessfully. The necessity of crossing roads also increases the risk of vehicle collisions, especially for small rodents, reptiles, amphibians, and low- or slow-flying birds. Roadway mortality or limitations on species movement leads to a variety of problems, including reduction and isolation of populations. As populations become isolated and smaller, they become particularly vulnerable to negative demographic trends, including genetic bottlenecks, genetic drift, and inbreeding depression. These changes in turn can affect ecological functions and the long-term viability of species, including those for which roads are not a major barrier, but which have important ecological relationships with high-risk species (e.g., predator/prey relationships, mutualisms such as burrow construction and use, pollination). This disruption may also affect vegetation communities if the spatial behavior of plant dispersers and pollinators is altered.

Fragmentation also decreases the functional size of conserved habitat patches. As remaining habitat areas diminish in size, the ratio of vulnerable edge to preserved interior area increases, especially with narrow or irregularly shaped habitat patches. Ecological consequences arise because, as this ratio increases, any given interior point (habitat or organism) is closer to potential threats existing outside the preserve boundary. Increased edge effects heighten species' vulnerability to stochastic disturbances, pollution, and invasion by non-native plant and animal species.

Fencing may inhibit the movement of some species that have large home ranges, such as badgers (*Taxidea taxus*), coyotes (*Canis latrans*), and mule deer (*Odocoileus hemionus*). Disrupting the ability of these species to move freely throughout their ranges may alter their foraging and social behavior, and may expose them to greater risks in other areas they may normally avoid or use less frequently due to lower habitat suitability, greater risks of predation, or greater risks of vehicle collisions.

Wildlife Community Alterations

Wildlife community alterations will occur in developed areas, and may occur along the open space–urban interface due to development-induced habitat degradation. Rottenborn (1999), for example, characterized wildlife species as being "tolerant" or "sensitive" to urbanization. The "tolerant" species include several birds that are commonly thought of as urban-related, such as pigeons (*Columbia livia*), mourning doves (*Zenaida macroura*), western scrub-jays (*Aphelocoma californica*), American crows (*Corvus brachyrhynchos*), northern mockingbirds (*Mimus polyglottos*), European starlings (*Sturnus vulgaris*), and bushtits (*Psaltriparus minimus*). Urban “sensitive” species included both year-long resident species, such as California quail (*Callipepla californica*), acorn woodpecker (*Melanerpes formicivorus*), and Bewick’s wren (*Thryomanes bewickii*), as well as migrants, such as willow flycatcher (*Empidonax traillii*) and yellow warbler (*Setophaga petechia*). Permeability to invasive or urban-tolerant species may be increased through reductions in plant structure and cover related to increased human activity in the area, and especially related to fuel-modification activities along habitat edges. These species may out-compete resident native species for resources (e.g., habitat, food, nesting locations) or directly prey on or parasitize the native residents. European starlings, for example, may directly compete with native cavity nesters for nest sites in urban settings.

Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects

By permanently increasing the extent of impermeable surfaces, urban development results in increased runoff, especially during storm events. Such increases can change the hydrograph of local creeks and streams, result in greater levels of scour and/or incision of local creeks, increased sediment loads downstream, alterations of downstream hydrology, and decreased groundwater recharge. Also, addition of new development may permanently increase the amount of pollutants such as grease, oil, and lawn pesticides in local creeks and streams transported from residences during wet weather. An increase in the quantity of pollutants reaching local creeks through higher runoff may affect the biological and physical characteristics of aquatic habitats. Pollutants can also enter groundwater when development occurs over percolation zones in streams, which can affect drinking water quality. However, Covered Activity AMMs (see Section 5.4) require construction in urban and rural areas to manage runoff so that existing runoff conditions and hydrograph (i.e., rate of runoff) are maintained and to reduce pollutants entering local streams. High runoff temperature may also result in an increase of in-stream water temperatures when runoff enters local streams. Permanent increases in impermeable surfaces or compaction of soils may also inhibit natural percolation of stormwater into groundwater basins, which may lead to a drawdown in groundwater levels.

Covered Activities could result in temporary hydrologic and water quality-related effects associated with construction, realignment, widening, extension, or abandonment and removal of culverts, bridges, or other stream-crossing facilities can have hydrologic effects to creeks and streams.

Covered Activities increase the potential for permanent ongoing discharge of point and non-point source pollutants to the natural landscape through surface and subterranean water flows, windblown trash accumulation, windblown dispersion of chemicals, and illegal dumping of industrial and household trash and garden waste in natural ecosystems. Pesticides, herbicides, and fertilizers may enter adjacent landscapes through runoff from irrigated landscapes or from storm events on a frequent basis. Contaminants from automobiles that collect on roadways, parking lots, and driveways and enter natural landscapes during storm events include oil, gas, brake dust, and other fluids. Road materials, leaks, and spills also permanently adversely affect riparian, wetland, aquatic, and semiaquatic species by contaminating their habitats. Illegal dumping of unwanted items such as trash, tires, and appliances in vacant habitat areas also crush vegetation and restrict photosynthesis by blocking the sun. Discarded electronics (i.e., e-waste) can introduce various toxic chemicals into the environment, including heavy metals that may leach into soil and water. These waste materials may chronically disrupt natural hydrology by forming obstructions and blocking flows and may create permanent habitat for pest species, such as non-native rats.

Vernal Pool Hydrologic Alterations

Vernal pool ecosystems are especially vulnerable to hydrologic alteration, because the timing and period of inundation can dictate whether annual plants and invertebrates are able to reproduce. As discussed in Chapter 3, in addition to direct filling of vernal pools by rainfall, vernal pools in the Plan Area are supported by perched water tables (perched aquifers) resulting from an impervious rock and clay duripan (hardpan) in the soil profile. This impervious soil layer hydrologically connects Valley Grassland, Vernal Pool, Swale, and Stream/Creek (Vernal Pool Invertebrate Habitat (VPIH)) to form the Vernal Pool Ecosystem. Subsurface flows from perched water tables stabilize vernal pool water levels, causing them to be inundated for longer periods of time than would be the case if the vernal pools were recharged only by rainfall (Rains et al. 2006). During and after local storm events, up to 60% of the water entering a vernal pool does so from the perched water table (Rains et al. 2006). Urban development can affect vernal pool hydrology in three major ways: (1) by permanently interrupting connection to surface water flows from up-gradient swales; (2) by damaging or permanently interrupting hydrologic connections to the perched water table; and (3) by puncturing the duripan within the vernal pool's micro-watershed, permanently increasing rate of water loss from the vernal pool and its associated perched aquifer, and allowing that water to drain into deeper groundwater tables.

Invasive Plants

Development, including roads and utility corridors, can promote invasive, non-native plant species that negatively affect habitat in a variety of ways, ultimately changing ecological functions and adversely affecting native species. As new urban development and infrastructure encroach into natural landscapes, newly disturbed areas and/or the new interface between developed areas and native habitats provide an opportunity for invasive plant species to establish and eventually invade natural habitat settings, degrading habitat and potentially displacing native species. Ornamental plants and native cultivars may spread to adjacent protected habitats and outcompete and displace native plant species; they can also hybridize (interbreed) with local native plants and thereby disrupt the genetics of the native population. Such hybridization can cause a number of problems for the native plant population, including poor growth and reproduction.

According to the *Invasive Plants of California's Wildlands* (Bossard et al. 2000), non-native invasive plant species can alter ecosystem processes, such as nutrient cycling, hydrologic cycles, frequencies of wildfires, and erosion and sediment deposition. Invasive plants interfere in ecosystem functions by outcompeting and displacing native plants and wildlife by providing refuge for non-native animals and by hybridizing with native species (Bossard et al. 2000). Several organizations, such as the California Native Plant Society (CNPS) and the California Invasive Plant Council (Cal-IPC) (formerly known as the California Exotic Pest Plant Council), have provided detailed documentation regarding invasive plant species that threaten California's native plants and animals.

Invasive plant species, and especially upland species, are often identified as an indirect "edge effect" of new urban development because invasive plants generally colonize modified or otherwise disturbed zones between development and remaining natural areas. However, invasive species can colonize virtually any upland area that is subject to some kind of disturbance, such as road shoulders, cleared zones along railroad lines, clearings along utility easements, areas affected by fire, fire breaks, and grazed areas.

Future development in the Plan Area will likely increase local sources of nitrogenous air pollutants, primarily due to increased transportation and demand for electricity generation. Increased nitrogen deposition (N-deposition) facilitates the growth of non-native plant species, especially invasive annual grasses in low-biomass ecosystems. Increased abundance of non-native plants, and invasive annual grasses in particular, represents a potentially significant effect to native vegetation communities and wildlife habitat. Nitrogen deposition can be locally elevated near roadways, with nitrogen flux along busy roads up to four times above background levels (Redling et al. 2013). However, nitrogen deposition can also result from emissions within the greater air basin.

Broadleaved pepperweed (*Lepidium latifolium*), yellow star-thistle (*Centaurea solstitialis*), and medusahead (*Elymus caput-medusae*) are common invasive species in grasslands and/or along Plan Area roadsides (Kleinschmidt Associates 2008).

Riparian and wetland ecosystems are also extremely vulnerable to invasive plants because of the highly effective transport of invasive species along rivers and streams. Invasive species can dominate the biomass of riparian and wetland communities where they become established, virtually choking out the native vegetation. Invasive plants commonly found in wetlands, riparian systems, and/or waterways in the Plan Area include broadleaved pepperweed, common water hyacinth (*Eichhornia crassipes*), Brazilian waterweed (*Egeria densa*), and Himalayan blackberry (*Rubus armeniacus*) (Kleinschmidt Associates 2008). Several other invasive species potentially affecting vernal pools and associated watersheds have also been identified, including waxy mannagrass (*Glyceria declinata*), barbed goatgrass (*Aegilops triuncialis*), Italian thistle

(*Carduus pycnocephalus*), stinkwort (*Dittrichia graveolens*), Klamath weed (common St. Johnswort) (*Hypericum perforatum*), yellow glandweed (*Parentucellia viscosa*), and milk thistle (*Silybum marianum*) (Appendix B).

Invasive Animals

Human activities associated with urban development can exacerbate the introduction or spread of non-native animal species. Non-native aquatic wildlife is known to have serious effects on native amphibian populations, including California tiger salamander (*Ambystoma californiense*). For example, aquarium species released in the wild may introduce new diseases to wild amphibian or fish populations. Feral cats (*Felis catus*) are a serious threat to native birds, especially birds that nest on or near the ground, as well as native reptiles and amphibians. They can also cause a shift in small mammal populations from native to non-native species. An increase in year-round water availability due to irrigation and water features can result in increased abundance of bullfrogs.

Invasive wildlife can negatively affect extant native wildlife and plants in many ways. Common native wildlife (e.g., ravens (*Corvus corax*), crows, pigeons, raccoons (*Procyon lotor*), skunks (*Mephitis mephitis)*, and gopher snakes (*Pituophis catenifer*)) and non-native species (e.g., Argentine ants (*Linepithema humile*), European starlings, wild turkeys (*Meleagris gallopavo*), bullfrogs (*Rana catesbeiana*), opossums (*Didelphimorphia*), house mice (*Mus musculus*), rats (*Rattus* spp.), and feral cats and dogs (*Canis lupus familiaris*)) may thrive in disturbed or otherwise marginal habitats and can harm native species through predation, competition, and displacement. Some of these non-native species may also have the potential to spread diseases and parasites to other native wildlife, as discussed below.

Urban Development Covered Activities in the UDA will increase the number of pet cats and dogs, and increase the potential for stray and feral animals. Unconstrained pets at the interface between habitat preserves and residential development can have significant predation effects on native wildlife, including birds, rodents, reptiles, and amphibians (e.g., Churcher and Lawton 1987; Kelly and Rotenberry 1993). Lost or abandoned pets may penetrate even farther into open space areas in search of food or refugia, including native prey.

Also, as noted below in the discussion of disease, domestic cats and dogs may be vectors for diseases that affect native wildlife, such as feline immunodeficiency virus, feline leukemia virus, feline infectious peritonitis, feline and canine distemper, panleukopenia, and rabies (Foley et al. 1999; Florida Fish and Wildlife Conservation Commission 2003).

Mesopredators

A related indirect consequence of habitat fragmentation and isolation is an increase in urban-adapted or urban-tolerant mesopredators, such as raccoons, skunks, opossums, and foxes (*Vulpes* spp.), in small habitat fragments where top predators, such as coyotes and bobcats (*Lynx rufus*), have been removed (i.e., the "mesopredator release" effect) (Crooks and Soulé 1999). Non-native mesopredators also may include free-roaming stray and feral cats and dogs, which can have the same effects as wild mesopredators. These species can out-compete smaller native species for available resources and increase predation rates, thus reducing the distribution and populations of vulnerable native species (Crooks and Soulé 1999). The increase in mesopredators in fragmented habitats is often considered an indirect edge effect, but because some of these species can penetrate long distances in natural habitats in the absence of top predators (e.g., coyotes, bobcats), they also have landscape-level ecosystem effects.

Pesticides and Fertilizers

Pesticide (including fungicide, herbicide, and rodenticide) and fertilizer use associated with urban development may affect vegetation communities and habitat quality, be directly toxic to species, or indirectly toxic through prey vectors, or reduce prey abundance. These substances may penetrate the open space–urban interface through urban runoff from residential and commercial landscape areas and golf courses, overspray, wind, direct application in interface areas, soil penetration, and wildlife vectors.

Pesticides, for example, can act in several ways. The original pesticide can be toxic, its decomposed elements can be even more toxic, and it can "bioaccumulate," whereby the contaminant concentrates further in each successive link of the food chain, and thus reaches higher concentrations at higher levels of the food chain. Dichlorodiphenyltrichloroethane (DDT) and other chlorinated hydrocarbon pesticides have been used worldwide to control crop pests and disease-carrying insects since the 1940s. DDT was banned in the United States by the U.S. Environmental Protection Agency (EPA) in 1972 because of unacceptable risks to the environment and potential harm to human health (EPA 1972). Long-term ecological exposure and accumulation resulted in eggshell thinning and loss of young in many raptorial bird species, resulting in serious declines in reproductive success (Terres 1980; Henny and Wight 1972).

In a similar manner, fertilizers can enter wetland and riparian systems and cause eutrophication (excessive nutrients in water bodies) and result in large algae blooms. They also can enhance growth of non-native species in edge areas.

Rodenticides may also affect wildlife in various ways. Rodenticides are directly toxic to rodents, but may also indirectly affect rodent predators, such as hawks and owls, coyotes, snakes, etc., either through loss or contamination of prey. Eradication of rodents can also affect habitat quality for other species, such as burrowing owls (*Athene cunicularia*) that use ground squirrel (*Otospermophilus beecheyi*) burrows and many species of reptiles, amphibians, and insects that use rodent burrows as refugia and aestivation and hibernation habitat.

Chronic Ground Vibration and Noise

Chronic increases in noise related to urban development primarily result from increased traffic volumes at all hours. Other sources of development-related increases in noise that may affect native wildlife include operation of landscape maintenance equipment and tools (e.g., mowers, blowers, trimmers, wood chippers), active recreation at parks (particularly at night), loud music from vehicles and residences, noise from aircraft operations at Mather Airport, and on-site heavy equipment and machinery use by commercial and industrial businesses.

Some of these noise sources, such as traffic noise, are relatively constant (although with daily cycles related to peak traffic periods), and some wildlife species may habituate and adapt to the chronic ambient noise levels, while others may avoid noisy areas. Other noise sources are more occasional or discrete and are more likely to startle wildlife and at least temporarily disrupt their behavior at the time. Noise may affect wildlife in several ways that disrupt both their behavior and physiology in complex and interactive ways, including startling or annoying, raising stress levels, interrupting sleep and rest, interfering with acoustic communications, interfering with prey detection, and in the case of loud abrupt noises, causing permanent injury to the auditory system (Dooling 2006; Barrass and Cohn 1984; Brattstrom and Bondello 1983).

Lighting

Ecological light pollution associated with "full-buildout of the UDA" will increase ambient light and direct glare from sky glare, lighted buildings, streetlights, and security lights, and would generally be chronic. Lighting from vehicles will be both chronic and unexpected.

Longcore and Rich (2004) address the ecological effects of light pollution at three levels: (1) behavioral and population ecology, (2) community ecology, and (3) large-scale ecosystem functions. Effects at the behavioral and population ecology level include orientation/ disorientation and attraction/repulsion, reproduction, and communication, and are the main effects of lighting related to construction activities. Orientation and disorientation are responses to ambient light levels, while attraction and repulsion are responses to the source of light (e.g., moths attracted to a light bulb). Orientation includes artificially expanding behavioral repertoires of normally diurnal (active during the day) or crepuscular (active during dawn or twilight hours) species, such as foraging or territorial advertisement or mate attraction (e.g., singing birds), into nighttime periods. Disorientation may occur in nocturnal species that normally orient during dark periods and whose visual systems are adapted to low light levels. Attraction to lights affects birds, which may suffer injury or mortality due to collisions with permanent lighted structures. Many insects are attracted to light sources, resulting in high numbers of prey being taken by nocturnal insectivores such as bats. Repulsion of nocturnal wildlife by lights is probably quite common and may cause them to avoid lighted areas in their normal home ranges.

Wildlife reproduction may be affected by lighting in various ways. Movement to breeding areas, chorus behavior, and mate selection by some amphibians may be affected (Longcore and Rich 2004). Lighting may disturb the nighttime rest and sleep periods of diurnal species, including most passerine (perching) birds, having effects similar to noise, including annoying individuals and causing them to abandon nests that are otherwise perfectly suitable. Nest site selection by some birds may be affected by light, with nests being established farther from light sources (Longcore and Rich 2004). Artificial light may simulate increased day length, affecting reproductive cycles by triggering premature reproductive activity at a time when environmental conditions are not conducive to successful reproduction (e.g., cold temperatures and/or poor food resources). Because light may interfere with sleep, it can be stressful and may disrupt normal biological rhythms and raise the level of stress hormones, which may in turn affect reproductive capacity.

At the level of community ecology, light pollution may affect competition and predation (Longcore and Rich 2004). Behavioral interactions by groups of species may be affected by lighting as species move into the "light niche" (Longcore and Rich 2004). Species groups that normally partition foraging periods in relation to ambient light levels may be in direct competition under artificial light conditions (e.g., some bats). Likewise, species that are adapted to higher light levels (e.g., crepuscular species) may out-compete strictly nocturnal species, which normally forage in the darkest part of the night.

Lighting may increase the risk of predation of both nocturnal and diurnal species because they may be more detectable to nocturnal predators. Some species, such as amphibians, may be attracted to light because insect prey may congregate around light sources, which may in turn increase the risk of the amphibians being preyed upon. Longcore and Rich (2004) characterize this as a tradeoff in the benefit of foraging longer (or at richer sources) with the cost of higher predation risk. Many small species, such as rodents, rabbits, snakes, and bats, actually forage at lower rates at high illumination levels (Longcore and Rich 2004), which may be a biological adaptation to high levels of moonlight. Chronic ecological light pollution may favor light-tolerant species over those that are dark-adapted (Longcore and Rich 2004).

Lighting can also indirectly affect vegetation communities, potentially by altering the behavior of seed dispersers (e.g., small rodents and ants); other potential plant dispersers, such as larger mammals and birds that transport seeds and plant parts over longer distances; and pollinators.

Increased Human Activity

Urban development results in permanent increases in human presence from adjacent development. Increased human presence near preserves will affect essential and normal behavioral patterns and physiology of wildlife. Similar to noise and lighting effects, permanent increases in human activity from adjacent urban development will disturb nocturnal animals during their rest or sleep periods, annoying them and causing harm to them if they abandon nests or den sites, as well as harming them by disrupting their normal biological rhythms and raising the level of stress hormones. Abandonment (even temporary) of active nests or dens increases the risk to eggs, nestlings, fledglings, and other dependent young. Flushing animals from nests, dens, and other refuges also increases their risk of injury or mortality from collisions with vehicles, as well as predation. Human presence may also alter the spatial behavior of animals, causing them to avoid certain parts of their home range, which may prevent them from using critical resources such as water.

Increases in human activity along the open space–urban interface may also result in trampling of vegetation and compaction of soils, affecting the viability of vegetation communities, wildlife habitat quality, and species that are sensitive to habitat structure, such as shrub and herbaceous vegetation integrity, soil friability, and burrowing substrate quality (e.g., rodents, reptiles, amphibians, and invertebrates). Increased human activity near preserves will also increase the amount of trash and debris that enters preserves and natural communities. Trash and debris can degrade vegetation communities and wildlife habitat, and can attract nuisance and pest species. Trash and debris include discarded packaging materials, plastic bags, and plastic and other lighter materials may be dispersed into natural areas by wind or along creeks and streams.

Increased Wildfire

Increased human activity related to urban development Covered Activities can result in increased wildfires. These fires are a result of human activities at the habitat preserve–urban interface, including accidental ignitions from sparks from equipment (e.g., mowers striking rocks), cigarettes, children playing with matches, etc., as well as intentional ignitions (i.e., arson). However, fires also may be ignited by downed or arcing power lines or cars catching on fire along roadways.

In most cases, wildfires in the UDA would be quickly suppressed for public safety and to protect property, but in some cases wildfires become uncontrollable and catastrophic. Wildfire suppression activities (e.g., grading, fire line construction) can also affect plant and animals through ground disturbance.

Outside the UDA, Covered Activities would not result in increased frequency, duration, or intensity of wildfire in that portion of the Plan Area.

Wildlife Disease

The increased human and associated pet population can increase the risk of disease transmission to native wildlife in the Plan Area. For example, free-ranging domestic cats and dogs can transmit new diseases to wild animals. Native wildlife in the Plan Area, including American badger, gray fox (*Urocyon cinereoargenteus*), and coyote, may be at risk of canine distemper (Deem et al. 2000). Diseases transmitted from humans and pets also may affect raptors, such as Cooper's hawk (*Accipiter cooperii*). Boal and Mannan (1999) found that mortality of nestling Cooper's hawks in urban settings primarily was from trichomoniasis, which is caused by the parasitic protozoan *Trichomonas gallinae* that occurs in the digestive and urogenital tracts of many animals and humans. This parasite causes lesions in the mouth, throat, and crop of birds and prevents infected individuals from eating. An important vector of trichomoniasis in urban areas may be domestic pigeons and potentially wild doves, which are preyed on by hawks and falcons. Stabler (1941), for example, found that of 242 pigeons originating from Pennsylvania, Maryland, and New Jersey, 64.5% were infected with *Trichomonas gallinae*. West Nile virus has been identified as a potential factor in loggerhead shrike (*Lanius ludovicianus*) declines in the Central Valley based on a correlation between higher infection rates of the virus and greater declines in shrike abundance in Central Valley counties compared to other counties (Pandolfino 2008). Chytrid fungus is implicated in the decline of several amphibian species, and can infect California tiger salamander. However, chytrid fungus has not been found to be responsible for California tiger salamander mortality in the lab or the field (CDFG 2010).

Vehicle and Aircraft Collisions with Wildlife

The increased capacity of roads in urban areas and increased capacity of roads from rural transportation projects likely will increase the risk of vehicle collisions where wildlife use or attempt to cross roadways, particularly in areas that were frequently used by wildlife before roads were constructed or improved and other development was built. Wildlife may be able to cross two-lane, low-density, and lower-speed roads in relative safety, but if roads are expanded to four and six lanes, and traffic densities and speeds increase, vehicle strikes can increase dramatically. Factors related to the number and types of species affected therefore include vehicle speeds, traffic volume, traffic pulses, accessibility of cover, structure of the road (e.g., whether the road is raised or at grade level with the surrounding environment), barrier walls to prevent access to a roadway, and availability of alternative crossings, such as bridges and culverts (Dodd et al. 2004).

Increased use of Mather Airport following proposed expansions will also result in increased chance of bird strikes; however, such strikes are relatively uncommon and are not included in take estimates for covered bird species.

Aboveground Utilities

Power lines, transmission towers, and utility poles can cause collisions, entanglements, and electrocution of birds, especially raptors (Franson et al. 1995; Lehman et al. 2007). Bird Covered Species known to be at particular risk of collisions with aboveground utilities include ferruginous hawk (*Buteo regalis*) and greater sandhill crane (*Grus canadensis*), as discussed in more detail in Section 6.6.

6.3.2 Temporary Environmental Stressors During Construction of Covered Activities

Construction Noise

Temporary direct effects related to noise will be generated during Covered Activities construction, including vegetation clearing, grading and earthmoving, excavation, trenching and tunneling, pouring of concrete and asphalt, and vehicle use. Construction may affect normal or essential behavioral patterns of covered wildlife in several ways. Excessive noise may affect bird Covered Species, for example, in at least four ways: (1) noise may annoy and cause birds to abandon nests that are otherwise suitable; (2) noise can raise the level of stress hormones, interfering with sleep and other activities; (3) intense noise can cause permanent injury to the auditory system; and (4) noise can interfere with acoustic communication by masking important sounds or sound components (Dooling 2006). Similar effects may occur in other taxa. For example, noise may interfere with communication in toads and frogs that use calls to advertise their location and attract mates (e.g., Barrass and Cohn 1984). Loud noise, such as off-road vehicles, may damage the hearing of some terrestrial species (Berry 1980; Brattstrom and Bondello 1983).

Construction Ground Vibration

Ground vibration will be generated during Covered Activities construction, including grading and earthmoving, excavation, trenching, and tunneling. Vibration caused by construction equipment may affect normal and essential behavioral patterns and the habitat of wildlife in several ways. Vibration from equipment operating in or near vernal pools, creeks, and other aquatic habitats may affect semi-aquatic Covered Species, such as giant gartersnake (*Thamnophis gigas*), western pond turtle (*Actinemys marmorata*), western spadefoot (*Spea hammondii*), and California tiger salamander, possibly causing them to alter their behavior and potentially abandon areas. For example, vibration can cause western spadefoot to emerge from burrow sites at inappropriate times because vibration created by machinery and construction equipment can mimic the effect of rainfall, which triggers western spadefoot emergence (Dimmitt and Ruibal 1980). Vibration may also directly disturb fossorial species that occupy burrows, dens, and depressions, including the covered western burrowing owl and American badger, as well as rodents, coyotes, and lagomorphs (rabbits and hares), causing them to abandon these areas and increase predation and vehicle collision risks. Excessive vibration might also cause the collapse of burrow systems and dens of fossorial species in areas with highly friable soils.

Construction Lighting

Ecological light pollution directly associated with construction ultimately would be temporary, but it may be considered chronic to some extent in terms of effects on wildlife. For example, lighting for security and public safety in some construction areas may extend for several months or more, thus potentially disrupting critical phases of species' life cycles, such as reproduction, or causing animals to abandon lighted areas. Other lighting effects may be short term or unexpected. Lighting during Urban Development Covered Activity construction primarily would occur during concrete and asphalt pouring and from vehicular use (Table 5-2), but also may be used for security and public safety and off-hours equipment maintenance (e.g., at staging areas). Lighting for nighttime construction or maintenance of construction equipment typically involves high-intensity lighting systems that may have very wide lightsheds and high glare values. Vehicle ingress and egress at construction sites may occur during twilight or nighttime hours (especially during winter months), resulting in unexpected light changes.

Construction Dust

Fugitive dust generated by Covered Activity construction, especially vegetation clearing and grading and earthmoving, can decrease photosynthesis and can kill individual plants by blocking or reducing light and penetration as well as photosynthesis, respiration, and transpiration; increased penetration of phytotoxic gaseous pollutants; and increased incidence of pests and diseases. The loss of plant vigor and productivity can directly affect covered plant species and covered wildlife that depend on plants for food or refuge. Construction vehicle traffic can also result in construction dust.

Increased Human Presence During Construction

Covered Activity temporary construction effects include activity at the construction site and ingress and egress to and from the construction area. Increased human presence during construction will temporarily affect essential and normal behavioral patterns and physiology of wildlife. Similar to noise and lighting effects, temporary increased human activity during construction will disturb nocturnal animals during their rest or sleep periods, annoying them and causing harm to them if they abandon nests or den sites, as well as harming them by disrupting their normal biological rhythms and raising the level of stress hormones. Abandonment (even temporary) of active nests or dens increases the risk to eggs, nestlings, fledglings, and other dependent young. Flushing animals from nests, dens, and other refuges also increases their risk of injury or mortality from collisions with construction equipment and other vehicles, as well as predation. Human presence may also alter the spatial behavior of animals, causing them to avoid certain parts of their home range, which may prevent them from using critical resources such as water. In addition, construction traffic can result in crushing or disturbance of animal and plant species in and near construction sites.

Laydown or Trampling of Vegetation

Trampling of vegetation communities and wildlife habitat in designated construction zones may occur during construction activities such as vegetation clearing, equipment storage, and vehicle use. Accidental trampling of vegetation communities and wildlife habitat may also occur outside designated construction zones. These effects may occur for various reasons, including incorrect construction plans, human error in interpreting plans, human error or accidents in operating construction equipment, and misunderstandings or disregard by construction personnel in adhering to construction plan requirements, including avoidance of natural resources.

Construction Trash and Debris

Covered Activity construction might cause trash and other non-toxic debris to enter species habitat. Trash and debris can degrade vegetation communities and wildlife habitat, and can attract nuisance and pest species. Trash and debris include discarded construction-related materials, such as packaging materials, plastic bags, and plastic sheeting that may be dispersed into natural areas by wind or along creeks and streams. Trash generated by construction personnel, such as food packaging and cigarette butts, also can be dispersed by wind and water into natural areas. Pest and predatory species, such as crows and ravens, gulls (*Laridae*), coyotes, skunks, and raccoons, may be attracted to discarded food. Certain kinds of construction debris, such as fiberglass insulation, can be directly dangerous to wildlife. Trash and debris may also blow into preserves from adjacent development and roadways.

Temporary Alterations to Hydrographs and Water Quality Effects

Covered Activity construction will result in temporary release of contaminants in uplands during activities such as vegetation clearing, grading and earthmoving, excavation, trenching and tunneling, pouring concrete or asphalt, and landscaping, and equipment and vehicle refueling and maintenance. Chemical and toxic compound pollution (fuel, oil, lubricants, paints, release agents, and other construction materials) may affect the health of upland vegetation communities, covered wildlife habitats, and covered wildlife species. Wildlife may be affected by contaminants through direct exposure (e.g., to the skin, fur, or feathers), through consumption of contaminated food, or by reduced habitat quality.

Temporary hydrologic alterations potentially occurring from construction of Covered Activities, including dewatering activities, include changes in flow rates and patterns in streams and rivers that may temporarily affect adjacent and downstream aquatic, wetland, and riparian vegetation communities, and aquatic species (e.g., fish), semi-aquatic species (including SSHCP covered reptiles such as giant gartersnake and western pond turtle), and riparian nesting birds. Construction of some Covered Activities may require temporary diversions or impoundments of surface waters and thus remove or degrade wetland and aquatic habitats during the period of diversion or impoundment.

Temporary water temperature changes also may occur due to temporary Covered Activity changes in the active channel morphology, thus affecting Covered Species associated with aquatic habitats (such as giant gartersnake, western pond turtle, western spadefoot, and California tiger salamander) that may have specific thermal tolerances.

Table 6-1
Environmental Stressors Associated with Covered Activities

Covered Activity	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Urban Development																								
Residential, Commercial and Industrial Structures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Park and Recreation Facilities	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Water Supply Facilities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Flood Control and Urban Stormwater Management in the UDA	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X								
Stream Bank Stabilization Projects	X	X		X	X	X	X	X	X	X	X	X		X	X	X								
Public and Private Utilities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X

Table 6-1
Environmental Stressors Associated with Covered Activities

	Temporary Environmental Stressors								Permanent Environmental Stressors															
Covered Activity	*Construction Noise*	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Solid Waste Management Facilities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Wastewater Facilities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Urban Transportation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Stream Channel Modification	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X							
Capital Southeast Connector	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mather Airport Development Projects	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Third-Party Projects	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mining in the UDA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rural Transportation Projects																								
Rural Collector Road Improvements	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Arterial Road Improvements	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Table 6-1
Environmental Stressors Associated with Covered Activities

Covered Activity	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Road Realignment Projects	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Road Interchange Projects	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Recycled Water Projects	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Covered Activities in Preserve Setbacks in the UDA																								
Trails	X	X		X	X	X	X	X	X	X	X	X	X	X		X				X				
Bioswales	X	X		X	X	X	X	X	X	X	X	X	X	X	X									
Fencing	X	X			X	X	X		X	X	X		X											
Fire Breaks	X	X		X	X	X	X	X	X	X	X	X		X		X	X			X				
Benches, Shade Structures, and Shade Trees	X	X		X	X	X	X		X					X		X				X				
Interpretive Signs and Kiosks	X	X		X	X	X	X		X				X											

Table 6-1
Environmental Stressors Associated with Covered Activities

Covered Activity	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Covered Activities in Stream Setbacks in the UDA																								
Trails	X	X		X	X	X	X	X	X	X	X	X	X	X		X				X				
Bioswales	X	X		X	X	X	X	X	X	X	X	X	X	X	X									
Crossings	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X			X	
Stream-bank Stabilization	X	X		X	X	X	X	X	X	X	X	X		X	X	X								
Fencing	X	X			X	X	X		X	X	X		X											
Benches, Shade Structures, and Shade Trees	X	X		X	X	X	X		X					X		X				X				
Interpretive Signs and Kiosks	X	X		X	X	X	X		X				X											
Riparian Re-establishment and Establishment	X	X		X	X	X	X	X	X		X	X												
Outfalls	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X							

Table 6-1
Environmental Stressors Associated with Covered Activities

Covered Activity	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Flood Control Structures and Stormwater Management	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X								
SSHCP Preserve System Covered Activities																								
Preserve Management and Monitoring	X	X	X	X	X	X		X													X			
Low-Impact Nature Trails	X	X		X	X			X	X	X		X		X						X				
Habitat Re-establishment and Establishment	X	X		X	X	X	X	X	X		X	X												
Species Surveys, Monitoring, Research and Adaptive Management Activities					X															X				

Table 6-1
Environmental Stressors Associated with Covered Activities

Covered Activity	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	Construction Ground Vibration	Construction Lighting	Construction Dust	Increased Human Presence	Laydown or Trampling	Construction Trash and Debris	Temporary Alterations to Hydrographs and Water Quality Effects	Loss of Land Covers and Covered Species Habitat	Habitat Fragmentation	Wildlife Community Alterations	Permanent Alterations to Hydrographs and Water Quality Effects	Vernal Pool Hydrologic Alterations	Invasive Plants	Invasive Animals	Mesopredators	Pesticides and Fertilizers	Chronic Ground Vibration and Noise	Lighting	Increased Human Activity	Increased Wildfire	Wildlife Disease	Vehicle and Aircraft Collisions with Wildlife	Aboveground Utilities
Water Supply for Livestock	X	X			X	X	X					X												
Groundwater Monitoring and Extraction Wells	X	X		X	X	X	X	X				X						X						
Detention Basins	X	X		X	X	X	X	X	X		X	X	X	X	X									
Utility Maintenance and Repair	X	X	X		X	X	X										X			X	X		X	
Covered Activities in the Laguna Creek Wildlife Corridor of the Preserve System																								
Trails	X	X		X	X	X	X	X	X	X	X	X	X	X		X				X				
Bioswales	X	X		X	X	X	X	X	X	X	X	X	X	X	X									
Crossings	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X			X	
Stream-bank Stabilization	X	X		X	X	X	X	X	X	X	X	X		X	X	X								
Fencing	X	X			X	X	X		X	X	X		X											
Benches, Shade Structures, and Shade Trees	X	X		X	X	X	X		X					X		X				X				

Table 6-1
Environmental Stressors Associated with Covered Activities

Covered Activity	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Interpretive Signs and Kiosks	X	X		X	X	X	X		X				X											
Riparian Re-establishment and Establishment	X	X		X	X	X	X	X	X		X	X												
Outfalls	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X							
Flood Control Structures and Stormwater Management	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X								

Table 6-2
Covered Species Vulnerability to Environmental Stressors

Covered Species	Temporary Environmental Stressors								Permanent Environmental Stressors																	
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Plants																										
Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*)			X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X			
Boggs Lake hedge-hyssop (*Gratiola heterosepala*)			X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X			
Dwarf downingia (*Downingia pusilla*)			X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X			
Legenere (*Legenere limosa*)			X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X			
Pincushion navarretia (*Navarretia myersii*)			X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X			
Sacramento Orcutt grass (*Orcuttia viscida*)			X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X			
Slender Orcutt grass (*Orcuttia tenuis*)			X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	X			

Table 6-2
Covered Species Vulnerability to Environmental Stressors

Covered Species	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Sanford's arrowhead (*Sagittaria sanfordii*)			X	X	X	X	X	X	X	X		X		X	X		X		X	X	X			
Invertebrates																								
Vernal pool fairy shrimp (*Branchinecta lynchi*)			X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X			
Midvalley fairy shrimp (*Branchinecta mesovallensis*)			X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X			
Vernal pool tadpole shrimp			X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X			
Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*)			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)			X	X	X	X	X	X	X	X	X	X		X	X		X		X	X	X			

Table 6-2
Covered Species Vulnerability to Environmental Stressors

Covered Species	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Reptiles and Amphibians																								
California tiger salamander (*Ambystoma californiense*)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Western spadefoot (*Spea hammondii*)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Giant gartersnake (*Thamnophis gigas*)	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Western pond turtle (*Actinemys marmorata*)	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Birds																								
Cooper's hawk (*Accipiter cooperii*)	X	X	X		X			X	X	X	X	X				X	X	X	X	X	X	X	X	X
Ferruginous hawk (*Buteo regalis*)					X			X	X	X	X	X					X			X	X	X	X	X

Table 6-2
Covered Species Vulnerability to Environmental Stressors

Covered Species	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Swainson's hawk (*Buteo swainsoni*)	X	X	X	X	X		X		X	X	X					X		X	X	X	X	X	X	X
White-tailed kite (*Elanus leucurus*)	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Northern harrier (*Circus cyaneus*)	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Western burrowing owl (*Athene cunicularia*)	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X
Loggerhead shrike (*Lanius ludovicianus*)	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X
Greater sandhill crane (*Grus canadensis*)	X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X	X
Tricolored blackbird (*Agelaius tricolor*)	X	X	X	X	X		X	X	X	X	X	X				X	X	X	X	X	X	X	X	X

Table 6-2
Covered Species Vulnerability to Environmental Stressors

Covered Species	Temporary Environmental Stressors								Permanent Environmental Stressors															
	Construction Noise	*Construction Ground Vibration*	*Construction Lighting*	*Construction Dust*	*Increased Human Presence*	*Laydown or Trampling*	*Construction Trash and Debris*	*Temporary Alterations to Hydrographs and Water Quality Effects*	*Loss of Land Covers and Covered Species Habitat*	*Habitat Fragmentation*	*Wildlife Community Alterations*	*Permanent Alterations to Hydrographs and Water Quality Effects*	*Vernal Pool Hydrologic Alterations*	*Invasive Plants*	*Invasive Animals*	*Mesopredators*	*Pesticides and Fertilizers*	*Chronic Ground Vibration and Noise*	*Lighting*	*Increased Human Activity*	*Increased Wildfire*	*Wildlife Disease*	*Vehicle and Aircraft Collisions with Wildlife*	*Aboveground Utilities*
Mammals																								
American badger (*Taxidea taxus*)	X	X	X		X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	
Western red bat (*Lasiurus blossevillii*)	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X		X

6.4 Methods to Assess Effects of Covered Activities

Implementation of Covered Activities will result in incidental take of Covered Species and their modeled habitats. To meet regulatory requirements, properly mitigate effects, achieve the SSHCP Conservation Strategy (Chapter 7), and charge fees equitably (Chapter 9), the amount of species take must be quantified. Because of the broad geographic scope of the Plan, length of the proposed Permit Term, and because the details of many future activities and projects are not known at the time of SSHCP preparation, this effects assessment in is conducted at a programmatic level. The direct and indirect effects presented in this chapter reflect the maximum potential effects of the SSHCP Covered Activities on each land cover type and species modeled habitat. As discussed in Chapter 9, once these effect levels are reached, no further take is allowed under the SSHCP permits. The individual Covered Activity categories described in Chapter 5 do not have specific effect limits. This effects analysis assumes that all Covered Activities will effectively implement required SSHCP Avoidance and Minimization Measures (AMMs, described in Section 5.4 and summarized in Section 6.4.1) to assure effects are minimized to the maximum extent.

This effects analysis assumes that all currently undeveloped parcels located within the UDA boundary will be developed during the proposed 50-year SSHCP Permit Term, except for UDA parcels that are: (1) an existing preserve or permanently protected by a conservation easement (see Chapter 3), (2) are in the planned SSHCP Preserve System (see Chapter 7, Conservation Strategy), (3) within areas of Preserve Setbacks not altered through development of trails (Section 5.3), (4) within Non-Vernal Pool Ecosystem land cover types within Stream Setbacks that are not altered through development of trails[1] (Section 5.3), (5) within 8,660 acres of the approximately 9,160 acres of already subdivided parcels (defined as large lot sizes of 0.5 to 4.5 acres for the purposes of this effects analysis) primarily west of Excelsior Road in the UDA,[2] or (6) are the site of a proposed project with existing ESA incidental take authorization and other required entitlements.[3] Therefore,

1 All Vernal Pool, Swale, and Stream/Creek (VPIH) located within SSHCP Stream Setbacks were assumed to be permanently impacted.

2 Most of these 0.5- to 4.5-acre lots contain single-family dwellings in a matrix of agricultural uses or Valley Grassland (e.g., estate homes, hobby farms, or horse properties). Based on historical land use patterns and the expertise of County planners related to these areas, the Plan Permittees assume that these properties are likely to remain as single-family dwelling units and are unlikely to be further developed or significantly modified over the proposed 50-year Permit Term. Therefore, the SSHCP assumes that Urban Development Covered Activities occurring on these 0.5- to 4.5-acre lots mostly west of Excelsior Road will result in a maximum conversion of 500 acres over the Permit Term. These assumptions are used only to develop estimates of effects to Covered Species modeled habitats within the UDA.

3 The Mather Field Specific Plan is still pursuing its own ESA consultation with the USFWS and a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers; however, the SSHCP effect analysis treats parcels within the boundary of the Mather Field Specific Plan the same as parcels with existing ESA incidental take authorization and other entitlements.

future urban development and associated infrastructure as well as mining Covered Activities to be implemented within the UDA were broadly defined in Chapter 5, and information on the precise locations of most Covered Activities within the UDA is not presented. Consequently, this chapter's analysis of Covered Activity effects within the UDA did not attempt to discern the effect of individual, separate activities.

The species effects presented in this chapter are based on the best available information on extent and duration of effects for each SSHCP Covered Activity (Chapter 5) and the best available information on modeled habitat and occurrences for each SSHCP Covered Species (Chapter 3 and Appendix B). When available, project-specific geographic information system (GIS) layers for project footprints were used. Absent project-specific GIS layers, general plan designations were used to estimate projected development locations and boundaries. Further, the Permittees conducted an extensive review of Covered Species occurrences in the Plan Area (Appendix B), and updated the database of occurrences during SSHCP preparation as new information became available (e.g., tricolored blackbird counts conducted every three years). Therefore, this chapter presents valid estimates of the effects of the SSHCP Covered Activities on Covered Species and Covered Species modeled habitat.

6.4.1 SSHCP Avoidance and Minimization Measures

As described in Section 5.4, AMMs are required elements of all Covered Activity design or implementation. The impact calculations presented in this chapter assume full implementation and effectiveness of all SSHCP AMMs, including:

- Low-effect development measures (LIDs);
- Road design requirements;
- BMPs for road construction and maintenance;
- BMPs for construction adjacent to preserves, habitat linkages, and wetland/riparian areas;
- Post-construction BMPs adjacent to preserves, habitat linkages, and wetland/riparian areas;
- Design features and requirements for public access in the SSHCP Preserve System; and
- Species-specific measures.

The SSHCP Covered Activity AMMs are described in Section 5.4. Table 6-3 lists the general AMMs, Covered Species affected, and the environmental stressor that the measure reduces.

In analyzing effects of Covered Activities, the Permittees assumed that (1) the required AMMs will always be included and implemented along with each SSHCP Covered Activity (see Section 5.4), (2) the appropriate AMMs will always be correctly implemented by the Permittees and by

Third-Party Project Proponents implementing Covered Activities (see Chapter 9), and that (3) each AMM will be effective in avoiding or minimizing both direct and indirect effects to the maximum extent. The SSHCP assumes that AMM implementation will ensure that the actual acres of impact will not exceed the acres or locations of effects presented herein. The effectiveness of AMMs will be ensured through monitoring, as described in Chapter 8.

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
Condition 1. Avoid and Minimize Urban Development Impacts to Watershed Hydrology and Water Quality			
LID-1	Stormwater Quality	All	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Pesticides and Fertilizers.
LID-2	Groundwater Recharge	All	Permanent Alterations to Hydrographs and Downstream Water Quality Effects.
LID-3	Natural Site Features	All	Loss of Land Covers and Covered Species Habitat; Permanent Alterations to Hydrographs and Downstream Water Quality Effects.
Condition 2. Avoid and Minimize Urban Development Direct and Indirect Impacts to Existing Preserves and SSHCP Preserves			
EDGE-1	Compatible Land Uses	All	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Pesticides and Fertilizers; Vernal Pool Hydrologic Alterations; Invasive Plants; Invasive Animals; Chronic Ground Vibration and Noise; Lighting; Increased Human Activity; Increased Wildfire; Wildlife Disease; Vehicle and Aircraft Collisions with Wildlife.
EDGE-2	Single-Loaded Streets	All	Wildlife Community Alterations; Invasive Animals; Chronic Ground Vibration and Noise; Lighting; Increased Human Activity; Increased Wildfire; Wildlife Disease; Vehicle and Aircraft Collisions with Wildlife.
EDGE-3	Preserve Setbacks	All	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Pesticides and Fertilizers; Vernal Pool Hydrologic Alterations; Invasive Plants; Invasive Animals; Chronic Ground Vibration and Noise; Lighting; Increased Human Activity; Increased Wildfire; Wildlife Disease; Vehicle and Aircraft Collisions with Wildlife.

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
EDGE-4	Locate Stormwater Control Outside Preserves	All	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Vernal Pool Hydrologic Alterations; Pesticides and Fertilizers.
EDGE-5	Stormwater Control in Preserve Setbacks	All	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Pesticides and Fertilizers.
EDGE-6	Detention Basins in Linkage Preserves	All	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Vernal Pool Hydrologic Alterations; Pesticides and Fertilizers.
EDGE-7	Hardpan/Duripan Protection	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	Vernal Pool Hydrologic Alterations
EDGE-8	Outdoor Lighting	Ricksecker's water scavenger beetle ,valley elderberry longhorn beetle, California tiger salamander, western spadefoot, giant gartersnake, western pond turtle, Cooper's hawk, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	Lighting

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
EDGE-9	Livestock Access to Preserves	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Vernal Pool Hydrologic Alterations; Invasive Plants; Increased Human Activity; Vehicle and Aircraft Collisions with Wildlife.
EDGE-10	Prevent Invasive Species Spread	All	Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Pesticides and Fertilizers; Vernal Pool Hydrologic Alterations; Invasive Plants.
Condition 3. Implement Construction Best Management Practices (BMPs)			
BMP-1	Construction Fencing	All	Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
BMP-2	Erosion Control	All	Temporary Alterations to Hydrographs and Water Quality Effects
BMP-3	Equipment Storage and Fueling	All	Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
BMP-4	Erodible Materials	All	Temporary Alterations to Hydrographs and Water Quality Effects
BMP-5	Dust Control	All	Construction Dust
BMP-6	Construction Lighting	Ricksecker's water scavenger beetle , valley elderberry longhorn beetle, California tiger salamander, western spadefoot, giant gartersnake, western pond turtle, Cooper's hawk, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat.	Construction Lighting
BMP-7	Biological Monitor	All	Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
BMP-8	Training of Construction Staff	All	Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
BMP-9	Soil Compaction	All	Temporary Alterations to Hydrographs and Water Quality Effects; Wildlife Community Alterations; Permanent Alterations to Hydrographs and Downstream Water Quality Effects; Invasive Plants.
BMP-10	Revegetation	All	Temporary Alterations to Hydrographs and Water Quality Effects; Wildlife Community Alterations; Laydown or

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
			Trampling of Vegetation.
BMP-11	Speed Limit	All	Construction Noise; Construction Ground Vibration; Construction Dust;
Condition 4. Avoid and Minimize Effects that May Result From Implementation of Covered Transportation Projects			
ROAD-1	Road Project Location	All	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations; Vernal Pool Hydrologic Alterations; Invasive Plants; Pesticides and Fertilizers; Chronic Ground Vibration and Noise; Lighting
ROAD-2	Wildlife Crossing Structures	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, American badger	Habitat Fragmentation; Wildlife Community Alterations; Mesopredators; Vehicle and Aircraft Collisions with Wildlife
ROAD-3	Roadside Pesticide Use	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot	Wildlife Community Alterations; Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants; Pesticides and Fertilizers
Condition 5. Avoid and Minimize Impacts that Result From Public Use of Low-Impact Nature Trails in Preserves			
NATURE TRAIL-1	Nature Trail Plan	All	Invasive Plants; Invasive Animals; Lighting; Increased Human Activity; Wildlife Disease
NATURE TRAIL-2	Nature Trail Protection of Duripan	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp,	Vernal Pool Hydrologic Alterations

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
		vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	
NATURE TRAIL-3	Nature Trail Location	All	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Increased Human Activity; Wildlife Disease
NATURE TRAIL-4	Biological Studies Prior to Nature Trail Design	All	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Increased Human Activity; Wildlife Disease
NATURE TRAIL-5	Monitoring of Nature Trail Impacts	All	Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants; Invasive Animals; Lighting; Increased Human Activity; Wildlife Disease
Condition 6. Avoid and Minimize Impacts to Existing Vernal Pools When Re-establishing or Establishing Vernal Pools Wetlands			
RE-ESTABLISHMENT/ ESTABLISHMENT-1	Vernal Pool	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	Vernal Pool Hydrologic Alterations

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
RE-ESTABLISHMENT/ ESTABLISHMENT-2	Vernal Pool Inocula Bank	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	Invasive Plants; Wildlife Community Alterations
Condition 7. Avoid and Minimize Impacts to Streams and Creeks			
STREAM-1	Laguna Creek Wildlife Corridor	Valley elderberry longhorn beetle, giant gartersnake, western pond turtle, Cooper's hawk, Swainson's hawk, white-tailed kite, western red bat	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations, Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants; Mesopredators; Pesticides and Fertilizers; Increased Human Activity; Chronic Ground Vibration and Noise; Lighting; Wildlife Disease; Vehicle and Aircraft Collisions with Wildlife
STREAM-2	UDA Stream Setbacks	Valley elderberry longhorn beetle, giant gartersnake, western pond turtle, Cooper's hawk, Swainson's hawk, white-tailed kite, western red bat	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations, Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants; Mesopredators; Pesticides and Fertilizers; Increased Human Activity; Chronic Ground Vibration and Noise; Lighting; Wildlife Disease; Vehicle and Aircraft Collisions with Wildlife
STREAM-3	Minor Tributaries to UDA Streams	Valley elderberry longhorn beetle, giant gartersnake, western pond turtle, Cooper's hawk, Swainson's hawk, white-tailed kite, western red bat	Loss of Land Covers and Covered Species Habitat; Wildlife Community Alterations, Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants; Pesticides and Fertilizers; Lighting

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
STREAM-4	Minimize Effects from Temporary Channel Re-Routing	Valley elderberry longhorn beetle, giant gartersnake, western pond turtle, Cooper's hawk, Swainson's hawk, white-tailed kite, western red bat	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations, Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants
STREAM-5	Design for Stream Channel Re-Routing, Widening, or Deepening	Valley elderberry longhorn beetle, giant gartersnake, western pond turtle, Cooper's hawk, Swainson's hawk, white-tailed kite, western red bat	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations, Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants
Condition 8. Avoid and Minimize Impacts to Covered Species from Utility and Utility Maintenance Covered Activities			
UTILITY-1	Avian Collision Avoidance	Ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird,	Aboveground Utilities
UTILITY-2	Utility Maintenance on Preserves	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	Laydown or Trampling of Vegetation; Temporary Alterations to Hydrographs and Water Quality Effects
UTILITY-3	Trenchless Construction Methods	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's	Construction Dust; Increased Human Presence; Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations; Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Vernal Pool Hydrologic Alterations; Invasive Plants

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
		hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat	
UTILITY-4	Siting of Entry and Exit Location	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, California tiger salamander, western spadefoot, ferruginous hawk, Swainson's hawk, white-tailed kite, northern harrier, western burrowing owl, loggerhead shrike, greater sandhill crane, tricolored blackbird, American badger, western red bat,	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations; Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Vernal Pool Hydrologic Alterations; Invasive Plants
Condition 9. Avoid and Minimize Impacts That Might Result From Removing or Breaching Levees to Establish or Re-establish Riparian Habitat			
LEVEE-1	Preparation of Hydrologic Analysis	All	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations; Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Vernal Pool Hydrologic Alterations
General Covered Species Take AMMs			
SPECIES-1	Litter Removal Program	All	Construction Trash and Debris
SPECIES-2	No Pets in Construction Areas	All	Increased Human Presence
SPECIES-3	Take Report	All	Take of Covered Species, Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations, Pesticides and Fertilizers; Increased Human Activity; Vehicle and Aircraft Collisions with Wildlife
SPECIES-4	Post-Construction Compliance Report	All	Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Wildlife Community Alterations,

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
			Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects; Invasive Plants; Mesopredators; Pesticides and Fertilizers; Increased Human Activity; Chronic Ground Vibration and Noise; Lighting; Wildlife Disease; Vehicle and Aircraft Collisions with Wildlife
Species Specific Measures			
PLANT-1	Rare Plant Surveys	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia , legenere, pincushion navarretia), Sanford's arrowhead	Take of Covered Species Occurrences, Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Dust; Laydown or Trampling of Vegetation; Increased Human Presence Near Construction Sites; Construction Trash and Debris
PLANT-2	Rare Plant Protection	Ahart's dwarf rush, Boggs Lake hedge-hyssop, dwarf downingia , legenere, pincushion navarretia), Sanford's arrowhead	Take of Covered Species Occurrences, Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Dust; Laydown or Trampling of Vegetation; Increased Human Presence Near Construction Sites; Construction Trash and Debris
ORCUTT-1	Orcutt Grass Surveys	Sacramento Orcutt Grass, Slender Orcutt Grass	Take of Covered Species Occurrences, Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Dust; Laydown or Trampling of Vegetation; Increased Human Presence Near Construction Sites; Construction Trash and Debris
ORCUTT-2	Orcutt Grass Protection	Sacramento Orcutt Grass, Slender Orcutt Grass	Take of Covered Species Occurrences, Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Dust; Laydown or Trampling of Vegetation; Increased Human Presence Near Construction Sites; Construction Trash and Debris
CTS-1	California Tiger Salamander Daily Construction Schedule	California tiger salamander	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
			During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
CTS-2	California Tiger Salamander Monitoring	California tiger salamander	Take of Covered Species Occurrences; Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
CTS-3	California Tiger Salamander Exclusion Fencing	California tiger salamander	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
CTS-4	Avoid California Tiger Salamander Entrapment	California tiger salamander	Take of Covered Species Occurrences
CTS-5	Erosion Control Materials in California Tiger Salamander Habitat	California tiger salamander	Take of Covered Species Occurrences
CTS-6	California Tiger Salamander Encounter Protocol	California tiger salamander	Take of Covered Species Occurrences; Increased Human Presence During Construction
CTS-7	Rodent Control	California tiger salamander	Take of Covered Species Occurrences; Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Temporary Alterations to Hydrographs and Water Quality Effects; Increased Human Presence During Construction; Pesticides and Fertilizers

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
WS-1	Western Spadefoot Surveys	Western spadefoot	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WS-2	Western Spadefoot Work Window	Western spadefoot	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WS-3	Western Spadefoot Monitoring	Western spadefoot	Take of Covered Species Occurrences; Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WS-4	Western Spadefoot Exclusion Fencing	Western spadefoot	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WS-5	Avoid Western Spadefoot Entrapment	Western spadefoot	Take of Covered Species Occurrences
WS-6	Erosion Controls in Western Spadefoot Habitat	Western spadefoot	Take of Covered Species Occurrences

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
WS-7	Western Spadefoot Encounter Protocol	Western spadefoot	Take of Covered Species Occurrences; Increased Human Presence During Construction
GGS-1	Giant Gartersnake Surveys	Giant gartersnake	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GGS-2	Giant Gartersnake Work Window	Giant gartersnake	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GGS-3	Giant Gartersnake Monitoring	Giant gartersnake	Take of Covered Species Occurrences; Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GGS-4	Giant Gartersnake Habitat Dewatering and Exclusion	Giant gartersnake	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GGS-5	Avoid Giant Gartersnake Entrapment	Giant gartersnake	Take of Covered Species Occurrences

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
GGS-6	Erosion Control Materials in Giant Gartersnake Habitat	Giant gartersnake	Take of Covered Species Occurrences
GGS-7	Giant Gartersnake Encounter Protocol	Giant gartersnake	Take of Covered Species Occurrences; Increased Human Presence During Construction
GGS-8	Giant Gartersnake Post-Construction Restoration	Giant gartersnake	Loss of Land Covers and Covered Species Habitat, Habitat Fragmentation; Wildlife Community Alterations; Permanent Alterations to Hydrographs and Water Quality Effects; Invasive Plants
WPT-1	Western Pond Turtle Surveys	Western pond turtle	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WPT-2	Western Pond Turtle Work Window	Western pond turtle	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WPT-3	Western Pond Turtle Monitoring	Western pond turtle	Take of Covered Species Occurrences; Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WPT-4	Western Pond Turtle Habitat Dewatering and Exclusion	Western pond turtle	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
			Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WPT-5	Avoid Western Pond Turtle Entrapment	Western pond turtle	Take of Covered Species Occurrences
WPT-6	Erosion Controls in Western Pond Turtle Habitat	Western pond turtle	Take of Covered Species Occurrences
WPT-7	Western Pond Turtle Modeled Habitat Speed Limit	Western pond turtle	Take of Covered Species Occurrences; Increased Human Presence During Construction.
WPT-8	Western Pond Turtle Encounter Protocol	Western pond turtle	Take of Covered Species Occurrences; Increased Human Presence During Construction
WPT-9	Western Pond Turtle Post Construction Restoration	Western pond turtle	Loss of Land Covers and Covered Species Habitat, Habitat Fragmentation; Wildlife Community Alterations; Permanent Alterations to Hydrographs and Water Quality Effects; Invasive Plants
TCB-1	Tricolored Blackbird Surveys	Tricolored blackbird	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
TCB-2	Tricolored Blackbird Pre-Construction Surveys	Tricolored blackbird	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
TCB-3	Tricolored Blackbird Nest Buffer	Tricolored blackbird	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
			Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
TCB-4	Tricolored Blackbird Nest Buffer Monitoring	Tricolored blackbird	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
TCB-5	Timing of Pesticide Use and Harvest Timing on Agricultural Preserves	Tricolored blackbird	Take of Covered Species Occurrences; Increased Human Presence; Vehicle and Aircraft Collisions with Wildlife; Pesticides and Fertilizers
SWHA-1	Swainson's Hawk Surveys	Swainson's hawk	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
SWHA-2	Swainson's Hawk Pre-Construction Surveys	Swainson's hawk	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
SWHA-3	Swainson's Hawk Nest Buffer	Swainson's hawk	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
SWHA-4	Swainson's Hawk Nest Buffer Monitoring	Swainson's hawk	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GSC-1	Greater Sandhill Crane Surveys	Greater sandhill crane	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GSC-2	Greater Sandhill Crane Pre-Construction Surveys	Greater sandhill crane	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GSC-3	Greater Sandhill Crane Roost Buffer	Greater sandhill crane	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
GSC-4	Greater Sandhill Crane Visual Barrier	Greater sandhill crane	Take of Covered Species Occurrences; Construction Noise; Construction Lighting; Construction Dust; Increased Human Presence During Construction
GSC-5	Greater Sandhill Crane Roosting Buffer Monitoring	Greater sandhill crane	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
			Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
WBO-1	Burrowing Owl Surveys	Western burrowing owl	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris
WBO-2	Burrowing Owl Pre-Construction Survey	Western burrowing owl	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris
WBO-3	Burrowing Owl Avoidance	Western burrowing owl	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris
WBO-4	Burrowing Owl Construction Monitoring	Western burrowing owl	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris
WBO-5	Burrowing Owl Passive Relocation	Western burrowing owl	Take of Covered Species Occurrences; Increased Human Presence During Construction
WBO-6	Burrowing Owl Timing of Maintenance Activities	Western burrowing owl	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Construction Dust; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
WBO-7	Rodent Control	Western burrowing owl	Take of Covered Species Occurrences; Loss of Land Covers and Covered Species Habitat; Habitat Fragmentation; Temporary Alterations to Hydrographs and Water Quality Effects; Increased Human Presence During Construction; Pesticides and Fertilizers
RAPTOR-1	Raptor Surveys	Cooper's hawk, loggerhead shrike, northern harrier, and white-tailed kite	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris
RAPTOR-2	Raptor Pre-Construction Surveys	Cooper's hawk, loggerhead shrike, northern harrier, and white-tailed kite	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris
RAPTOR-3	Raptor Nest/Roost Buffer	Cooper's hawk, loggerhead shrike, northern harrier, and white-tailed kite	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris
RAPTOR-4	Raptor Nest/Roost Buffer Monitoring	Cooper's hawk, loggerhead shrike, northern harrier, and white-tailed kite	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris

Table 6-3
Summary of AMMs that Minimize Effects of Environmental Stressors on Covered Species Modeled Habitats and Individuals

Measure	Title of Measure	Covered Species	Relevant Environmental Stressors
BAT-1	Winter Hibernaculum Surveys	Western red bat	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
BAT-2	Winter Hibernaculum Pre-Construction Surveys	Western red bat	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
BAT-3	Winter Hibernaculum Buffer	Western red bat	Take of Covered Species Occurrences; Construction Noise; Construction Ground Vibration; Construction Lighting; Increased Human Presence During Construction; Laydown or Trampling of Vegetation; Construction Trash and Debris; Temporary Alterations to Hydrographs and Water Quality Effects
BAT-4	Bat Eviction Methods	Western red bat	Take of Covered Species Occurrences; Increased Human Presence During Construction

6.4.2 GIS-Driven Calculation of Permanent Effects

The effects of Covered Activities on each SSHCP land cover and each Covered Species were quantified using a GIS. The Permittees used GIS to overlay an electronic map-layer of Covered Activity footprints onto an electronic map-layer of the Plan Area Land Cover Types baseline map (Figure 3-1) and quantified the acres of overlap to determine acres of direct impact to each SSHCP land cover type and each species modeled habitat.

This chapter's impact methodology assumes that all Covered Species modeled habitat currently existing within the UDA will be permanently removed, except:

- Within existing preserves,
- Within the areas proposed for the SSHCP Preserve System (Section 7.5),
- Within areas of Preserve Setbacks not altered through development of trails (Section 5.3),
- Non-Vernal Pool Ecosystem land cover types within Stream Setbacks that are not altered through development of trails[4] (Section 5.3);
- Sites of proposed projects with existing ESA incidental take authorization and other required entitlements;[5] and
- Within 8,660 acres of the approximately 9,160 acres of already-subdivided parcels (defined as large lot sizes of 0.5 to 4.5 acres for the purposes of this effect analysis) primarily west of Excelsior Road in the UDA[6]. As discussed in Chapter 5, only three categories of development Covered Activities (Rural Transportation Projects, Recycled water Projects, and operations/maintenance of flood control facilities) will be constructed within the Plan Area outside the UDA (see Figures 5-5 and 5-6). For Covered Activities outside the UDA, specific project details and planned locations are known at this time, and are presented in Sections 5.2.3 and 5.2.4.

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4 All Vernal Pool, Swale, and Stream/Creek (VPIH) located within SSHCP Stream Setbacks were assumed to be permanently impacted.

5 The Mather Field Specific Plan is still pursuing its own ESA consultation with USFWS and a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers; however, the SSHCP effects analysis treats parcels within the boundary of the Mather Field Specific Plan the same as parcels with existing ESA incidental take authorization and other entitlements.

6 Most of these 0.5- to 4.5-acre lots contain single-family dwellings in a matrix of agricultural uses or Valley Grassland (e.g., estate homes, hobby farms, or horse properties). Based on historical land use patterns and the expertise of County planners related to these areas, the Plan Permittees assume that these properties are likely to remain as single-family dwelling units and are unlikely to be further developed or significantly modified over the proposed 50-year Permit Term. Therefore, the SSHCP assumes that Urban Development Covered Activities occurring on these 0.5- to 4.5-acre lots mostly west of Excelsior Road will result in a maximum conversion of 500 acres over the Permit Term. These assumptions are used only to develop estimates of effects to Covered Species modeled habitats within the UDA.

Effects of projects outside the UDA were estimated by overlaying an electronic GIS map of the maximum project footprints (including Construction Zones) onto the GIS maps of known species occurrences, Covered Species modeled habitats, and any designated species Critical Habitat. These effect footprints incorporate maximum estimated construction, grading, and staging areas associated with construction and operations activities. Habitats for covered vernal pool plants and invertebrates partially located within the effect footprint of a Covered Activity were assumed to be completely affected.

Buffers were applied using GIS to all transportation project Covered Activities outside the UDA to identify Construction Zones that enclose areas of direct and indirect effects:

- Thoroughfares (typically four to six lanes (see Section 5.2.3): Permittees used the GIS “buffer” tool to delineate a 80-foot distance on either side of the roadway’s centerline to map the maximum 160-foot-wide Construction Zone for each Thoroughfare project described in Section 5.2.3. To accommodate new turn lanes at intersections, the Thoroughfare project maximum Construction Zone width was increased from 80 to 186 feet on both sides of an intersection, beginning 500 feet from the intersection center.
- Arterial roads (typically four-lane roadways with a center two-way left-turn lane or a raised center median): Permittees used the GIS “buffer” tool to delineate a 67-foot distance from the road centerline to create a 134-foot Construction Zone along road segments for each arterial road project described in Section 5.2.3.
- Collector roads (two-lane roads in rural areas): Permittees used the GIS “buffer” tool to delineate a 62-foot distance from the road centerline to create a 125-foot Construction Zone along road segments for each collector road project described in Section 5.2.3.
- Roads forming interchange overpass, on-ramps, and off-ramps for I-5 and SR-99: Permittees used the GIS “buffer” tool to delineate a 75-foot distance from the road centerline to create a 150-foot Construction Zone were buffered by 150 feet using GIS.
- Roads planned for re-aligning: Permittees used the GIS “buffer” tool to delineate a 200-foot distance from the road centerline to create a 400-foot Construction Zone along road segments planned for re-alignment. This 400-foot-wide Construction Zone is necessary because is many instances the final combination of alignments has not been determined, so a conservatively large Construction Zone ensures that any areas that might possibly be affected are included in calculations.
- In compliance with AMM ROAD-1 (Section 5.4), new Roadways that cross planned SSHCP preserves within the UDA will be designed by project proponents to avoid and minimize direct effects on vernal pools and other wetlands.

- GIS buffers were developed on a case-by-case basis for roads that are planned for widening adjacent to existing preserves, roads in areas where existing infrastructure or an abundance of wetland resources may limit expansion on one side of the road, and at right-angle turns. The Permittees used their professional judgment when reviewing aerial imagery and SSHCP land cover type mapping and applied GIS buffers to create Construction Zones that are appropriate for each individual situation.
- The Construction Zone is wider where any of the above roadways cross streams. In particular, larger roadway Construction Zones were mapped at stream crossings to allow for greater flexibility and movement of construction equipment. Section 5.2.3 identifies a total of 48 stream crossings of rural road improvements projects outside the UDA. At these 48 stream crossings, an additional 25-foot GIS buffer was applied on either side of the road Construction Zone to create a stream crossing Construction Zone 50 feet greater than the initial road Construction Zone. For example, if the initial road Construction Zone is 108 feet then the portion of that road that crosses a stream has a Construction Zone of 158 feet).

For the Capital Southeast Connector, the Southeast Connector Joint Powers Authority (Connector JPA) provided project-specific construction footprints (Section 5.2.1.1). Although the roadway widths along the Capital Southeast Connector would vary, the Permittees assumed the Construction Zone for the Capital Southeast Connector is 200 feet wide across the entire alignment, centered on the road centerline. This provides for a conservative estimate of permanent effect, considering that the Construction Zone for a thoroughfare is assumed to be only 160 feet wide. The one exception to this uniform 200-foot-wide Construction Area for the Capital Southeast Connector is at intersections, where the Construction Zone was determined on a case-by-case basis.

- Construction Zones for planned UDA pipelines (Section 5.2.1) that could affect existing preserves or SSHCP Preserves were determined in GIS as follows:
    - Planned UDA sewer lines were buffered in GIS by 30 feet to map a 60-foot Construction Zone.
    - Planned UDA water pipelines were buffered in GIS by 20 feet to map a 40-foot Construction Zone.
    - Planned UDA recycled water pipelines were buffered in GIS by 37.5 feet to map a 75-foot Construction Zone.
    - For UDA pipeline segments that are planned to be constructed using trenchless construction methods, permanent effects were mapped for a 12-foot-wide dirt access road along the trenchless pipeline alignment. The entry and exit locations were assumed to be located outside Preserves within the area of permanent effect in the

UDA. Access road alignments were adjusted in GIS to avoid effects on jurisdictional waters and wetlands.

Outside the UDA, the Permittees calculated the permanent effects of construction and ongoing maintenance and operations by applying GIS buffers to the footprints of proposed projects (i.e., roadways, recycled-water delivery projects). These footprints were obtained from the project proponents, including the Connector JPA, SRCSD, and others.

The Permittees assume in the land cover effect analysis in Section 6.5 and the Covered Species effects analysis in Section 6.6 that all temporary effects associated with Covered Activities will occur within the permanent effect footprint or would be contained through AMMs before entering preserves. The Permittees assume that Covered Activity temporary construction activities such as equipment and material staging will occur within the UDA permanently affected areas, or in the Construction Zones included as permanently effected outside the UDA. Therefore, temporary construction effects were not calculated separately. Similarly, the Permittees assume that most operation and maintenance will not result in additional effects to habitat because the analysis assumes full removal of natural land cover types within permanent effect footprints. Operations and maintenance activities could result in some recurring direct take of birds, which is discussed qualitatively for each species as appropriate in Section 6.6. In addition, flood control and stormwater management maintenance activities in the UDA will result in temporary loss of habitat for western pond turtle. However, these activities will not affect giant gartersnake because they will be limited to the UDA which does not contain modeled giant gartersnake habitat.

6.4.2.1 Determining Take of Covered Species and Removal of Modeled Habitat

As discussed in Chapter 3, maps were generated of each Covered Species' modeled habitat to show portions of the Plan Area that will be used for species breeding, feeding, roosting, sheltering, foraging, or other important life history activities (Section 3.4). The Covered Activity footprints described above were overlaid in GIS onto the maps of Covered Species modeled habitat, and wherever the two overlapped, Covered Species modeled habitat was considered removed. When Valley Grassland is converted to Vernal Pool or other wetland types as a result of re-establishment or establishment actions, the conversion is counted as a loss of Valley Grassland.

As discussed in Chapter 3, for giant gartersnake, Swainson's hawk, and greater sandhill crane, the SSHCP identified a subset of the Covered Species modeled habitat as "high-value" habitat for the species in this Plan Area. For each of these three Covered Species, high-value habitat and the methodology by which it was delineated is defined in Chapter 3. Effects on high-value habitat for these three species was calculated using the same GIS methods described above, but with the habitat map restricted to only the high-value modeled habitat. These effects are presented separately from overall modeled habitat effects for these species in Section 6.6.

Generally, occurrence data for Covered Species in the Plan Area are incomplete. Comprehensive surveys for Covered Species have not been conducted to allow a reasonable level of confidence in estimates of individual take, with the exception of the Covered Species plants. For these plant species, the Plan Permittees calculated direct effects to the Covered Species by assuming that all occurrences located within the GIS-derived project footprint will be taken. For all other Covered Species, the SSHCP impact analysis uses the species modeled habitat as a "surrogate" for quantifying direct and indirect take of individuals. For vernal pool species, all modeled aquatic habitat (Vernal Pool, Swale, and Stream/Creek (VPIH)) were assumed to be occupied. This assumption is appropriate because Plan Area aquatic habitat is a more mature system than in other locations (e.g., Placer County), and surveys conducted within the Plan Area generally indicate that pools are occupied by one or more of the three covered branchiopods. By assuming that all pools are occupied, mitigation will balance out take of individual vernal pool Covered Species over time. The Plan Permittees also assumed that all known and unknown occurrences within that removed acreage will be taken.

Most indirect impacts will occur within the UDA, as that is where urban development will abut existing preserves and proposed preserves. Outside the UDA, indirect impacts will occur within zones along rural transportation Covered Activities. Most indirect effects do not disturb land cover types or Covered Species modeled habitat, and thus cannot be quantified using GIS-based methods. Therefore, indirect effects to Covered Species and Covered Species modeled habitat were assessed mostly qualitatively for the SSHCP. Indirect effects that were quantified using GIS are for micro-watershed effects on the Vernal Pool Ecosystem in planned and existing preserves, including effects on the Vernal Pool, Swale, and Stream/Creek (VPIH) land cover types (Section 6.4.2.2).

6.4.2.2 Effects on the Vernal Pool Ecosystem

If a Covered Activity project footprint overlaid any portion of a Vernal Pool, Swale, or Stream/Creek (VPIH), that entire Vernal Pool, Swale, or Stream/Creek (VPIH) was assumed to be completely directly affected. All Vernal Pool Ecosystem aquatic land cover types located in planned Stream Setbacks and Preserve Setbacks were also assumed as permanently directly affected (see Sections 6.4.2.3 and 6.4.2.4).

As discussed in Section 6.3.1 (under the heading Vernal Pool Hydrologic Alterations), Covered Activities also have the potential to indirectly affect Vernal Pool, Swale, and Stream/Creek (VPIH) by disruption of soil duripan that supports the perched aquifer or disrupts the micro-watershed of the vernal pool. The surface watershed of vernal pools was modeled using data gathered from Light Detection and Ranging (LIDAR) data (Appendix E). If more than 10% of a watershed of a Vernal Pool land cover type was removed, that Vernal Pool was considered indirectly affected. Indirect affects to stream/creeks (VPIH) were determined using a different methodology. When a Swale and Stream/Creek (VPIH) land cover type feature intersected a vernal pool that is directly affected, it is assumed that the Swale or Stream/Creek (VPIH) land cover type is indirectly affected.

The effects analysis for Covered Species assumes that indirectly affected vernal pools, swales, or Stream/Creek (VPIH) are no longer modeled Vernal Pool, Swale, or Stream/Creek (VPIH) habitat.

6.4.2.3 Effects on Preserve Setbacks

This chapter quantifies direct effects to SSHCP land covers within each proposed Preserve Setback by overlaying Preserve Setback Covered Activities footprints (e.g., trails, fire breaks). Where project-level information was not available, GIS layers from the County and City general plans were used to identify road crossing and trail locations within proposed setbacks. The impact methodology assumes that all Vernal Pool, Swale, and Stream/Creek (VPIH) land covers located in proposed Preserve Setbacks will be permanently affected. This is because trail construction. Bioswales, and other Covered Activities allowed in Preserve Setbacks cannot be guaranteed to avoid effects on Vernal Pool, Swale, or Stream/Creek (VPIH). Though this may overestimate actual effects to the Vernal Pool Ecosystem in Preserve Setbacks, it ensures that any effects will be mitigated. Other SSHCP land cover types in Preserve Setbacks were quantified as neither affected nor preserved. This assumption is intended to capture the future uses of the Preserve Setbacks and likely effects on non-Vernal Pool Ecosystem land cover types. These land cover types would generally remain in a natural state similar to that seen along the wider expanses of the American River Parkway, but will include enough development of trails and other infrastructure that they cannot be considered preserved.

6.4.2.4 Effects on Streams and Stream Setbacks

Effects on streams were calculated in GIS for all Covered Activities that may have in-stream effects. Examples of Covered Activities resulting in permanent effects to the natural structure or function of a wetland or stream include installing hardscape in the channel, creating a culvert through the channel, constructing a new bridge over the channel, or reducing channel complexity (e.g., removing riffle, runs, or pools).

This chapter quantified direct effects to SSHCP land covers within each planned Stream Setback by overlaying Stream Setback Covered Activities footprints (i.e., trails) or the footprints of other Covered Activities that enter Stream Setbacks. Where project-level information was not available, GIS layers from the County and City general plans were used to identify road crossing and trail locations within proposed setbacks. The impact methodology assumes that any Vernal Pool, Swale, and Stream/Creek (VPIH) land covers located in proposed Stream Setbacks will be permanently affected. This is because trail construction, utility crossings, and road crossings allowed in Stream Setbacks cannot be guaranteed to avoid effects on Vernal Pool, Swale, or Stream/Creek (VPIH). Though this may overestimate actual effects to the Vernal Pool Ecosystem in Stream Setbacks, it ensures that any effects will be mitigated. Those portions of Stream Setbacks not directly or indirectly affected were considered neither affected nor preserved. These methods reflect that the Implementing Entity will not control public usage and habitat conditions within the Stream Setback in the same way as on SSHCP Preserves, and thus the Permittees are not requesting credit for this habitat as preserved. However, the land cover types and Covered Species modeled habitat present within the Stream Setback will generally remain undisturbed, so it is appropriate to consider it not affected.

6.4.2.5 Effects on Critical Habitat

As discussed in Chapter 3, vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp, Sacramento Orcutt grass, slender Orcutt grass, and California tiger salamander have designated Critical Habitat within the Plan Area. There are four Primary Constituent Elements (PCEs) for the Critical Habitat of the three vernal pool crustaceans (USFWS 2006):

1. Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described below in (2) providing for dispersal and promoting hydroperiods of adequate length in the pools;
2. Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 41 days (VPTS) or 18 days (VPFS), in all but the driest years.
3. Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves; and
4. Structure within the pools described above in (2), consisting of organic and inorganic materials that provide shelter.

Sacramento Orcutt grass and slender Orcutt grass Critical Habitat has two PCEs:

1. Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features, including swales connecting the pools, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

2. Depressional features, including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and non-native upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

California tiger salamander Critical Habitat has four PCEs:

1. Standing bodies of fresh water, including natural and man-made (e.g., stock) ponds, vernal pools, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a sufficient length of time necessary for the species to complete the aquatic portion of its life cycle.
2. Barrier-free upland habitats adjacent to breeding ponds that contain small mammal burrows.
3. Upland areas between occupied locations (PCE 1) and areas with small mammal burrows (PCE 2) that allow for dispersal among such sites.
4. The geographic, topographic, and edaphic features that support aggregations or systems of hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands, which together form hydrologically and ecologically functional units called vernal pool complexes.

Using the GIS methodology discussed in Section 6.4.2, acres of direct permanent loss in each Critical Habitat Unit were determined by overlaying the footprints of Covered Activities on the boundaries of each Critical Habitat unit located in the Plan Area. This method identified loss of PCEs 1 and 2 for the vernal pool crustaceans; PCEs 1 and 2 for Sacramento Orcutt grass and slender Orcutt grass; and PCEs 1, 2, and 3 for California tiger salamander.

The acreage of indirect effects on the Vernal Pool Ecosystem in Critical Habitat from adjacent development were calculated as discussed above. This chapter presents the acres of direct and indirect effects to SSHCP land cover types within each Critical Habitat Unit, including developed land covers. This method identified potential loss of biological function within vernal pools, corresponding to PCEs 3 and 4 for the vernal pool crustaceans, and interruption of hydrologic connection of the Vernal Pool Ecosystem, corresponding to PCE 4 for California tiger salamander. The USFWS will use those calculations and related maps when completing a Critical Habitat Adverse Modification Analysis under Section 7 of the ESA.

6.4.3 Qualitative Analysis of Indirect Effects

Most indirect effects are analyzed qualitatively in tables and in the narrative for each Covered Species and SSHCP land cover types. As discussed above, estimates of direct effects on land cover types and Covered Species modeled habitat have been quantified conservatively (i.e., somewhat overestimated). These conservative estimates are intended, in part, to incorporate many of the indirect effects of the environmental stressors described in Section 6.3 and ensure that the SSHCP Conservation Strategy provides enough conservation to offset these indirect effects.

6.5 Effects of Covered Activities on Land Cover Types

6.5.1 Permanent Effects on Land Cover Types

This section quantifies the estimated permanent direct effects of Covered Activities on land cover types within the Plan Area. As described in Section 3.2, Valley Grassland is categorized as those lands that are hydrologically connected to, or inside, the Vernal Pool Ecosystem and those that are not hydrologically connected to, or outside, the Vernal Pool Ecosystem. Of the total 135,152 acres of Valley Grassland within the Plan Area there are 97,349 acres that are part of the Vernal Pool Ecosystem and 37,803 acres that are outside of the Vernal Pool Ecosystem. In Table 6-4, the Valley Grassland in the Vernal Pool Ecosystem is categorized as aquatic and those areas that are outside the Vernal Pool Ecosystem are categorized as terrestrial.

Table 6-4 shows the permanent direct and indirect effects to natural land cover types within the Plan Area that will be affected by SSHCP Covered Activities. In total, approximately 33,497 acres, or 12%, of the 272,596 acres of natural land covers in the Plan Area would be removed over the proposed 50-year Permit Term. This includes the removal of approximately 32,054 acres of natural land covers inside the UDA and approximately 1,443 acres of natural land covers outside the UDA.

Approximately 65% of the permanent direct impacts to all natural land covers are to Valley Grassland, with approximately 22,014 acres of the 135,152 acres of Valley Grassland present in the Plan Area being removed. More specifically, of the 97,349 acres of Valley Grassland in the Vernal Pool Ecosystem, 16,472 acres will be removed, and of the 37,803 acres of Valley Grassland outside of the Vernal Pool Ecosystem, 5,542 acres will be removed. The next largest permanent direct impact (16%) is to Cropland; of the approximately 51,829 acres in the Plan Area, 5,285 acres of Cropland would be removed. Permanent direct impacts to 2,749 acres of the 15,991 acres of Irrigated Pasture–Grassland in the Plan Area and 1,455 acres of the 26,460 acres of Vineyard in the Plan Area represent approximately 8% and 4%, respectively, of the total permanent direct impacts to all land cover types. The remainder of the land covers represents 6% of the total permanent direct impacts. Similar to the Plan-wide impacts, permanent direct impacts to Valley Grassland, Cropland, Irrigated Pasture–Grassland, and Vineyard account for approximately 94% of the total permanent direct impacts in the UDA and approximately 88% of total permanent direct impacts outside of the UDA.

With respect to the total acreage of the land cover type that will be removed compared to the acreage of that land cover type present in the Plan Area, the land covers that will be most affected are Mine Tailing Riparian Woodland and Stream/Creek (VPIH). Of the 641 acres of Mine Tailing Riparian Woodland in the Plan Area, 218 acres, or 34%, would be directly and permanently impacted. Also, SSHCP Covered Activities will permanently and directly impact 22 acres, or 30%, of the approximately 73 acres of Stream/Creek (VPIH) in the Plan Area. Permanent direct impacts to the remainder of the land cover types compared to the amount that exists in the Plan Area are less than 20% for each type, and the acreages are listed in Table 6-4. Because the majority of the SSHCP Covered Activities will be implemented within the UDA, for most of the land cover types, more than half of the land cover type present within the UDA will be permanently and directly impacted. Land cover types for which this is not true are Blue Oak Savanna, Freshwater Marsh, Stream/Creek (VPIH), and Vernal Pool. In contrast, outside of the UDA, no more than 1.2% of any one land cover type will be removed by SSHCP Covered Activities.

Table 6-4
Permanent Direct and Indirect Effects on Natural Land Covers

Land Cover	Direct Effects (acres)	Indirect Effects (acres)	Total Impacts (acres)	Total Available in Plan Area (acres)	Percent of Total in Plan Area Affected
Aquatic					
Vernal Pool	389	94	483	4,536	11%
Swale	234	44	278	1,252	22%
Seasonal Wetland	105	Qualitative[1]	105	2,600	4%
Freshwater Marsh	127	Qualitative	127	2,954	4%
Streams/Creeks (VPIH)	22	4	26	73	36%
Streams/Creeks	117	Qualitative	117	2,778	4%
Open Water	155	Qualitative	155	2,344	7%
Mixed Riparian Woodland	184	Qualitative	184	5,856	3%
Mixed Riparian Scrub	189	Qualitative	189	1,454	13%
Mine Tailing Riparian Woodland	218	Qualitative	218	641	34%
Valley Grassland (in Vernal Pool Ecosystem)	16,472	Qualitative	16,472	97,349	17%
Terrestrial					
Valley Grassland (Outside of Vernal Pool Ecosystem)	5,542	Qualitative	5,542	37,803	15%
Blue Oak Woodland	9	Qualitative	9	9,132	0.1%
Blue Oak Savanna	38	Qualitative	38	5,637	1%
Cropland	5,285	Qualitative	5,285	51,829	10%
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	15,991	17%

Table 6-4
Permanent Direct and Indirect Effects on Natural Land Covers

Land Cover	Direct Effects (acres)	Indirect Effects (acres)	Total Impacts (acres)	Total Available in Plan Area (acres)	Percent of Total in Plan Area Affected
Orchards	207	Qualitative	207	3,907	5%
Vineyards	1,455	Qualitative	1,455	26,460	6%
Grand Total	**33,497**	**142**	**33,639**	**272,596**	**12%**

1. Most indirect effects (Section 6.3) do not disturb land cover types or Covered Species modeled habitat, and thus cannot be quantified using the GIS-based methods. Therefore, most Covered Activity indirect effects to land cover types were assessed qualitatively for the SSHCP.

Permanent indirect effects from Covered Activities on the Vernal Pool Ecosystem include altered hydrology of vernal pools from removal or disturbance to their micro-watersheds. Indirect impacts are quantified for Vernal Pool, Swale, and Stream/Creek (VPIH) in Table 6-4 and also are quantified in Table 6-5 because these three land covers are components of the Vernal Pool Ecosystem. Valley Grassland that is hydrologically connected to the Vernal Pool Ecosystem is also a component of the Vernal Pool Ecosystem, but indirect impacts to this specific land cover are not quantified. In total, approximately 17,259 acres, or 17%, of the 103,210 acres of the Vernal Pool Ecosystem in the Plan Area would be removed or indirectly impacted over the proposed 50-year Permit Term; indirect impacts account for 142 acres of the total impact acreage. This includes the following impacts to the Vernal Pool Ecosystem: removal of 16,795 acres (64%) and indirect impacts to 132 acres (0.5%) of the 26,048 acres present inside the UDA; and removal of 322 acres (0.4%) and indirect impacts to 9.5 acres (0.01%) of 77,162 acres present outside the UDA.

Table 6-5
Direct and Indirect Effects on the Vernal Pool Ecosystem

Land Cover	Direct Effects (acres)	Indirect Effects (acres)	Total Impacts (acres)	Total Available in Plan Area (acres)	Percent of Total in Plan Area Affected
Valley Grassland (in Vernal Pool Ecosystem)	16,472	Qualitative	16,472.29	97,349	17%
Vernal Pool	389	944	483	4,536	11%
Swale	234	44	278	1,252	22%
Stream/Creek (VPIH)	22	4	26	73	34%
Grand Total	**17,116.39**	**141.54**	**17,258.93**	**103,210**	**17%**

Other than Vernal Pool, Swale, and Stream/Creek (VPIH) for which indirect effects were quantified, the permanent indirect effects of the remainder of the natural land covers are discussed qualitatively and are summarized in Table 6-6. Indirect effects will be greatest within the UDA because most Covered Activities will occur within the UDA. The Plan Permittees expect that the indirect effects of Covered Activities on natural land covers will be minor outside the UDA because no Urban Development Covered Activities will occur outside, the UDA and indirect effects to natural land covers outside the UDA will be limited to those resulting from rural roadways and water pipeline projects. Additionally, since the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and proposed UDA preserves, edge effects of Covered Activities within Preserves will be less than those within the UDA. Permanent indirect effects of Covered Activities to natural land covers are described qualitatively in Table 6-6, along with AMMs that avoid and minimize these effects.

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 2, LID-2 (Groundwater Recharge) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams) Condition 7, STREAM-5 (Permanent Stream Channel Re-Establishment) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Absent AMMs, the close proximity of planned development and roads to natural land covers will increases the likelihood of hydromodification, such as impacting duripan or hardpan, increasing impermeable surfaces, and decreasing opportunities for groundwater recharge, and will result in the degradation of water quality through the release of pollutants and toxins. Directly impacting the upstream watershed or aquatic land covers, re-routing streams, and stabilizing stream banks using impervious materials will indirectly affect the hydrology of natural land covers. Edge effects such as irrigation overspray or faulty irrigation systems will alter hydrology, which can allow invasive species to establish or type-convert the land cover. Increased traffic resulting in the increased release of chemicals such as fuel, oils, and lubricants, improper management of stormwater and livestock, and the improper use of pesticides will degrade water quality. The adverse effects of altering the watershed hydrographs will be avoided and minimized through the implementations of AMMs such as: (1) the avoidance of direct impacts to streams and other natural land covers through, for example, siting and design and the use of trenchless technology; (2) the avoidance of impacts to duripan and hardpan; (3) requiring Preserve Setbacks; (4) the avoidance of impacts from irrigation in the Preserves by requiring landscaping adjacent to Preserves to be installed between trails and development (away from Preserves); requiring drought-tolerant landscaping to minimize the amount of water required to maintain the landscaping; limiting irrigation adjacent to Preserves to 5 years (temporary) and requiring the use of drip irrigation only to avoid overspray; and requiring monitoring of irrigation to ensure system is functioning properly to avoid leaks; (5) providing design criteria for re-routing streams, if re-routing cannot be avoided, that would minimize hydromodification, such as allowing the re-routed

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
		stream to migrate laterally over its active and terrace floodplain; (6) limiting utility maintenance in Preserves to periods when vernal pools are dry to avoid inadvertently modifying the hydrology (e.g., creating road ruts in wet soils conditions, etc.); and (7) treating all temporarily disturbed areas, after construction is completed, to remove soil compaction and restore water infiltration capacity and soil hydrologic characteristics similar to pre-project conditions. The degradation of water quality will be limited further through implementation of AMMs that require proper management of stormwater, pesticides, and livestock, such as: (1) requiring stormwater be managed consistent with the State Water Resources Control Board (SWRCB) regulations; (2) requiring stormwater from urban development be directed from Preserves and Preserve Setbacks; (3) requiring stormwater from trails, located in Preserve Setbacks, be directed into low-velocity bioretention swales outside of Preserves; (4) requiring application of roadside pesticides comply with applicable regulations and limiting the use of pesticides near sensitive areas; and (5) ensuring that livestock access points are planned to avoid impacts resulting from concentrating livestock in a limited number locations, which could modify hydrology and degrade water quality. Additionally, the degradation of water quality adjacent to Preserves will limited by requiring streets adjacent to the Preserve be single-loaded, to the maximum extent feasible, which would reduce the number of vehicles on the road and, thus, reduce potential for the release of chemicals such as fuel, oils, and lubricants by vehicles. Condition 1, LID-2, ensures prioritization of Preserves that are suitable for groundwater recharge; this AMM will ensure that the

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
		Preserves offset the decrease in groundwater recharge that would result from increasing impermeable surfaces associated with urban development.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP Preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	The Landscape Preserves established outside the UDA will primarily avoid effects of habitat fragmentation on natural land covers through maintaining large, interconnected Preserves. Implementation of AMMs will further reduce edge effects along Preserve boundaries outside of the UDA. Within the UDA, Preserves will be smaller and bordered by urban development, resulting in increased habitat fragmentation as development occurs. Implementation of AMMs will ameliorate the edge effects that can decrease the functionality of fragmented Preserves with a higher edge to preserved interior ratio. AMMs will prevent fragmentation of habitat within Preserves and/or setbacks, because these measures will: (1) require stormwater management facilities to be located outside of Preserves; (2) require avoidance of impacts to duripan and hardpan; (3) ensure that livestock access points are planned to avoid trampling vegetation; (4) require that trails are planned to avoid impacts to natural land covers; and (5) avoid the spread of invasive species by incorporating invasive plant prevention techniques into Preserve Maintenance Plans in addition to other AMMs. AMMs that site less-intensive land uses, such as parks, and single-loaded streets, adjacent to Preserves, and require appropriate setbacks from the Preserves, including a 50-foot setback from urban development, will minimize edge effects. The avoidance of direct impacts to natural features, such streams and providing appropriate setbacks throughout the Plan Area will

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
		provide linkages that connect Preserves and, thus, reduce habitat fragmentation.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA Covered Activities would not substantially affect wildfire frequency, duration, or intensity. Within the UDA, most wildfires will be quickly suppressed and the primary impacts to natural land covers will result from wildfire suppression activities, such as grading. Less often, if wildfires become uncontrollable, they can be catastrophic, especially if fuel loads have built up and fire intensity or fire frequency is high; these types of fire can prevent natural land covers from successfully recovering. Implementation of AMMs that reduce the potential ignition sources adjacent to the Preserves will reduce the risk of increased wildfire. Specifically, minimizing roads, except single-loaded streets, and urban development adjacent to Preserves and trail planning and monitoring to reduce and monitor potential ignition sources along trails will reduce the risk of increased fire. As discussed in Section 6.3, invasive plant species can alter natural frequencies of wildfires. Therefore, to avoid altering the frequency of wildfires, invasive plant prevention techniques will be incorporated into Preserve Maintenance Plans, along with other AMMs, will reduce the spread of invasive species. Also, effects of wildfire suppression on natural land covers will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memorandum of agreement with responsible fire agencies.

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 5, NATURE TRAIL-2 (Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Vernal pools, a component of the Vernal Pool Ecosystem, will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Additionally, indirect effects will occur to an estimated 142 acres of the Vernal Pool Ecosystem (Table 6-5). Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves because: (1) direct impacts to hardpan and duripan will be avoided and minimized through siting and design and the use of trenchless technology; (2) livestock access points will be planned to avoid soil compaction in vernal pools that could result from concentrating livestock in a limited number locations; and (3) roads adjacent to the Preserve will be minimized, which will reduce changes in hydrology. Additionally, vernal pools will be re-established or established in the Plan Area, as required by AMMs, which will improve hydrologic conditions of vernal pools. The Vernal Pool Ecosystem Conservation Strategy (Section 7.6.1.1.1) will offset unavoidable indirect impacts.
Chronic Ground Vibration and Noise	None required	Does not affect land cover types.
Lighting	None required	Does not affect land cover types.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Trail Plan) Condition 5, NATURE TRAIL-3 (Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Trail Impacts)	Increased human activity can adversely affect natural land covers due to impacts, such trampling of vegetation. Implementation of AMMs ensures that increased human activity in and near Preserves is limited and that it does not substantially affect natural land covers. Implementation of AMMs will minimize increased human activity adjacent to and within Preserves because: (1) land uses adjacent to the Preserves will be, to the maximum extent practicable, land uses with less intensive human activity and appropriate Preserve Setbacks will be established; (2)

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
	Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	roads adjacent to the Preserves will be single-loaded streets, which will result in less-intensive human activity as compared to a higher-use roads; (3) public access to trails will be monitored and managed in accordance with a trail plan and management actions, such as discontinuation of trail use, will be taken if adverse effects of human activity are occurring in the Preserves; and (4) trails will be sited away from sensitive natural land covers to limit the human activity to areas that are less sensitive. Within the UDA, increased human activity can adversely affect streams, which may contain aquatic natural land covers. However, the application of Stream Setbacks throughout the Plan Area would reduce the level of human activity adjacent to streams.
Wildlife Community Alterations	None required	Does not affect land cover types.
Invasive Plants	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 7, STREAM-5 (Permanent Stream Channel Re-Establishment) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Unmanaged trails and new disturbances in the Preserves and landscaping with invasive species adjacent to Preserves will encourage the spread invasive plants into adjacent habitat. Additionally, nitrogen deposition associated with increased vehicle emissions from vehicles associated with new urban development traveling along Plan Area rural roadway projects will also result in competitive advantages for non-native invasive plants. Unmanaged proliferation of invasive, non-native plants will adversely affect the composition of natural land covers by displacing native species and potentially converting the land type from natural to disturbed. Implementation of AMMs ensures that the spread of invasive plants in and near Preserves is limited and does not substantially affect natural land covers. Implementation of AMMs will minimize the spread of invasive, non-native plant species adjacent to and/or within Preserves because: (1) land uses adjacent to the Preserves will be, to the maximum extent practicable, land uses

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
		with less-intensive human activity and appropriate Preserve Setbacks will be established; (2) roads adjacent to the Preserves will be single-loaded streets, which will result in less vehicle emissions as compared to a higher-use roads; (3) landscaping adjacent to the Preserves will be limited to areas between trails and development (away from Preserves) with drought-tolerant species that are not included on the Cal-IPC list; (4) invasive plant prevention techniques will be incorporated into Preserve Maintenance Plans in addition to other AMMs; (5) trails will be planned to reduce the spread of invasive species, will be monitored for the establishment of invasive species along trail corridors, and will be managed to reduce the spread of invasive weeds; and (6) new disturbances within Preserves will be avoided through the use of trenchless technology and ensuring that livestock access points are planned to avoid impacts resulting from concentrating livestock in a limited number locations. Implementation of AMMs also will minimize the spread of invasive, non-native plants in the Plan Area through treating roadside weed infestations; requiring that local, native plants are used for re-routing streams; and retaining natural aquatic features, such as creeks and streams, into Preserve design in lieu of landscaping. Additionally, preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	None required	Does not affect land cover types.
Mesopredators	None required	Does not affect land cover types.
Wildlife Disease	None required	Does not affect land cover types.

Table 6-6
Permanent Indirect Effects on Natural Land Cover Types

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Natural Land Cover Types
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Pesticide and fertilizer use associated with urban development may affect the quality of natural land covers through the reduction of pollinators or exterminating or weakening native species and/or allowing establishment of non-native species. The adverse effects of pesticide and fertilizer use will be avoided and minimized through implementation of AMMs because: (1) land uses adjacent to the Preserves will be, to the maximum extent practicable, land uses with less intensive human activity (e.g., residential and commercial landscape area, golf courses, or single-loaded streets) and appropriate Preserve Setbacks will be established; (2) roads will be sited in less-sensitive areas, which will reduce the spread of invasive species and, thus, the need for pesticide use in sensitive natural land covers; (3) application of roadside pesticides will comply with applicable regulations and the use pesticides near sensitive areas will be limited; (4) the spread of invasive plants will be limited and managed such that pesticides are not necessary to treat weed infestations; and (5) stormwater will be directed from Preserves and Preserve Setbacks and will be managed consistent with the SWRCB regulations.
Vehicle and Aircraft Collisions with Wildlife	None required	Does not affect land cover types.
Aboveground Electrical Utilities Collision and Electrocution	None required	Does not affect land cover types.

6.5.2 Temporary Effects on Land Cover Types

Natural land covers near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to natural land covers. Generally, these temporary effects will occur within the project footprint or road right-of-way area, which are already quantified as permanently impacted as described in Section 6.5.1 and listed in Tables 6-4 and 6-5. Potential construction-related environmental stressors are described in Section 6.3.2, and their effects on natural land covers are qualitatively described in Table 6-7.

Table 6-7
Temporary Effects to Natural Land Cover Types

Environmental Stressor	Effect Reduced By	Potential Effect on Natural Land Cover Types
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single-Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into natural land covers will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of natural land covers will adversely affect the viability of vegetation communities. Implementation of AMMs ensures that trampling and compaction do not occur.
Construction Noise	None required	Does not affect land cover types.
Construction Ground Vibration	None required	Does not affect land cover types.
Construction Lighting	None required	Does not affect land cover types.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-10 (Revegetation) Condition 3, BMP-11 (Speed Limit)	The generation of fugitive dust during construction can decrease photosynthesis and can kill individual plants, and, thus, can degrade the viability of natural land covers. Implementation of AMMs ensures that dust is controlled and will not affect natural land covers.
Increased Human Presence during Construction	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Increased human activity can result in direct impacts, such as trampling of vegetation and compaction of soils, which can negatively affect the viability of natural land cover. Implementation of AMMs ensures that the adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Trash and debris will degrade the habitat value of natural land covers. Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6 Effects of Covered Activities on Covered Species

The direct effects analysis addresses permanent and temporary removal or degradation of modeled habitat that will reduce available habitat for important life history needs for Covered Species, including breeding, foraging, and cover. The direct effects analysis takes into consideration the anticipated direct effects resulting from the Covered Activities, including the following:

1. The likely placement of Covered Activities over the term of the permit (see Section 6.4, Methods to Assess Effects of Covered Activities)
2. Best information on the components or elements of each Covered Activity (i.e., construction, operation, and maintenance elements)
3. The likely environmental stressors associated with each element of a Covered Activity
4. Best information on the likely response of each Covered Species to the environmental stressors.

Direct effects are quantified as modeled habitat land cover conversion and removal of documented occurrences of the Covered Species. Indirect effects on documented occurrences and their modeled habitat are provided for vernal pool plant and invertebrate species.

6.6.1 Ahart's Dwarf Rush

Permanent Effects

Permanent direct and indirect effects of Covered Activities on Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*) will include removal, modification, or significant degradation of modeled habitat, as well as direct and indirect take of all individual Ahart's dwarf rush occupying removed, modified, or degraded habitat.

All modeled habitat for Ahart's dwarf rush is within the Vernal Pool Ecosystem, which includes Valley Grassland, Vernal Pool, and Swale (see Section 3.4.1, Plant Covered Species Habitat Models, and Figure 3-3). In addition to the direct removal, modification, or degradation of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds will remove part or all of the perched aquifer and existing hydrology that supports vernal pool and swale habitat. In addition, edge effects will heighten Ahart's dwarf rush's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of vernal pool and swale habitat. Effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for Ahart's dwarf rush.

These indirect effects on vernal pool and swale habitat are included in all permanent effects calculations presented in this section.

There is one documented occurrence of Ahart's dwarf rush in the Plan Area within the UDA in Preserve Planning Unit (PPU) 1. This occurrence will be preserved in a proposed preserve. This occurrence will not be directly or indirectly impacted. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 7,403 acres of Ahart's dwarf rush modeled habitat within the Plan Area (see Table 6-8), including 310 acres of Ahart's dwarf rush modeled aquatic habitats (i.e., vernal pools and swales) and 7,093 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on Ahart's dwarf rush modeled habitat will occur primarily inside the UDA, with approximately 7,340 acres of permanent effects on Vernal Pool Ecosystem in the UDA and approximately 63 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

Table 6-8
Ahart's Dwarf Rush Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	23,885	7,093	Qualitative	7,093	12,223	7,035	Qualitative	7,035	11,662	58	Qualitative	58
Vernal Pool	937	149	51	200	585	146	50	196	352	3	1	4
Swale	314	90	20	110	194	89	20	109	120	1	0	1
Vernal Pool Ecosystem	**25,136**	**7,332**	**71**	**7,403**	**13,002**	**7,270**	**70**	**7,340**	**12,134**	**62**	**1**	**63**

As shown in Table 6-8, approximately 71 acres of Ahart's dwarf rush modeled habitat will be indirectly affected in the Plan Area, 70 acres of which will occur in the UDA as a result of Urban Development Covered Activities. Outside the UDA, 1 acre of Ahart's dwarf rush modeled habitat will be indirectly affected. In addition to the 71 acres of indirect effects quantified in Table 6-8, Covered Activities in the Plan Area will cause other indirect effects to Ahart's dwarf rush that are not easily quantified (Table 6-9 and 6-10). These "other" indirect effects to Ahart's dwarf rush (Table 6-9) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the Ahart's dwarf rush present on existing preserves, future SSHCP proposed preserves (see Chapter 7, Conservation Strategy), and other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on Ahart's dwarf rush will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to Ahart's dwarf rush outside the UDA will occur to Ahart's dwarf rush habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, and pesticide use that will affect Ahart's dwarf rush habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing Ahart's dwarf rush habitat within the project footprint. Some of these "other" indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-8). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on Ahart's dwarf rush that are not quantified are described qualitatively in Table 6-9, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect Ahart's dwarf rush. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Table 6-9
Permanent Indirect Effects on Ahart's Dwarf Rush

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to Ahart's dwarf rush habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats or the hardpan/duripan, avoidance and project design outside of sensitive habitats, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter Ahart's dwarf rush habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on Ahart's dwarf rush. Within the UDA, habitat fragmentation will affect Ahart's dwarf rush because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves will be reduced

Table 6-9
Permanent Indirect Effects on Ahart's Dwarf Rush

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on Ahart's dwarf rush.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-4 (Nature Trail Location) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on Ahart's dwarf rush habitat will result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on Ahart's dwarf rush will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Ahart's dwarf rush will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves, but indirect effects will occur to an estimated 67.3 acres of Ahart's dwarf rush modeled aquatic habitat (Table 6-8). However, the Ahart's dwarf rush Conservation Strategy (Section 7.6.2.1, Ahart's Dwarf Rush) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses)	No effects on Ahart's dwarf rush are expected from increased

Table 6-9
Permanent Indirect Effects on Ahart's Dwarf Rush

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	human activity on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and Ahart's dwarf rush modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter Ahart's dwarf rush aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in Ahart's dwarf rush habitat will not occur.

Table 6-9
Permanent Indirect Effects on Ahart's Dwarf Rush

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants within the Vernal Pool Ecosystem will introduce competition for resources along with affecting critical hydroperiods for supporting the Ahart's dwarf rush. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on Ahart's dwarf rush. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the Vernal Pool Ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	None required for this species.	No effect on this species.

Table 6-9
Permanent Indirect Effects on Ahart's Dwarf Rush

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on Ahart's dwarf rush or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-10
Temporary Effects to Ahart's Dwarf Rush

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling)	Runoff from construction activities into Ahart's dwarf rush habitat will be fully avoided through implementation of AMMs.

Table 6-10
Temporary Effects to Ahart's Dwarf Rush

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of Ahart's dwarf rush habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. Implementation of AMMs ensures that trampling and compaction will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction dust effects on Ahart's dwarf rush individuals, modeled habitat, and vernal pool water quality will reduce habitat quality for Ahart's dwarf rush. Implementation of AMMs will ensure that dust is controlled and will not affect Ahart's dwarf rush.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas)	Increased human activity in construction and maintenance areas will affect Ahart's dwarf rush habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets will access occupied pools causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect Ahart's dwarf rush habitat quality through direct effects on water quality. Implementation of AMMs will ensure that construction trash and debris are controlled.

Temporary Effects

Ahart's dwarf rush occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to Ahart's dwarf rush. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-8).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on Ahart's dwarf rush are qualitatively described in Table 6-10.

6.6.2 Boggs Lake Hedge-Hyssop

Permanent Effects

Permanent direct and indirect effects of Covered Activities on Boggs Lake hedge-hyssop (*Gratiola heterosepala*) will include removal, modification, or significant degradation of modeled habitat, as well as direct and indirect take of all individual Boggs Lake hedge-hyssop occupying removed, modified, or degraded habitat.

All modeled habitat for Boggs Lake hedge-hyssop is within seasonal wetlands and the Vernal Pool Ecosystem, which includes Valley Grassland and Vernal Pool (see Section 3.4.1, Plant Covered Species Habitat Models, and Figure 3-4). In addition to the direct removal, modification, or degradation of modeled habitat, edge effects on seasonal wetlands or vernal pool micro-watersheds will remove part or all of the perched aquifer and existing hydrology that supports Boggs Lake hedge-hyssop modeled habitat. In addition, edge effects will heighten Boggs Lake hedge-hyssop's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of modeled habitat. In particular, seasonal wetland ecosystems are extremely vulnerable to invasive plants because of the highly effective transport of invasive species along waterways. Invasive species can dominate the biomass of wetland communities where they become established, virtually choking out the native vegetation. In addition, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for Boggs Lake hedge-hyssop. These indirect effects on Boggs Lake hedge-hyssop modeled habitat are included in all permanent effects calculations presented in this section.

Of the 30 documented occurrences of Boggs Lake hedge-hyssop within the Plan Area, 19 are located within the UDA in PPU 1 and PPU 3 and 11 are located outside the UDA in PPU 1. One of the 30 occurrences of Boggs Lake hedge-hyssop will be preserved within a proposed preserve (inside the UDA in PPU 1). Seven of the documented occurrences will be directly impacted: 1 outside the PPUs, 5 in PPU 1, and 1 in PPU 3. No occurrences will be indirectly impacted. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 8,724 acres of Boggs Lake hedge-hyssop modeled habitat within the Plan Area (see Table 6-11), including approximately 292 acres of vernal pools, approximately 8,419 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the vernal pools, and 13 acres of seasonal wetlands. Covered Activity impacts on Boggs Lake hedge-hyssop modeled habitat will occur primarily inside the UDA, with approximately 8,584 acres of permanent effects on modeled habitat in the UDA and approximately 140 acres of permanent effects on modeled habitat outside the UDA.

Table 6-11
Boggs Lake Hedge-Hyssop Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	35,115	8,419	Qualitative	8,419	14,346	8,294	Qualitative	8,294	20,769	125	Qualitative	125
Vernal Pool	1,531	240	52	292	607	227	51	278	924	13	1	14
Subtotal Vernal Pool Ecosystem	*36,646*	*8,659*	*52*	*8,711*	*14,953*	*8,521*	*51*	*8,572*	*21,693*	*138*	*1*	*139*
Seasonal Wetland	354	13	Qualitative	13	18	12	Qualitative	12	336	1	Qualitative	1
GRAND TOTAL	**37,000**	**8,672**	**52**	**8,724**	**14,971**	**8,533**	**51**	**8,584**	**22,029**	**139**	**1**	**140**

As shown in Table 6-11, approximately 52 acres of Boggs Lake hedge-hyssop modeled habitat will be indirectly affected in the Plan Area, 51 acres of which will occur in the UDA as a result of Urban Development Covered Activities. Outside the UDA, 1 acre of Boggs Lake hedge-hyssop modeled habitat will be indirectly affected. In addition to the 52 acres of indirect effects quantified in Table 6-11, Covered Activities in the Plan Area will cause other permanent indirect effects to Boggs Lake hedge-hyssop that are not easily quantified (Table 6-12). These "other" indirect effects to Boggs Lake hedge-hyssop (Table 6-12) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the Boggs Lake hedge-hyssop present on existing preserves, on future SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on Boggs Lake hedge-hyssop will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to Boggs Lake hedge-hyssop outside the UDA will occur to Boggs Lake hedge-hyssop habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, etc., that will affect Boggs Lake hedge-hyssop habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing Boggs Lake hedge-hyssop habitat within the project footprint. Some of these "other" indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to seasonal wetlands and Vernal Pool Ecosystem reported in Table 6-11). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on Boggs Lake hedge-hyssop that are not quantified are described qualitatively in Table 6-12, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect Boggs Lake hedge-hyssop. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Table 6-12
Permanent Indirect Effects on Boggs Lake Hedge-Hyssop

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to Boggs Lake hedge-hyssop habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents that will impact seasonal wetlands and the Vernal Pool Ecosystem. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats or the hardpan/duripan, avoidance and project design outside of sensitive habitats, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter Boggs Lake hedge-hyssop habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on Boggs Lake hedge-hyssop. Within the UDA, habitat fragmentation will affect Boggs Lake hedge-hyssop because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA

Table 6-12
Permanent Indirect Effects on Boggs Lake Hedge-Hyssop

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	Preserves will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on Boggs Lake hedge-hyssop.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on Boggs Lake hedge-hyssop habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on Boggs Lake hedge-hyssop will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Boggs Lake hedge-hyssop will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves, but indirect effects will occur to an estimated 52.4 acres of Boggs Lake hedge-hyssop modeled aquatic habitat (Table 6-11). However, the Boggs Lake hedge-hyssop Conservation Strategy (Section 7.6.2.2, Boggs Lake Hedge-Hyssop) will offset these unavoidable impacts.

Table 6-12
Permanent Indirect Effects on Boggs Lake Hedge-Hyssop

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on Boggs Lake hedge-hyssop are expected from increased human activity on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and Boggs Lake hedge-hyssop modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter Boggs Lake hedge-hyssop aquatic habitat, that water chemistry of modeled aquatic habitat will not be affected, and that resultant wildlife community alterations in Boggs Lake hedge-hyssop habitat will not occur.

Table 6-12
Permanent Indirect Effects on Boggs Lake Hedge-Hyssop

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants within seasonal wetlands and the Vernal Pool Ecosystem will introduce competition for resources along with affecting critical hydroperiods for supporting the Boggs Lake hedge-hyssop. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on Boggs Lake hedge-hyssop. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen

Table 6-12
Permanent Indirect Effects on Boggs Lake Hedge-Hyssop

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		deposition will be minimized through monitoring and adaptive management of seasonal wetlands and the Vernal Pool Ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on Boggs Lake hedge-hyssop, seasonal wetlands, or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-13
Temporary Effects to Boggs Lake Hedge-Hyssop

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	Runoff from construction activities into Boggs Lake hedge-hyssop habitat will be fully avoided through implementation of AMMs.

Table 6-13
Temporary Effects to Boggs Lake Hedge-Hyssop

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Water Quality Effects	Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of Boggs Lake hedge-hyssop habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. Implementation of AMMs ensures that trampling and compaction will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction dust effects on Boggs Lake hedge-hyssop individuals, modeled habitat, and vernal pool water quality will reduce habitat quality for Boggs Lake hedge-hyssop. Implementation of AMMs will ensure that dust is controlled and will not affect Boggs Lake hedge-hyssop.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas)	Increased human activity in construction and maintenance areas will affect Boggs Lake hedge-hyssop habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets will access occupied habitat causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect Boggs Lake hedge-hyssop habitat quality through direct effects on water quality. Implementation of AMMs will ensure that construction trash and debris are controlled.

Temporary Effects

Boggs Lake hedge-hyssop occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to Boggs Lake hedge-hyssop. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to seasonal wetlands and Vernal Pool Ecosystem reported in Table 6-11).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on Boggs Lake hedge-hyssop are qualitatively described in Table 6-13.

6.6.3 Dwarf Downingia

Permanent Effects

Permanent direct and indirect effects of Covered Activities on dwarf downingia (*Downingia pusilla*) will include removal, modification, or significant degradation of modeled habitat, as well as direct and indirect take of all individual dwarf downingia occupying removed, modified, or degraded habitat.

All modeled habitat for dwarf downingia is within the Vernal Pool Ecosystem, which includes Valley Grassland, Vernal Pool, and Swale (see Section 3.4.1, Plant Covered Species Habitat Models, and Figures 3-5). In addition to the direct removal, modification, or degradation of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds will remove part or all of the perched aquifer and existing hydrology that supports vernal pool and swale habitat. In addition, edge effects will heighten dwarf downingia's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of vernal pool and swale habitat. Effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for dwarf downingia. These indirect effects on vernal pool and swale habitat are included in all permanent effects calculations presented in this section.

Of the 10 documented dwarf downingia occurrences in the Plan Area, all are located outside the UDA: 8 in PPU 6 and 2 in PPU 7. Covered activities will not directly or indirectly impact any documented occurrence of dwarf downingia. Exhaustive surveys for dwarf downingia have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 1,982 acres of dwarf downingia modeled habitat within the Plan Area (see Table 6-14), including 159 acres of dwarf downingia modeled aquatic habitats (i.e., vernal pools and swales) and 1,823 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on dwarf downingia modeled habitat will occur primarily inside the UDA, with approximately 1,900 acres of permanent effects on Vernal Pool Ecosystem in the UDA and approximately 82 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

Table 6-14
Dwarf Downingia Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	22,241	1,823	Qualitative	1,823	2,673	1,750	Qualitative	1,750	19,568	73	Qualitative	73
Vernal Pool	1,661	94	13	107	305	85	13	98	1,356	9	0	9
Swale	359	46	6	52	106	46	6	52	253	0	0	0
Vernal Pool Ecosystem	**24,261**	**1,963**	**19**	**1,982**	**3,084**	**1,881**	**19**	**1,900**	**21,177**	**82**	**0**	**82**

As shown in Table 6-14, approximately 19 acres of dwarf downingia modeled habitat will be indirectly affected in the Plan Area, all of which will occur in the UDA as a result of Urban Development Covered Activities. Outside the UDA, no dwarf downingia modeled habitat will be indirectly affected. In addition to the 19 acres of indirect effects quantified in Table 6-14, Covered Activities in the Plan Area will cause other permanent indirect effects to dwarf downingia that are not easily quantified (Table 6-15). These “other” indirect effects to dwarf downingia (Table 6-15) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the dwarf downingia present on existing preserves, on future SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on dwarf downingia will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to dwarf downingia outside the UDA will occur to dwarf downingia habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, etc., that will affect dwarf downingia habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing dwarf downingia habitat within the project footprint. Some of these “other” indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-14). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on dwarf downingia that are not quantified are described qualitatively in Table 6-15, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect dwarf downingia. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize “other” indirect impacts.

Table 6-15
Permanent Indirect Effects on Dwarf Downingia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to dwarf downingia habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats or the hardpan/duripan, avoidance and project design outside of sensitive habitats, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter dwarf downingia habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on dwarf downingia. Within the UDA, habitat fragmentation will affect dwarf downingia because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves will be reduced through

Table 6-15
Permanent Indirect Effects on Dwarf Downingia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on dwarf downingia.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on dwarf downingia habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on dwarf downingia will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Dwarf downingia will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves, but indirect effects will occur to an estimated 19.4 acres of dwarf downingia modeled aquatic habitat (Table 6-14). However, the dwarf downingia Conservation Strategy (Section 7.6.2.3, Dwarf Downingia) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses)	No effects on dwarf downingia are expected from increased human

Table 6-15
Permanent Indirect Effects on Dwarf Downingia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	activity on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and dwarf downingia modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter dwarf downingia aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in dwarf downingia habitat will not occur.

Table 6-15
Permanent Indirect Effects on Dwarf Downingia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants within the Vernal Pool Ecosystem will introduce competition for resources along with affecting critical hydroperiods for supporting the dwarf downingia. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on dwarf downingia. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the Vernal Pool Ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	None required for this species.	No effect on this species.

Table 6-15
Permanent Indirect Effects on Dwarf Downingia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on dwarf downingia or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-16
Temporary Effects to Dwarf Downingia

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling)	Runoff from construction activities into dwarf downingia habitat will be fully avoided through implementation of AMMs.

Table 6-16
Temporary Effects to Dwarf Downingia

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of dwarf downingia habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. Implementation of AMMs ensures that trampling and compaction will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction dust effects on dwarf downingia individuals, modeled habitat, and vernal pool water quality will reduce habitat quality for dwarf downingia. Implementation of AMMs will ensure that dust is controlled and will not affect dwarf downingia.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas)	Increased human activity in construction and maintenance areas will affect dwarf downingia habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets will access occupied pools causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect dwarf downingia habitat quality through direct effects on water quality. Implementation of AMMs will ensure that construction trash and debris are controlled.

Temporary Effects

Dwarf downingia occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to dwarf downingia. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-14).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on dwarf downingia are qualitatively described in Table 6-16.

6.6.4 Legenere

Permanent Effects

Permanent direct and indirect effects of Covered Activities on legenere (*Legenere limosa*) will include removal, modification, or significant degradation of modeled habitat, as well as direct and indirect take of all individual legenere occupying removed, modified, or degraded habitat.

All modeled habitat for legenere is within seasonal wetlands and the Vernal Pool Ecosystem, which includes Valley Grassland and Vernal Pool (see Section 3.4.1, Plant Covered Species Habitat Models, and Figure 3-6). In addition to the direct removal, modification, or degradation of modeled habitat, edge effects on seasonal wetlands or vernal pool micro-watersheds will remove part or all of the perched aquifer and existing hydrology that supports legenere modeled habitat. In addition, edge effects will heighten legenere's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of modeled habitat. In particular, seasonal wetland ecosystems are extremely vulnerable to invasive plants because of the highly effective transport of invasive species along waterways. Invasive species can dominate the biomass of wetland communities where they become established, virtually choking out the native vegetation. In addition, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for legenere. These indirect effects on legenere modeled habitat are included in all permanent effects calculations presented in this section.

Of the 56 documented occurrences in the Plan Area, 30 are located within the UDA and 26 are outside the UDA. Covered activities will directly impact 2 documented occurrences within the UDA, including 1 in PPU 1 and 1 in PPU 3. Covered activities will indirectly impact 3 documented occurrences within the UDA in PPU 1 and 2 in PPU 3. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 10,778 acres of legenere modeled habitat within the Plan Area (see Table 6-17), including 341 acres of vernal pools, 10,401 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the vernal pools, and 36 acres of seasonal wetlands. Covered Activity impacts on legenere modeled habitat will occur primarily inside the UDA, with approximately 10,625 acres of permanent effects on modeled habitat in the UDA and approximately 153 acres of permanent effects on modeled habitat outside the UDA.

Table 6-17
Legenere Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	47,527	10,401	Qualitative	10,401	17,040	10,264	Qualitative	10,264	30,487	137	Qualitative	137
Vernal Pool	2,560	276	65	341	825	263	64	327	1,735	13	1	14
Subtotal Vernal Pool Ecosystem	*50,087*	*10,677*	*65*	*10,742*	*17,865*	*10,527*	*64*	*10,591*	*32,222*	*150*	*1*	*151*
Seasonal Wetland	886	36	Qualitative	36	59	34	Qualitative	34	827	2	Qualitative	2
GRAND TOTAL	**50,973**	**10,713**	**65**	**10,778**	**17,924**	**10,561**	**64**	**10,625**	**33,049**	**152**	**1**	**153**

As shown in Table 6-17, approximately 65 acres of legenere modeled habitat will be indirectly affected in the Plan Area, 64 acres of which will occur in the UDA as a result of Urban Development Covered Activities. Outside the UDA, 1 acre of legenere modeled habitat will be indirectly affected. In addition to the 65 acres of indirect effects quantified in Table 6-17, Covered Activities in the Plan Area will cause other permanent indirect effects to legenere that are not easily quantified (Table 6-18). These “other” indirect effects to legenere (Table 6-18) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the legenere present on existing preserves, on future SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on legenere will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to legenere outside the UDA will occur to legenere habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, etc., that will affect legenere habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing legenere habitat within the project footprint. Some of these “other” indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to seasonal wetlands and Vernal Pool Ecosystem reported in Table 6-17). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on legenere that are not quantified are described qualitatively in Table 6-18, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect legenere. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize “other” indirect impacts.

Table 6-18
Permanent Indirect Effects on Legenere

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to legenere habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents that will impact seasonal wetlands and the Vernal Pool Ecosystem. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats or the hardpan/duripan, avoidance and project design outside of sensitive habitats, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter legenere habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on legenere. Within the UDA, habitat fragmentation will affect legenere because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves will be reduced through

Table 6-18
Permanent Indirect Effects on Legenere

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on legenere.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on legenere habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on legenere will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Legenere will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves, but indirect effects will occur to an estimated 65.5 acres of legenere modeled aquatic habitat (Table 6-17). However, the legenere Conservation Strategy (Section 7.6.2.4, Legenere) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses)	No effects on legenere are expected from increased human activity

Table 6-18
Permanent Indirect Effects on Legenere

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and legenere modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter legenere aquatic habitat, that water chemistry of modeled aquatic habitat will not be affected, and that resultant wildlife community alterations in legenere habitat will not occur.

Table 6-18
Permanent Indirect Effects on Legenere

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants within seasonal wetlands and the Vernal Pool Ecosystem will introduce competition for resources along with affecting critical hydroperiods for supporting the legenere. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on legenere. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of seasonal wetlands and the Vernal Pool Ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	None required for this species.	No effect on this species.

Table 6-18
Permanent Indirect Effects on Legenere

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on legenere, seasonal wetlands, or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-19
Temporary Effects to Legenere

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling)	Runoff from construction activities into legenere habitat will be fully avoided through implementation of AMMs.

Table 6-19
Temporary Effects to Legenere

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of legenere habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. Implementation of AMMs ensures that trampling and compaction will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction dust effects on legenere individuals, modeled habitat, and vernal pool water quality will reduce habitat quality for legenere. Implementation of AMMs will ensure that dust is controlled and will not affect legenere.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas)	Increased human activity in construction and maintenance areas will affect legenere habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets will access occupied habitat causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect legenere habitat quality through direct effects on water quality. Implementation of AMMs will ensure that construction trash and debris are controlled.

Temporary Effects

Legenere occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to legenere. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to seasonal wetlands and Vernal Pool Ecosystem reported in Table 6-17).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on legenere are qualitatively described in Table 6-19.

6.6.5 Pincushion Navarretia

Permanent Effects

Permanent direct and indirect effects of Covered Activities on pincushion navarretia (*Navarretia myersii*) will include removal, modification, or significant degradation of modeled habitat, as well as direct and indirect take of all individual pincushion navarretia occupying removed, modified, or degraded habitat.

All modeled habitat for pincushion navarretia is within the Vernal Pool Ecosystem, which includes Valley Grassland, Vernal Pool, and Swale (see Section 3.4.1, Plant Covered Species Habitat Models, and Figure 3-7). In addition to the direct removal, modification, or degradation of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds will remove part or all of the perched aquifer and existing hydrology that supports vernal pool and swale habitat. In addition, edge effects will heighten pincushion navarretia's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of vernal pool and swale habitat. Effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for pincushion navarretia. These indirect effects on vernal pool and swale habitat are included in all permanent effects calculations presented in this section.

Of the 48 documented occurrences of pincushion navarretia in the Plan Area, all are located outside the UDA in PPU 7. No documented occurrences of pincushion navarretia will be directly or indirectly impacted. Exhaustive surveys for pincushion navarretia have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 8,258 acres of pincushion navarretia modeled habitat within the Plan Area (see Table 6-20), including 271 acres of pincushion navarretia aquatic habitats (i.e., vernal pools and swales) and 7,987 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on pincushion navarretia modeled habitat will occur primarily inside the UDA, with approximately 8,175 acres of permanent effects on Vernal Pool Ecosystem in the UDA and approximately 83 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

Table 6-20
Pincushion Navarretia Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	54,967	7,987	Qualitative	7,987	11,440	7,910	Qualitative	7,910	43,527	77	Qualitative	77
Vernal Pool	1,844	118	36	154	475	114	35	149	1,369	4	1	5
Swale	627	96	21	117	186	95	21	116	441	1	0	1
Vernal Pool Ecosystem	**57,438**	**8,201**	**57**	**8,258**	**12,101**	**8,119**	**56**	**8,175**	**45,337**	**82**	**1**	**83**

As shown in Table 6-20, approximately 57 acres of pincushion navarretia modeled habitat will be indirectly affected in the Plan Area, 56 acres of which will occur in the UDA as a result of Urban Development Covered Activities. Outside the UDA, 1 acre of pincushion navarretia modeled habitat will be indirectly affected. In addition to the 57 acres of indirect effects quantified in Table 6-20, Covered Activities in the Plan Area will cause other permanent indirect effects to pincushion navarretia that are not easily quantified (Table 6-21). These "other" indirect effects to pincushion navarretia (Table 6-21) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the pincushion navarretia present on existing preserves, on future SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on pincushion navarretia will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to pincushion navarretia outside the UDA will occur to pincushion navarretia habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, etc., that will affect pincushion navarretia habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing pincushion navarretia habitat within the project footprint. Some of these "other" indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-20). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on pincushion navarretia that are not quantified are described qualitatively in Table 6-21, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect pincushion navarretia. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Table 6-21
Permanent Indirect Effects on Pincushion Navarretia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to pincushion navarretia habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats or the hardpan/duripan, avoidance and project design outside of sensitive habitats, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter pincushion navarretia habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on pincushion navarretia. Within the UDA, habitat fragmentation will affect pincushion navarretia because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA

Table 6-21
Permanent Indirect Effects on Pincushion Navarretia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	Preserves will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on pincushion navarretia.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on pincushion navarretia habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on pincushion navarretia will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Pincushion navarretia will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves, but indirect effects will occur to an estimated 57.5 acres of pincushion navarretia modeled aquatic habitat (Table 6-20). However, the pincushion navarretia Conservation Strategy (Section 7.6.2.5, Pincushion Navarretia) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.

Table 6-21
Permanent Indirect Effects on Pincushion Navarretia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on pincushion navarretia are expected from increased human activity on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and pincushion navarretia modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter pincushion navarretia aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in pincushion navarretia habitat will not occur.

Table 6-21
Permanent Indirect Effects on Pincushion Navarretia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants within the Vernal Pool Ecosystem will introduce competition for resources along with affecting critical hydroperiods for supporting the pincushion navarretia. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on pincushion navarretia. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the Vernal Pool Ecosystem on Preserves and through AMMs related to invasive species.

Table 6-21
Permanent Indirect Effects on Pincushion Navarretia

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Animals	None required for this species.	No effect on this species. As described above in Wildlife Community Alterations, invasion by non-native plants will be avoided through preservation of existing vernal pool inundation period and water chemistry.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on pincushion navarretia or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-22
Temporary Effects to Pincushion Navarretia

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	Runoff from construction activities into pincushion navarretia habitat will be fully avoided through implementation of AMMs.

Table 6-22
Temporary Effects to Pincushion Navarretia

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of pincushion navarretia habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. Implementation of AMMs ensures that trampling and compaction will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction dust effects on pincushion navarretia individuals, modeled habitat, and vernal pool water quality will reduce habitat quality for pincushion navarretia. Implementation of AMMs will ensure that dust is controlled and will not affect pincushion navarretia.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas)	Increased human activity in construction and maintenance areas will affect pincushion navarretia habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets will access occupied pools causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect pincushion navarretia habitat quality through direct effects on water quality. Implementation of AMMs will ensure that construction trash and debris are controlled.

Temporary Effects

Pincushion navarretia occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to pincushion navarretia. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-20).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on pincushion navarretia are qualitatively described in Table 6-22.

6.6.6 Sacramento Orcutt Grass

Permanent Effects

Permanent direct and indirect effects of Covered Activities on Sacramento Orcutt grass (*Orcuttia viscida*) will include removal, modification, or significant degradation of modeled habitat. No individual Sacramento Orcutt grass occurrences will be removed.

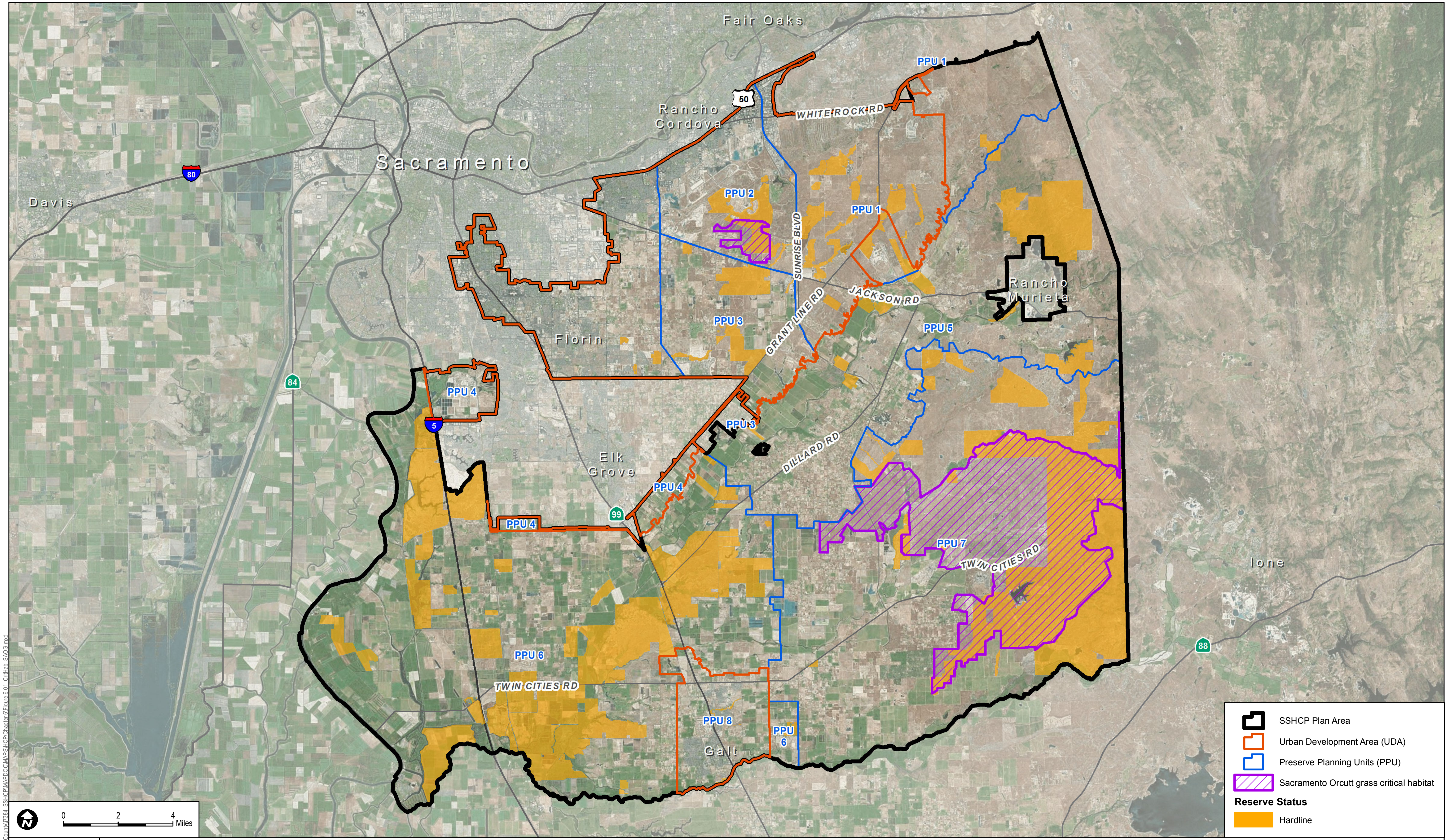
All modeled habitat for Sacramento Orcutt grass is within the Vernal Pool Ecosystem, which includes Valley Grassland and Vernal Pool (see Section 3.4.1, Plant Covered Species Habitat Models, and Figure 3-8). In addition to the direct removal, modification, or degradation of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds will remove part or all of the perched aquifer and existing hydrology that supports vernal pool habitat. In addition, edge effects will heighten Sacramento Orcutt grass's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of vernal pool habitat. Effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for Sacramento Orcutt grass, or non-native species outcompeting Sacramento Orcutt grass. These indirect effects on vernal pool habitat are included in all permanent effects calculations presented in this section.

There are 40 documented occurrences of Sacramento Orcutt grass distributed in the Plan Area, 30 of which are outside the UDA, including 28 in PPU 1 and 2 in PPU 7. There are 10 occurrences in the UDA including 8 in PPU 1 and 2 in PPU 3. Covered activities will not directly impact any occurrences of this species. Exhaustive surveys for Sacramento Orcutt grass have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area; however, additional occurrences will be avoided. Due to its rarity, take of this species is not permitted under the SSHCP with the exception of take related to Preserve management and monitoring.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 7,187 acres of Sacramento Orcutt grass modeled habitat within the Plan Area (see Table 6-23), including 196 acres of Sacramento Orcutt grass modeled aquatic habitats (i.e., vernal pools) and 6,991 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on Sacramento Orcutt grass will occur primarily inside the UDA, with approximately 7,116 acres of permanent effects on Vernal Pool Ecosystem in the UDA and approximately 70 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

The total 7,187 acres of permanent direct and indirect effects to Sacramento Orcutt grass modeled habitat includes removal of approximately 4,704 acres of Vernal Pool Ecosystem within the two Plan Area Core Recovery Areas (USFWS 2005). Effects inside the UDA include permanent effects to approximately 4,683 acres of Vernal Pool Ecosystem in the Mather Core Recovery Area (Table 6-24). Outside the UDA, 21 acres of Vernal Pool Ecosystem within the Cosumnes/Rancho-Seco Core Recovery Area will be affected by Covered Activities.

Permanent direct and indirect effects to Sacramento Orcutt grass modeled habitat include removal of approximately 248 acres of Vernal Pool Ecosystem in designated Critical Habitat (USFWS 2006) inside the UDA within Unit 2 and outside the UDA in Unit 3 (see Figure 6-1). Approximately 235 acres of Vernal Pool Ecosystem will be removed in Unit 2, including 12 acres of modeled aquatic habitat and 223 acres of supporting upland habitat. In Unit 3, a total of 13 acres of Vernal Pool Ecosystem will be removed (see Tables 6-23, 6-24, 6-25, and Figure 3-8).



SOURCE: Bing Maps, County of Sacramento 2014, USFWS 2012

FIGURE 6-1

Critical Habitat for Sacramento Orcutt grass

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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Table 6-23
Sacramento Orcutt Grass Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	33,265	6,991	Qualitative	6,991	11,971	6,925	Qualitative	6,925	21,294	66	Qualitative	66
Vernal Pool	1,227	148	48	196	456	144	47	191	771	4	1	5
Vernal Pool Ecosystem	**34,492**	**7,139**	**48**	**7,187**	**12,427**	**7,069**	**47**	**7,116**	**22,065**	**70**	**1**	**71**

Table 6-24
Sacramento Orcutt Grass Permanent Effects in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Areas (acres)				Mather Core Area (acres)				Cosumnes/Rancho-Seco Core Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	24,405	4,558	Qualitative	4,558	10,039	4,538	Qualitative	4,538	14,366	20	Qualitative	20
Vernal Pool	1,023	105	41	146	427	104	41	145	596	1	0	1
Vernal Pool Ecosystem	**25,428**	**4,663**	**41**	**4,704**	**10,466**	**4,642**	**41**	**4,683**	**14,962**	**21**	**0**	**21**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

Table 6-25
Permanent Effects to Sacramento Orcutt Grass Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)				Critical Habitat Unit 2 (acres)				Critical Habitat Unit 3 (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	9,695	236	Qualitative	236	505	223	Qualitative	223	9,190	13	Qualitative	13
Vernal Pool	419	11	1	12	22	11	1	12	397	0	0	0
Vernal Pool Ecosystem	**10,114**	**247**	**1**	**248**	**527**	**234**	**1**	**235**	**9,587**	**13**	**0**	**13**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

As shown in Table 6-23, approximately 48 acres of Sacramento Orcutt grass modeled habitat will be indirectly affected in the Plan Area, 47 acres of which will occur in the UDA as a result of Urban Development Covered Activities. Outside the UDA, 1 acre of Sacramento Orcutt grass modeled habitat will be indirectly affected. In addition to the 48acres of indirect effects quantified in Table 6-23, Covered Activities in the Plan Area will cause other permanent indirect effects to Sacramento Orcutt grass that are not easily quantified (Table 6-26). These “other” indirect effects to Sacramento Orcutt grass (Table 6-26) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the Sacramento Orcutt grass present on existing preserves, on future SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on Sacramento Orcutt grass will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to Sacramento Orcutt grass outside the UDA will occur to Sacramento Orcutt grass habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, etc., that will affect the Vernal Pool Ecosystem that provides Sacramento Orcutt grass habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing Sacramento Orcutt grass habitat within the project footprint. Some of these “other” indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-23). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on Sacramento Orcutt grass that are not quantified are described qualitatively in Table 6-26, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect Sacramento Orcutt grass. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize “other” indirect impacts.

Table 6-26
Permanent Indirect Effects on Sacramento Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to Sacramento Orcutt grass habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats or the hardpan/duripan, avoidance and project design outside of sensitive habitats, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter Sacramento Orcutt grass habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	The Landscape Preserves established outside the UDA, including in the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on Sacramento Orcutt grass. Within the UDA, habitat fragmentation will affect Sacramento Orcutt grass because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of

Table 6-26
Permanent Indirect Effects on Sacramento Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	EDGE AMMs. The effects of roads fragmenting some UDA Preserves will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on the Sacramento Orcutt grass population in the Mather Core Recovery Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on Sacramento Orcutt grass habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on Sacramento Orcutt grass will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Sacramento Orcutt grass will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves, but indirect effects will occur to an estimated 47.9 acres of Sacramento Orcutt grass modeled aquatic habitat (Table 6-23). However, the Sacramento Orcutt grass Conservation Strategy (Section 7.6.2.6, Sacramento Orcutt Grass) will offset these unavoidable impacts.

Table 6-26
Permanent Indirect Effects on Sacramento Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on Sacramento Orcutt grass are expected from increased human activity on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and Sacramento Orcutt grass modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter Sacramento Orcutt grass aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in Sacramento Orcutt grass habitat will not occur.

Table 6-26
Permanent Indirect Effects on Sacramento Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants within the Vernal Pool Ecosystem will introduce competition for resources along with affecting critical hydroperiods for supporting the Sacramento Orcutt grass. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on Sacramento Orcutt grass. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and

Table 6-26
Permanent Indirect Effects on Sacramento Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		adaptive management of the Vernal Pool Ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on Sacramento Orcutt grass or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-27
Temporary Effects to Sacramento Orcutt Grass

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	Runoff from construction activities into Sacramento Orcutt grass habitat will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) ORCUTT-1 (Orcutt Grass Survey) ORCUTT-2 (Orcutt Grass Protection)	Inadvertent trampling and compaction of Sacramento Orcutt grass habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. In addition, if a Covered Activity is located within 1 mile of the Mather Core Recovery Area and contains the Vernal Pool land cover type, the project site will be surveyed for Sacramento Orcutt grass. Any occurrences detected will be protected within an SSHCP Preserve at least 50 acres in size. Implementation of AMMs ensures that trampling, compaction, and take of this species will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction dust effects on Sacramento Orcutt grass individuals, modeled habitat, and vernal pool water quality will reduce habitat quality for Sacramento Orcutt grass. Implementation of AMMs will ensure that dust is controlled and will not affect Sacramento Orcutt grass.

Table 6-27
Temporary Effects to Sacramento Orcutt Grass

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas)	Increased human activity in construction and maintenance areas will affect Sacramento Orcutt grass habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets will access occupied pools causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect Sacramento Orcutt grass habitat quality through direct effects on water quality. Implementation of AMMs will ensure that construction trash and debris are controlled.

Temporary Effects

Sacramento Orcutt grass occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to Sacramento Orcutt grass. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-23).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on Sacramento Orcutt grass are qualitatively described in Table 6-27.

6.6.7 Slender Orcutt Grass

Permanent Effects

Permanent direct and indirect effects of Covered Activities on slender Orcutt grass (*Orcuttia tenuis*) will include removal, modification, or significant degradation of modeled habitat. No individual slender Orcutt grass occurrences will be removed.

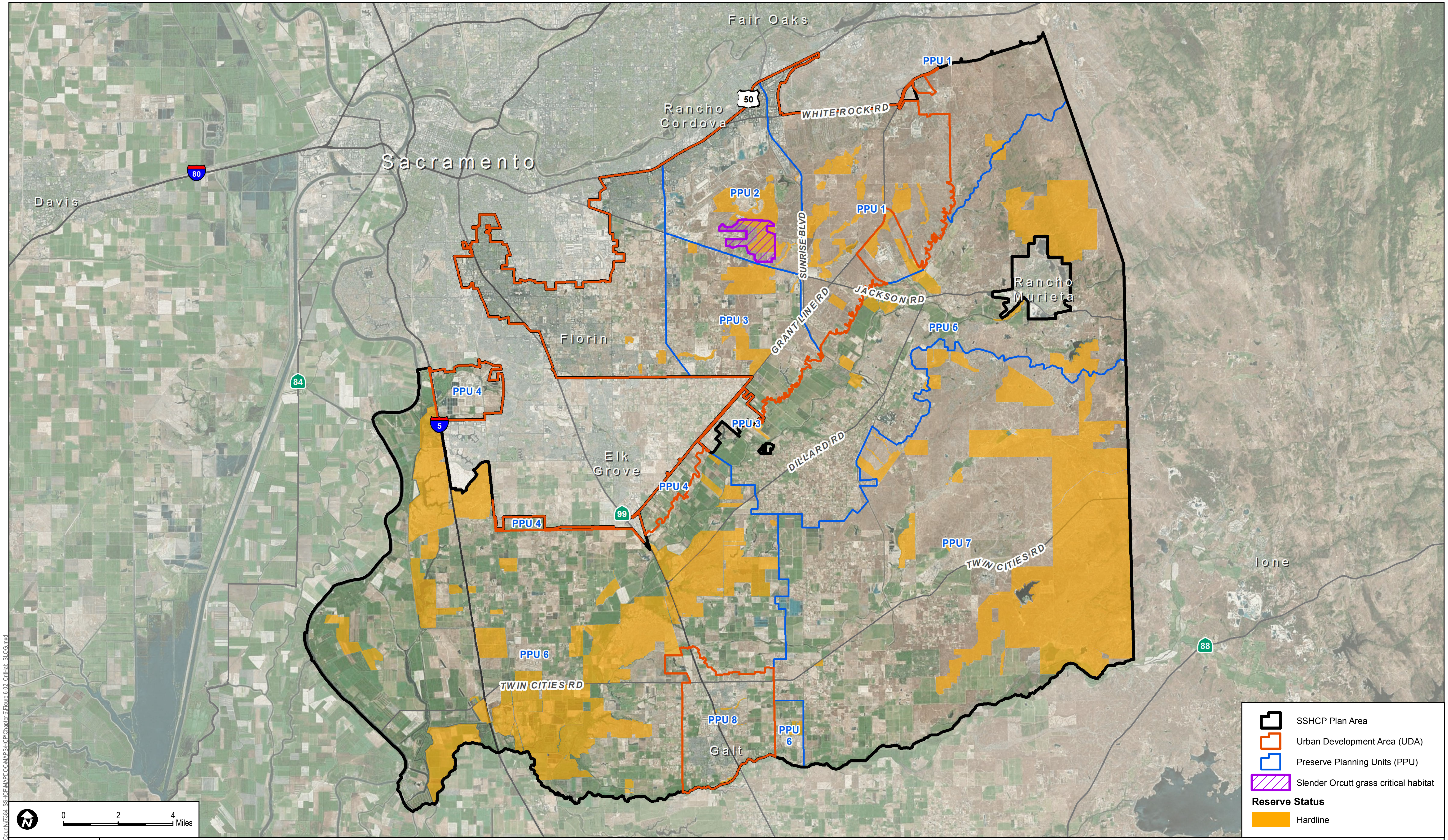
All modeled habitat for slender Orcutt grass is within the Vernal Pool Ecosystem, which includes Valley Grassland and Vernal Pool (see Section 3.4.1, Plant Covered Species Habitat Models, and Figure 3-9). In addition to the direct removal, modification, or degradation of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds will remove part or all of the perched aquifer and existing hydrology that supports vernal pool habitat. In addition, edge effects will heighten slender Orcutt grass's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of vernal pool habitat. Effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for slender Orcutt grass. These indirect effects on vernal pool habitat are included in all permanent effects calculations presented in this section.

There are four documented occurrences of slender Orcutt grass distributed in the Plan Area, all within the UDA: one of the occurrences is in PPU 1 and three are in PPU 3. Three (75%) of the four occurrences will be preserved in a proposed preserve (all inside the UDA in PPU 3). Covered activities will not directly impact any occurrences of this species. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area; however, additional occurrences will be avoided. Due to its rarity, take of this species is not permitted under the SSHCP with the exception of take related to Preserve management and monitoring.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 7,187 acres of slender Orcutt grass modeled habitat within the Plan Area (see Table 6-28), including 196 acres of slender Orcutt grass aquatic habitats (i.e., vernal pools) and 6,991 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on slender Orcutt grass modeled habitat will occur primarily inside the UDA, with approximately 7,116 acres of permanent effects on Vernal Pool Ecosystem in the UDA and approximately 71 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

The total 7,187 acres of permanent direct and indirect effects to slender Orcutt grass modeled habitat includes removal of approximately 4,704 acres of Vernal Pool Ecosystem within the two Plan Area Core Recovery Areas (USFWS 2005). Effects inside the UDA include permanent effects to approximately 4,683 acres of Vernal Pool Ecosystem in the Mather Core Recovery Area (Table 6-29). Outside the UDA, 21 acres of Vernal Pool Ecosystem within the Cosumnes/Rancho-Seco Core Recovery Area will be affected by Covered Activities.

Permanent direct and indirect effects include removal of approximately 235 acres of Vernal Pool Ecosystem in designated Critical Habitat (USFWS 2006) inside the UDA within Unit 6, including 12 acres of modeled aquatic habitat and approximately 223 acres of supporting upland habitat (see Tables 6-28, 6-29, 6-30, and Figures 3-9 and 6-2).



SOURCE: Bing Maps, County of Sacramento 2014, USFWS 2012

FIGURE 6-2

Critical Habitat for Slender Orcutt grass

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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Table 6-28
Slender Orcutt Grass Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	33,265	6,991	Qualitative	6,991	11,971	6,925	Qualitative	6,925	21,294	66	Qualitative	66
Vernal Pool	1,227	148	48	196	456	144	47	191	771	4	1	5
Vernal Pool Ecosystem	**34,492**	**7,139**	**48**	**7,187**	**12,427**	**7,069**	**47**	**7,116**	**22,065**	**70**	**1**	**71**

Table 6-29
Slender Orcutt Grass Permanent Effects in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Areas (acres)				Mather Core Area (acres)				Cosumnes/Rancho-Seco Core Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	24,405	4,558	Qualitative	4,558	10,039	4,538	Qualitative	4,538	14,366	20	Qualitative	20
Vernal Pool	1,023	105	41	146	427	104	41	145	596	1	0	1
Vernal Pool Ecosystem	**25,428**	**4,663**	**41**	**4,704**	**10,466**	**4,642**	**41**	**4,683**	**14,962**	**21**	**0**	**21**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

Table 6-30
Permanent Effects to Slender Orcutt Grass Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)				Critical Habitat SLEND 6 (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	505	223	Qualitative	223	505	223	Qualitative	223
Vernal Pool	22	11	1	12	22	11	1	12
Vernal Pool Ecosystem	**527**	**234**	**1**	**235**	**527**	**234**	**1**	**235**

As shown in Table 6-28, approximately 48 acres of slender Orcutt grass modeled habitat will be indirectly affected in the Plan Area, 47 acres of which will occur in the UDA as a result of Urban Development Covered Activities. Outside the UDA, 1 acre of slender Orcutt grass modeled habitat will be indirectly affected. In addition to the 48 acres of indirect effects quantified in Table 6-28, Covered Activities in the Plan Area will cause other permanent indirect effects to slender Orcutt grass that are not easily quantified (Table 6-31). These “other” indirect effects to slender Orcutt grass (Table 6-31) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the slender Orcutt grass present on existing preserves, on future SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on slender Orcutt grass will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to slender Orcutt grass outside the UDA will occur to slender Orcutt grass habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, etc., that will affect slender Orcutt grass habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing slender Orcutt grass habitat within the project footprint. Some of these “other” indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-28). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on slender Orcutt grass that are not quantified are described qualitatively in Table 6-31, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect slender Orcutt grass. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize “other” indirect impacts.

Table 6-31
Permanent Indirect Effects on Slender Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to slender Orcutt grass habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats or the hardpan/duripan, avoidance and project design outside of sensitive habitats, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter slender Orcutt grass habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets)	The Landscape Preserves established outside the UDA, including in the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on slender Orcutt grass. Within the UDA, habitat fragmentation will affect slender Orcutt grass because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The

Table 6-31
Permanent Indirect Effects on Slender Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	effects of roads fragmenting some UDA Preserves will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on the slender Orcutt grass population in the Mather Core Recovery Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on slender Orcutt grass habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on slender Orcutt grass will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Slender Orcutt grass will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and planned vernal pool Preserves, but indirect effects will occur to an estimated 47.9 acres of slender Orcutt grass modeled aquatic habitat (Table 6-28). However, the slender Orcutt grass Conservation Strategy (Section 7.6.2.7, Slender Orcutt Grass) will offset these unavoidable impacts.

Table 6-31
Permanent Indirect Effects on Slender Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on slender Orcutt grass are expected from increased human activity on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and slender Orcutt grass modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter slender Orcutt grass aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in slender Orcutt grass habitat will not occur.

Table 6-31
Permanent Indirect Effects on Slender Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants within the Vernal Pool Ecosystem will introduce competition for resources along with affecting critical hydroperiods for supporting the slender Orcutt grass. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on slender Orcutt grass. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the Vernal Pool Ecosystem on Preserves and through AMMs related to invasive species.

Table 6-31
Permanent Indirect Effects on Slender Orcutt Grass

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on slender Orcutt grass or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-32
Temporary Effects to Slender Orcutt Grass

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	Runoff from construction activities into slender Orcutt grass habitat will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) ORCUTT-1 (Orcutt Grass Survey) ORCUTT-2 (Orcutt Grass Protection)	Inadvertent trampling and compaction of slender Orcutt grass habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. In addition, if a Covered Activity is located within 1 mile of the Mather Core Recovery Area and contains the Vernal Pool land cover type, the project site will be surveyed for slender Orcutt grass. Any occurrences detected will be protected within an SSHCP Preserve at least 50 acres in size. Implementation of AMMs ensures that trampling, compaction, and take of this species will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction dust effects on slender Orcutt grass individuals, modeled habitat, and vernal pool water quality will reduce habitat quality for slender Orcutt grass. Implementation of AMMs will ensure that dust is controlled and will not affect slender Orcutt grass.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Increased human activity in construction and maintenance areas will affect slender Orcutt grass habitat quality through personnel

Table 6-32
Temporary Effects to Slender Orcutt Grass

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	SPECIES-2 (No Pets in Construction Areas)	bringing pets (e.g., dogs) to work sites. Pets will access occupied pools causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction)	Runoff from construction activities into slender Orcutt grass habitat will be fully avoided through implementation of AMMs.

Temporary Effects

Slender Orcutt grass occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to slender Orcutt grass. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool Ecosystem reported in Table 6-28).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on slender Orcutt grass are qualitatively described in Table 6-32.

6.6.8 Sanford's Arrowhead

Permanent Effects

Permanent direct and indirect effects of Covered Activities on Sanford's arrowhead (*Sagittaria sanfordii*) will include removal, modification, or significant degradation of modeled habitat, as well as direct and indirect take of all individual Sanford's arrowhead occupying removed, modified, or degraded habitat.

All modeled habitat for Sanford's arrowhead includes Freshwater Marsh, Open Water, Seasonal Wetland, Streams/Creek, and Valley Grassland that supports the hydrology and ecology of the aquatic habitats (see Section 3.4.1, Plant Covered Species Habitat Models, and Figure 3-10). In addition to the direct removal, modification, or degradation of modeled habitat, edge effects will heighten Sanford's arrowhead's vulnerability to stochastic disturbances, pollution, and invasion by non-native plants, which displace native species and adversely affect the composition of modeled habitat. By permanently increasing the extent of impermeable surfaces, urban development will result in increased runoff, which will change the hydrograph (i.e., rate of runoff) of creeks and streams, result in greater levels of scour and/or incision, increase sediment loads downstream, alter downstream hydrology, and decrease groundwater recharge. In addition, an increased quantity of pollutants will reach local creeks and affect the characteristics of Sanford's arrowhead modeled aquatic habitats. In addition, riparian and wetland ecosystems are extremely vulnerable to invasive plants because of the highly effective transport of invasive species along rivers and streams. Invasive species can dominate the biomass of riparian and wetland communities where they become established, virtually choking out the native vegetation. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for Sanford's arrowhead. These indirect effects on modeled habitat are included in all permanent effects calculations presented in this section.

Of the 63 documented occurrences of Sanford's arrowhead within the Plan Area, 14 are located inside the UDA and 49 are located outside the UDA. Twelve of the documented occurrences will be directly impacted, all of which are inside the UDA (7 outside of the PPUs, 3 in PPU 2, 1 in PPU 3, and 1 in PPU 4). No documented occurrences will be indirectly impacted. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 10,620 acres of Sanford's arrowhead modeled habitat within the Plan Area (see Table 6-33), including 103 acres of freshwater marsh, 68 acres of open water, 72 acres of seasonal wetlands, 83 acres of streams/creeks, and 10,294 acres of surrounding Valley Grassland that supports the hydrology and ecology of the aquatic habitats. Covered Activity impacts on Sanford's arrowhead will occur primarily inside the UDA, with approximately 10,397 acres of permanent effects on modeled habitat in the UDA and approximately 223 acres of permanent effects on modeled habitat outside the UDA.

Table 6-33
Sanford's Arrowhead Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Freshwater Marsh	2,044	103	Qualitative	103	350	99	Qualitative	99	1,694	4	Qualitative	4
Open Water	1,086	68	Qualitative	68	86	67	Qualitative	67	1,000	1	Qualitative	1
Seasonal Wetlands	1,425	72	Qualitative	72	117	70	Qualitative	70	1,308	2	Qualitative	2
Streams/Creeks	893	83	Qualitative	83	126	67	Qualitative	67	767	16	Qualitative	16
Valley Grassland	47,375	10,294	Qualitative	10,294	17,412	10,094	Qualitative	10,094	29,963	200	Qualitative	200
GRAND TOTAL	**52,823**	**10,620**	**Qualitative**	**10,620**	**18,091**	**10,397**	**Qualitative**	**10,397**	**34,732**	**223**	**Qualitative**	**223**

As shown in Table 6-33, Covered Activities in the Plan Area will cause permanent indirect effects to Sanford's arrowhead that are not easily quantified. These "other" indirect effects to Sanford's arrowhead (Table 6-33) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the Sanford's arrowhead present on existing preserves, on future SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will be avoided inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on Sanford's arrowhead will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and future SSHCP proposed preserves outside the UDA are much larger than the existing and planned UDA Preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the modeled habitat within Preserves.

Most indirect effects to Sanford's arrowhead outside the UDA will occur to Sanford's arrowhead habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, pesticide use, etc., that will affect Sanford's arrowhead habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing Sanford's arrowhead habitat within the project footprint. Some of these "other" indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects reported in Table 6-33). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on Sanford's arrowhead that are not quantified are described qualitatively in Table 6-34, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect Sanford's arrowhead. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Table 6-34
Permanent Indirect Effects on Sanford's Arrowhead

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-2 (Groundwater Recharge) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams) Condition 7, STREAM-4 (Minimize Effects from Temporary Channel Re-routing) Condition 7, STREAM-5 (Design for Stream Channel Re-Routing) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	The close proximity of planned development and roads to Sanford's arrowhead habitat will increase hydrologic and water quality effects, including urban runoff that alter normal hydroperiods in occupied pools and contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Hydrologic factors are important in triggering germination and providing a suitable environment for completing the reproductive cycle (see Appendix B, Species Accounts, for more details). Implementation of AMMs such as those that require control of stormwater runoff, control of pollutants and toxins, protection of sensitive habitats, avoidance and project design outside of sensitive habitats, setbacks for streams/creeks, measures to minimize effects from channel re-routing, educational awareness for workers, and monitoring of biological resources will ensure pollutants will not enter Sanford's arrowhead modeled habitat and that water quality of modeled aquatic habitat will not be affected.

Table 6-34
Permanent Indirect Effects on Sanford's Arrowhead

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-4 (Nature Trail Location)	The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on Sanford's arrowhead. Within the UDA, habitat fragmentation will affect Sanford's arrowhead because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads and trails fragmenting some UDA Preserves will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on Sanford's arrowhead.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	As discussed in Section 6.3, Environmental Stressors from Covered Activities, Covered Activities outside the UDA would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on Sanford's arrowhead habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on Sanford's arrowhead will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memoranda of agreement with responsible fire agencies. In addition, the potential for increased wildfires will be minimized through the implementation of AMMs that reduce the open space–urban interface, require setbacks for streams/creeks, and control public access within the Preserve.
Vernal Pool Hydrologic Alterations	None required for this species.	No effect on this species.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.

Table 6-34
Permanent Indirect Effects on Sanford's Arrowhead

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 4, ROAD-1 (Road Project Location) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Outdoor lighting could indirectly affect the use of Sanford's arrowhead modeled habitat by potential pollinators (e.g., bees, flies, wasps; see Appendix B, Species Accounts, for more details) via behavioral disruptions due to night time light pollution. Implementation of AMMs will ensure that outdoor lighting effects on Sanford's arrowhead will be minimized.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	No effects on Sanford's arrowhead are expected from increased human activity on or near Preserves or Preserve Setbacks since access to the Preserves will be tightly controlled through implementation of NATURE TRAIL AMMs and an approved Preserve Management Plan.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection)	Wildlife community alterations in developed areas will facilitate the presence (and increase) of wildlife species that live and reproduce well in urban landscapes. Urban-tolerant species, such as squirrels and mice, will facilitate a shift in vegetation community structure and Sanford's arrowhead modeled habitat if their seed caches are placed within adjacent Preserves and consist of non-native or introduced plant species (see Invasive Plants below). Implementation of AMMs such as those that require control of stormwater runoff or non-native species will ensure pollution will not enter Sanford's arrowhead aquatic habitat, that water chemistry of

Table 6-34
Permanent Indirect Effects on Sanford's Arrowhead

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams) Condition 8, UTILITY-3 (Trenchless Construction Method) Condition 8, UTILITY-4 (Siting of Entry and Exit Locations)	vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in Sanford's arrowhead habitat will not occur.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control)	Unmanaged proliferation of non-native plants within Sanford's arrowhead modeled habitat will introduce competition for resources along with affecting modeled habitat soil and hydrologic characteristics for supporting the Sanford's arrowhead. Implementation of AMMs will minimize proliferation of invasive plants, and Preserve management for thatch such as grazing or prescribed fire will reduce biomass of upland non-native plants. In addition to implementation of AMMs, small infestations of invasive

Table 6-34
Permanent Indirect Effects on Sanford's Arrowhead

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	plants will be addressed on a case-by-case basis through Preserve management under a Preserve Management Plan. These will substantially reduce effects of non-native plants on Sanford's arrowhead. Effects of proliferation of non-native plants will be reduced under the SSHCP relative to existing unmanaged conditions (see Chapter 7, Conservation Strategy). New Urban Development Covered Activities and new rural roadway projects will result in additional vehicle trips in the Plan Area. Nitrogen deposition associated with increased vehicle emissions from these trips will result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of Sanford's arrowhead modeled habitat on Preserves and through AMMs related to invasive species.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Adverse effects on Sanford's arrowhead or modeled habitat plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs that limit edge effects, Stream/Creek setbacks, and monitoring and control of pesticide use near Preserves (Chapter 8, SSHCP Monitoring and Management Programs) will also reduce pesticide drift and limit pesticide effects.

Table 6-34
Permanent Indirect Effects on Sanford's Arrowhead

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-35
Temporary Effects to Sanford's Arrowhead

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 1, LID-2 (Groundwater Recharge) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Runoff from construction activities into Sanford's arrowhead habitat will be fully avoided through implementation of AMMs.

Table 6-35
Temporary Effects to Sanford's Arrowhead

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Inadvertent trampling and compaction of Sanford's arrowhead habitat will adversely affect the species propagation by damaging individuals or microhabitat nutrients and soil resources. Implementation of AMMs ensures that trampling and compaction will not occur.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	Condition 3, BMP-6 (Construction Lighting) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Construction lighting directed towards Sanford's arrowhead modeled habitat may temporarily affect the behavior of potential pollinators (e.g., bees, flies, wasps; see Appendix B, Species Accounts, for more details) via behavioral disruptions. Implementation of AMMs will minimize construction lighting effects on Sanford's arrowhead by ensuring that construction lighting is directed away from adjacent natural habitats.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Construction dust effects on Sanford's arrowhead individuals and/or modeled habitat will reduce habitat quality, including water quality, for Sanford's arrowhead. Implementation of AMMs will ensure that dust is controlled and will not affect Sanford's arrowhead.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Increased human activity in construction and maintenance areas will affect Sanford's arrowhead habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets will access occupied habitat causing general disturbance and affecting water quality. Implementation of AMMs ensures that these adverse effects of increased human presence will not occur.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Trash and debris will adversely affect Sanford's arrowhead habitat quality through direct effects on water quality. Implementation of

Table 6-35
Temporary Effects to Sanford's Arrowhead

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	SPECIES-1 (Litter Removal Program) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	AMMs will ensure that construction trash and debris are controlled.

Temporary Effects

Sanford's arrowhead occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2, Temporary Environmental Stressors During Construction of Covered Activities) that will result in additional disturbance to habitat or additional harm to Sanford's arrowhead. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Sanford's arrowhead modeled habitat reported in Table 6-33).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on Sanford's arrowhead are qualitatively described in Table 6-35.

6.6.9 Vernal Pool Fairy Shrimp

Permanent Effects

Permanent direct and indirect effects of Covered Activities on vernal pool fairy shrimp will include modification or significant degradation of modeled habitat and the direct and indirect take of all vernal pool fairy shrimp individuals occupying that modified or degraded habitat.

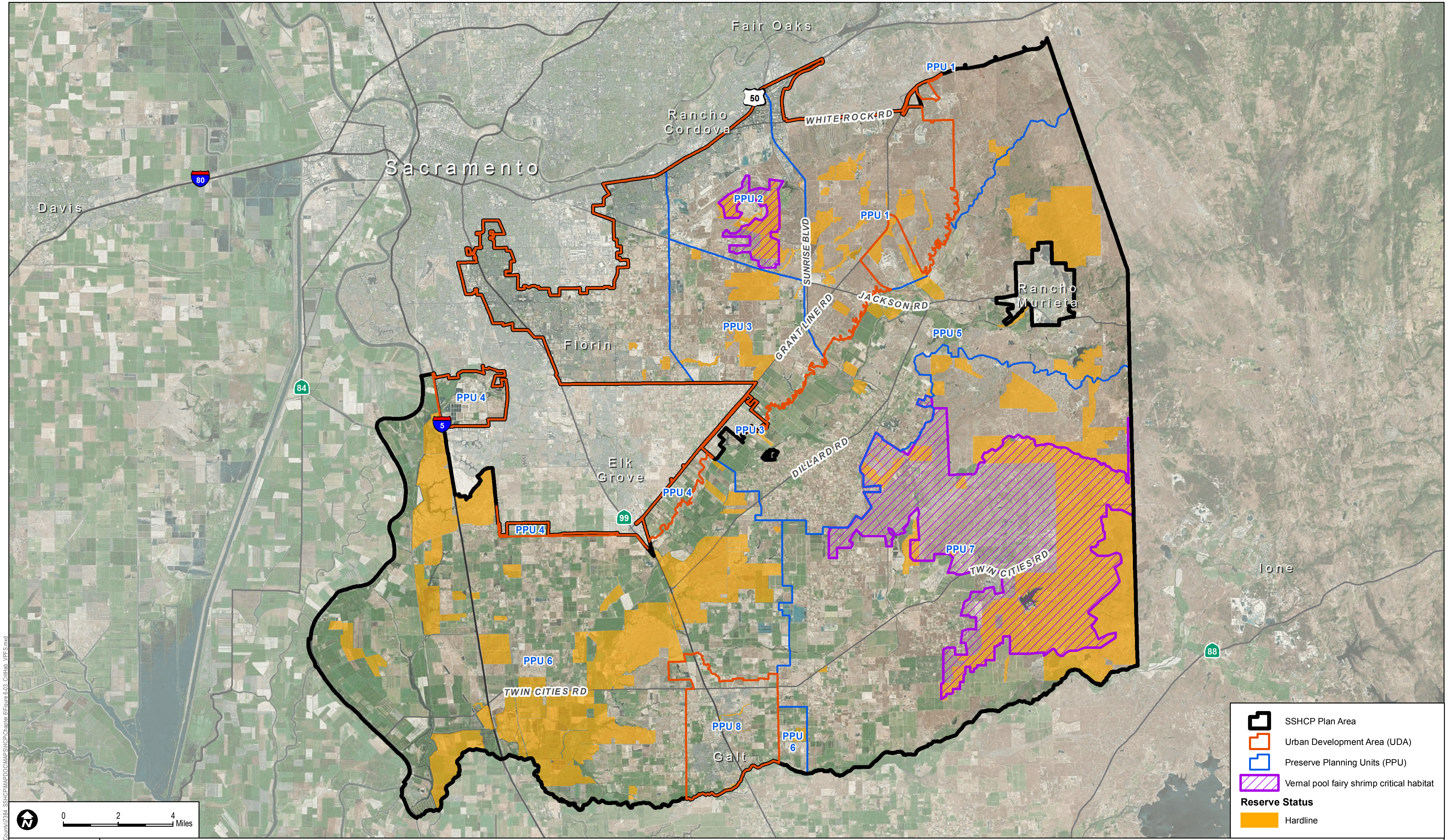
All modeled habitats for vernal pool fairy shrimp are within the Vernal Pool Ecosystem, which includes the Vernal Pool, Swale, Stream/Creek (VPIH) and hydrologically connected Valley Grassland land cover types (see Section 3.2 and Figure 3-14). In addition to direct removal of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds remove part or all of the perched aquifer, existing hydrology, and ecosystem that supports Vernal Pool, Swale, and Stream/Creek (VPIH) habitat. Over time, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for vernal pool fairy shrimp. These indirect effects on Vernal Pool, Swale, and Stream/Creek (VPIH) habitat are included in all permanent effects acreages presented in this section.

Vernal pool fairy shrimp historically occurred throughout the Plan Area; however, all of the extant occurrence records within the Plan Area (a total of 28) are located outside the UDA in PPU 7 (see Section 3.4).

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 17,259 acres of vernal pool fairy shrimp modeled habitat within the Plan Area (see Table 6-36), including 787 acres of vernal pool fairy shrimp modeled aquatic habitats (i.e., Vernal Pools, Swales, and Streams/Creeks (VPIH)) and 16,472 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on vernal pool fairy shrimp modeled habitat will occur primarily inside the UDA, with approximately 16,927 acres of permanent effects on Vernal Pool Ecosystem in the UDA and a total of 332 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

The total 17,259 acres of permanent direct and indirect effects to vernal pool fairy shrimp modeled habitat includes removal of a total of 8,553 acres of Vernal Pool Ecosystem within the two Plan Area Core Recovery Areas (USFWS 2005). Effects inside the UDA include permanent effects to 8,500 acres of Vernal Pool Ecosystem in the Mather Core Recovery Area (Table 6-37). Outside the UDA, 53 acres within the Cosumnes/Rancho-Seco Core Recovery Area will be permanently affected.

Permanent direct and indirect effects include removal of approximately 746 acres of Vernal Pool Ecosystem in designated Critical Habitat (USFWS 2006) (see Figure 6-3). A total of 695 acres of Vernal Pool Ecosystem will be removed in Unit 13, including 32 acres of modeled aquatic habitat and 663 acres of supporting upland habitat. In Unit 14a, a total of 51 acres of Vernal Pool Ecosystem will be removed, including 7 acres of modeled aquatic habitat and 44 acres of supporting upland habitat (see Table 6-38 and Figure 3-14).



SOURCE: Bing Maps, County of Sacramento 2014, USFWS 2012

FIGURE 6-3

Critical Habitat for vernal pool fairy shrimp

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Table 6-36
Vernal Pool Fairy Shrimp Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	97,349	16,472	Qualitative	16,472	24,584	16,186	Qualitative	16,186	72,765	286	Qualitative	286
Vernal Pool	4,536	389	94	483	935	355	85	440	3,601	34	9	43
Swale	1,252	234	44	278	461	232	43	275	791	2	1	3
Streams/Creeks (VPIH)	73	22	4	26	68	22	4	26	5	0	0	0
Vernal Pool Ecosystem	**103,210**	**17,117**	**142**	**17,259**	**26,048**	**16,795**	**132**	**16,927**	**77,162**	**322**	**10**	**332**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

Table 6-37
Vernal Pool Fairy Shrimp Permanent Effects in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)				Mather Core Recovery Area (acres)				Cosumnes/Rancho-Seco Core Recovery Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	53,367	8,164	Qualitative	8,164	17,023	8,118	Qualitative	8,118	36,344	46	Qualitative	46
Vernal Pool*	2,464	150	72	222	709	144	72	216	1,755	6	0	6
Swale	740	113	38	151	324	112	38	150	416	1	0	1
Streams/Creeks (VPIH)	61	13	3	16	61	13	3	16	0	0	0	0
Vernal Pool Ecosystem	**56,632**	**8,440**	**113**	**8,553**	**18,117**	**8,387**	**113**	**8,500**	**38,515**	**53**	**0**	**53**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively

Table 6-38
Permanent Effects to Vernal Pool Fairy Shrimp Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)				Critical Habitat Unit 13 (acres)				Critical Habitat Unit 14A (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	28,971	707	Qualitative	707	1,146	663	Qualitative	663	27,825	44	Qualitative	44
Vernal Pool	1,320	24	1	25	31	18	1	19	1,289	6	0	6
Swale	343	8	2	10	14	7	2	9	329	1	0	1
Streams/Creek (VPIH)	12	4	0	4	12	4	0	4	0	0	0	0
Vernal Pool Ecosystem	**30,646**	**743**	**3**	**746**	**1,203**	**692**	**3**	**695**	**29,443**	**51**	**0**	**51**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

As shown in Table 6-36, approximately 142 acres of vernal pool tadpole shrimp modeled aquatic habitat will be indirectly impacted in the Plan Area, most of which will occur in the UDA (132 acres) as a result of urban development Covered Activities. Outside the UDA, 10 acres of vernal pool tadpole shrimp modeled aquatic habitat will be indirectly impacted. In addition to the 142 acres of indirect effects quantified above in Table 6-36, Covered Activities in the Plan Area will cause other permanent indirect effects to vernal pool tadpole shrimp that are not easily quantified (Table 6-39).

The Plan Permittees expect that the indirect effects of Covered Activities on vernal pool fairy shrimp will be minor outside the UDA, based on two primary factors. First, no urban development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and SSHCP proposed preserves outside the UDA are much larger than the existing and proposed UDA preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to vernal pool fairy shrimp outside the UDA will occur to vernal pool fairy shrimp aquatic habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, pesticide use, etc. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing vernal pool fairy shrimp habitat within the project footprint. Some of these “other” indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to vernal pool hydrology reported in Tables 6-36 through 6-38). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on vernal pool fairy shrimp that are not quantified are described qualitatively in Table 6-39, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or proposed SSHCP preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect vernal pool fairy shrimp. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize “other” indirect impacts.

Table 6-39
Permanent Indirect Effects on Vernal Pool Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality). Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to vernal pool fairy shrimp habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in occupied pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter vernal pool fairy shrimp aquatic habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	The Landscape Preserves established outside the UDA, including in the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on vernal pool fairy shrimp. Within the UDA, habitat fragmentation will affect vernal pool fairy shrimp because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2) will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on the vernal pool fairy shrimp population in the Mather Core Recovery Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Trail Impacts)	As discussed in Section 6.3, outside the UDA Covered Activities would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on vernal pool tadpole shrimp habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on vernal pool fairy shrimp will be minimized through implementation of the Preserve System Monitoring and Management Program,

Table 6-39
Permanent Indirect Effects on Vernal Pool Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		which will include a commitment to develop memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Vernal pool fairy shrimp will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs minimize hydrologic alterations to the micro-watersheds of existing and proposed vernal pool preserves, but indirect effects will occur to an estimated 142 acres of vernal pool fairy shrimp modeled aquatic habitat (Table 6-36). However, the vernal pool fairy shrimp Conservation Strategy (Chapter 7) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on vernal pool fairy shrimp are expected from increased human activity on Preserves or Preserve Setbacks. Implementation of AMMs ensures that increased human activity in and near Preserves is limited and that it does not substantially affect vernal pool fairy shrimp habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	Increases in inundation period may facilitate wildlife community alterations, including invasion by non-native predators of vernal pool fairy shrimp such as non-native fishes (e.g., mosquitofish (*Gambusia affinis*)) and American bullfrogs (Balfour and Morey 1999). Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter vernal pool fairy shrimp aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in vernal pool fairy shrimp habitat will not occur.

Table 6-39
Permanent Indirect Effects on Vernal Pool Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plant valley grasslands of the Vernal Pool Ecosystem will affect critical hydroperiods for supporting the vernal pool fairy shrimp's lifecycle. Implementation of AMMs will minimize proliferation of non-native plants, and preserve management for thatch, such as grazing or prescribed fire, will reduce biomass of upland non-native plants. These will substantially reduce effects of non-native plants on vernal pool fairy shrimp. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7). Nitrogen deposition associated with increased vehicle emissions from vehicles associated with new urban development traveling along Plan Area rural roadway projects will also result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the vernal pool ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described above in Wildlife Community Alterations, invasion by non-native predators of vernal pool fairy shrimp such as non-native fishes (e.g., mosquitofish) and bullfrogs (Balfour and Morey 1999) is avoided through preservation of existing vernal pool inundation period and water chemistry.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.

Table 6-39
Permanent Indirect Effects on Vernal Pool Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use	Adverse effects on vernal pool fairy shrimp or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Temporary Effects

Vernal pool fairy shrimp occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to vernal pool fairy shrimp. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool hydrology reported in Tables 6-36 through 6-38).

These potential construction-related environmental stressors were described above generally in Section 6.3.2, and their additional effects on vernal pool fairy shrimp are qualitatively described in Table 6-40.

Table 6-40
Temporary Effects to Vernal Pool Fairy Shrimp

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location). Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into vernal pool fairy shrimp habitat will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Inadvertent trampling and compaction of vernal pool vegetation will adversely affect vernal pool fairy shrimp propagation by damaging cysts. Implementation of AMMs ensures that trampling and compaction do not occur. No effect on vernal pool fairy shrimp.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control)	Construction dust effects on vernal pool vegetation communities and vernal pool water quality will reduce habitat quality for vernal pool fairy shrimp. Implementation of AMMs ensures that dust is controlled and will not affect vernal pool fairy shrimp.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Increased human activity in construction and maintenance areas would affect vernal pool habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets accessing occupied pools would cause general disturbance and affect water quality. Implementation of AMMs ensures that increased human presence does not occur. No effect on vernal pool fairy shrimp.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor)	Trash and debris would adversely affect vernal pool fairy shrimp habitat quality through direct effects on water quality and by

Table 6-40
Temporary Effects to Vernal Pool Fairy Shrimp

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-8 (Training of Construction Staff)	possibly attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled, and that no effect on vernal pool fairy shrimp will occur.

6.6.10 Mid-Valley Fairy Shrimp

Permanent Effects

Permanent direct and indirect effects of Covered Activities on mid-valley fairy shrimp will include modification or significant degradation of modeled habitat and the direct and indirect take of all mid-valley fairy shrimp individuals occupying that modified or degraded habitat.

All modeled habitats for mid-valley fairy shrimp are within the Vernal Pool Ecosystem, which includes the Vernal Pool, Swale, Stream/Creek (VPIH) and hydrologically connected Valley Grassland land cover types (see Section 3.2 and Figure 3-11). In addition to direct removal of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds remove part or all of the perched aquifer, existing hydrology, and ecosystem that supports Vernal Pool, Swale, and Stream/Creek (VPIH) habitat. Over time, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for mid-valley fairy shrimp. These indirect effects on Vernal Pool, Swale, and Stream/Creek (VPIH) habitat are included in all permanent effects acreages presented in this section.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 12,639 acres of mid-valley fairy shrimp modeled habitat within the Plan Area (see Table 6-41), including approximately 633 acres of mid-valley fairy shrimp aquatic habitats (i.e., Vernal Pools, Swales, and Streams/Creeks (VPIH)) and 12,006 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on mid-valley fairy shrimp will occur primarily inside the UDA, with a total of 12,402 acres of permanent effects on Vernal Pool Ecosystem in the UDA and a total of 237 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

The total 12,639 acres of permanent direct and indirect effects to mid-valley fairy shrimp modeled habitat includes removal of a total of 6,308 acres of Vernal Pool Ecosystem within the two Plan Area Core Recovery Areas (USFWS 2005). Effects inside the UDA include permanent effects to 6,267 acres of Vernal Pool Ecosystem in the Mather Core Recovery Area (Table 6-42). Outside the UDA, 41 acres within the Cosumnes/Rancho-Seco Core Recovery Area will be permanently affected.

Table 6-41
Mid-Valley Fairy Shrimp Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	50,061	12,006	Qualitative	12,006	19,269	11,799	Qualitative	11,799	30,792	207	Qualitative	207
Vernal Pool	2,818	337	71	408	860	312	69	381	1,958	25	2	27
Swale	759	190	35	225	393	188	34	222	366	2	1	3
Vernal Pool Ecosystem	**53,638**	**12,553**	**106**	**12,639**	**20,522**	**12,299**	**103**	**12,402**	**33,116**	**234**	**3**	**237**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

Table 6-42
Mid-Valley Fairy Shrimp Permanent Effects in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Areas (acres)				Mather Core Recovery Area (acres)				Cosumnes/Rancho Seco Core Recovery Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	24,081	6,009	Qualitative	6,009	13,405	5,975	Qualitative	5,975	10,676	34	Qualitative	34
Vernal Pool	1,259	130	52	182	642	124	52	176	617	6	0	6
Swale	404	86	31	117	270	85	31	116	134	1	0	1
Vernal Pool Ecosystem	**25,744**	**6,225**	**83**	**6,308**	**14,317**	**6,184**	**83**	**6,267**	**11,427**	**41**	**0**	**41**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

As shown in Table 6-41, approximately 106 acres of mid-valley fairy shrimp modeled aquatic habitat will be indirectly impacted in the Plan Area, most of which will occur in the UDA (103 acres) as a result of urban development Covered Activities. Outside the UDA, 3 acres of mid-valley fairy shrimp modeled aquatic habitat will be indirectly impacted. In addition to the 106 acres of indirect effects quantified in Table 6-41, Covered Activities in the Plan Area will cause other permanent indirect effects to mid-valley fairy shrimp that are not easily quantified (Table 6-43).

The Plan Permittees expect that the indirect effects of Covered Activities on mid-valley fairy shrimp will be minor outside the UDA, based on two primary factors. First, no urban development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and SSHCP proposed preserves outside the UDA are much larger than the existing and proposed UDA preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves.

Most indirect effects to mid-valley fairy shrimp outside the UDA will occur to mid-valley fairy shrimp aquatic habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, pesticide use, etc. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing mid-valley fairy shrimp habitat within the project footprint. Some of these "other" indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to vernal pool hydrology reported in Tables 6-41 and 6-42). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on mid-valley fairy shrimp that are not quantified are described qualitatively in Table 6-43, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or proposed SSHCP preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect mid-valley fairy shrimp. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Temporary Effects

Mid-valley fairy shrimp occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to mid-valley fairy shrimp. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to vernal pool hydrology reported in Table 6-41).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on mid-valley fairy shrimp are qualitatively described in Table 6-44.

Table 6-43
Permanent Indirect Effects on Mid-Valley Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality). Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to mid-valley fairy shrimp habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in occupied pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter mid-valley fairy shrimp aquatic habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	The Landscape Preserves established outside the UDA, including in the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on mid-valley fairy shrimp. Within the UDA, habitat fragmentation will affect mid-valley fairy shrimp because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2) will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on the mid-valley fairy shrimp population in the Mather Core Recovery Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA Covered Activities would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on mid-valley fairy shrimp habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on mid-valley fairy shrimp will be minimized through implementation of the Preserve System Management Program, which will include a

Table 6-43
Permanent Indirect Effects on Mid-Valley Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		commitment to develop memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Mid-valley fairy shrimp will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs minimize hydrologic alterations to the micro-watersheds of existing and proposed vernal pool preserves, but indirect effects will occur to an estimated 142 acres of mid-valley fairy shrimp modeled aquatic habitat (Table 6-41). However, the mid-valley fairy shrimp Conservation Strategy (Chapter 7) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on mid-valley fairy shrimp are expected from increased human activity on Preserves or preserves setbacks. Implementation of AMMs ensures that increased human activity in and near Preserves is limited and that it does not substantially affect mid-valley fairy shrimp habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	Increases in inundation period may facilitate wildlife community alterations, including invasion by non-native predators of mid-valley fairy shrimp such as non-native fishes (e.g., mosquitofish) and American bullfrogs (Balfour and Morey 1999). Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter mid-valley fairy shrimp aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in mid-valley fairy shrimp habitat will not occur.

Table 6-43
Permanent Indirect Effects on Mid-Valley Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plant valley grasslands of the Vernal Pool Ecosystem will affect critical hydroperiods for supporting the mid-valley fairy shrimp's lifecycle. Implementation of AMMs will minimize proliferation of non-native plants, and preserve management for thatch, such as grazing or prescribed fire, will reduce biomass of upland non-native plants. These will substantially reduce effects of non-native plants on mid-valley fairy shrimp. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7). Nitrogen deposition associated with increased vehicle emissions from vehicles associated with new urban development traveling along Plan Area rural roadway projects will also result in competitive advantages for non-native invasive plants. The unavoidable effects of Nitrogen deposition will be minimized through monitoring and adaptive management of the vernal pool ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described above in Wildlife Community Alterations, invasion by non-native predators of mid-valley fairy shrimp such as non-native fishes (e.g., mosquitofish) and bullfrogs (Balfour and Morey 1999) is avoided through preservation of existing vernal pool inundation period and water chemistry.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.

Table 6-43
Permanent Indirect Effects on Mid-Valley Fairy Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use	Adverse effects on mid-valley fairy shrimp or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-44
Temporary Effects to Mid-Valley Fairy Shrimp

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location). Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials)	Runoff from construction activities into mid-valley fairy shrimp habitat will be fully avoided through implementation of AMMs.

Table 6-44
Temporary Effects to Mid-Valley Fairy Shrimp

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Inadvertent trampling and compaction of vernal pool vegetation will adversely affect mid-valley fairy shrimp propagation by damaging cysts. Implementation of AMMs ensures that trampling and compaction do not occur. No effect on mid-valley fairy shrimp.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control)	Construction dust effects on vernal pool vegetation communities and vernal pool water quality will reduce habitat quality for mid-valley fairy shrimp. Implementation of AMMs ensures that dust is controlled and will not affect mid-valley fairy shrimp.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Increased human activity in construction and maintenance areas would affect vernal pool habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets accessing occupied pools would cause general disturbance and affect water quality. Implementation of AMMs ensures that increased human presence does not occur. No effect on mid-valley fairy shrimp.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Trash and debris would adversely affect mid-valley fairy shrimp habitat quality through direct effects on water quality and by possibly attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled. No effect on mid-valley fairy shrimp.

6.6.11 Vernal Pool Tadpole Shrimp

Permanent Effects

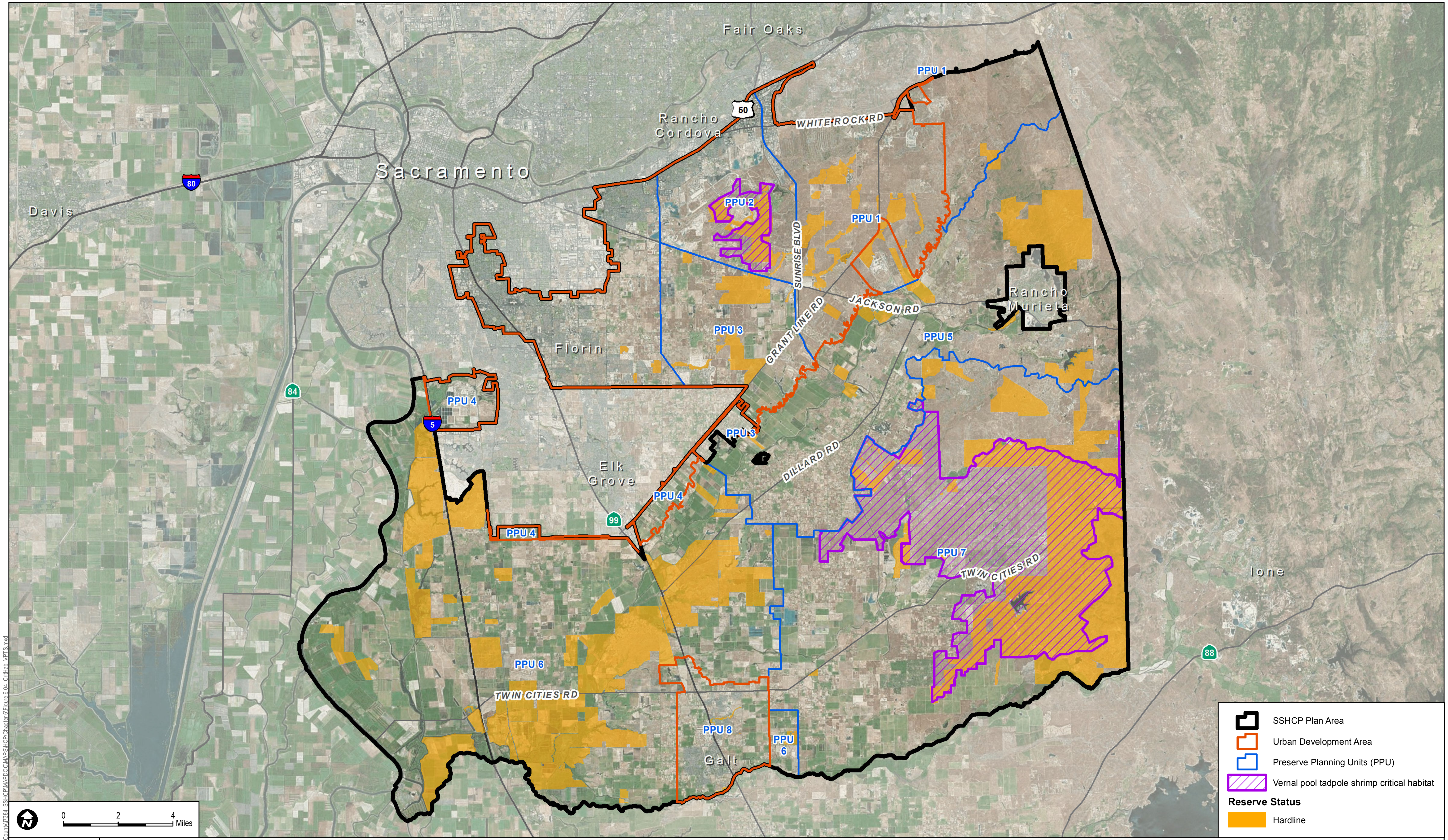
Permanent direct and indirect effects of Covered Activities on vernal pool tadpole shrimp will include modification or significant degradation of modeled habitat and the direct and indirect take of all vernal pool tadpole shrimp individuals occupying that modified or degraded habitat.

All modeled habitats for vernal pool tadpole shrimp are within the Vernal Pool Ecosystem, which includes the Vernal Pool, Swale, Stream/Creek (VPIH) and hydrologically connected Valley Grassland land cover types (see Section 3.2 and Figures 3-2 and 3-15). In addition to direct removal of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds remove part or all of the perched aquifer, existing hydrology, and ecosystem that supports Vernal Pool, Swale, and Stream/Creek (VPIH) habitat. Over time, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for vernal pool tadpole shrimp. These indirect effects on Vernal Pool, Swale and Stream/Creek (VPIH) habitat are included in all permanent effects acreages presented in this section.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 17,259 acres of vernal pool tadpole shrimp modeled habitat within the Plan Area (see Table 6-45), including 787 acres of vernal pool tadpole shrimp aquatic habitats (i.e., Vernal Pools, Swales, and Streams/Creeks (VPIH)) and 16,472 acres of surrounding Valley Grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on vernal pool tadpole shrimp modeled habitat will occur primarily inside the UDA, with a total 16,927 acres of permanent effects on Vernal Pool Ecosystem in the UDA and a total of 332 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

The total 17,259 acres of permanent direct and indirect effects to vernal pool tadpole shrimp modeled habitat includes removal of a total of 8,553 acres of Vernal Pool Ecosystem within the two Plan Area Core Recovery Areas (USFWS 2005). Effects inside the UDA include permanent effects to approximately 8,500 acres of Vernal Pool Ecosystem in the Mather Core Recovery Area (Table 6-46). Outside the UDA, 53 acres of Vernal Pool Ecosystem within the Cosumnes/Rancho-Seco Core Recovery Area will be affected by Covered Activities.

Permanent direct and indirect effects to vernal pool tadpole shrimp modeled habitat include removal of 746 acres of Vernal Pool Ecosystem in designated Critical Habitat (USFWS 2006) (see Figure 6-4). A total of 695 acres of Vernal Pool Ecosystem will be removed in Unit 8, including 32 acres of modeled aquatic habitat and 663 acres of supporting upland habitat. In Unit 9b, a total of 51 acres of Vernal Pool Ecosystem will be removed, including 7 acres of modeled aquatic habitat and 44 acres of supporting upland habitat (see Tables 6-45, 6-46, 6-47, and Figure 3-15).



SOURCE: Bing Maps, County of Sacramento 2014, USFWS 2012

FIGURE 6-4

Critical Habitat for vernal pool tadpole shrimp

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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Table 6-45
Vernal Pool Tadpole Shrimp Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	97,349	16,472	Qualitative	16,472	24,584	16,186	Qualitative	16,186	72,765	286	Qualitative	286
Vernal Pool	4,536	389	94	483	935	355	85	440	3,601	34	9	43
Swale	1,252	234	44	278	461	232	43	275	791	2	1	3
Streams/Creeks (VPIH)	73	22	4	26	68	22	4	26	5	0	0	0
Vernal Pool Ecosystem	**103,210**	**17,117**	**142**	**17,259**	**26,048**	**16,795**	**132**	**16,927**	**77,162**	**322**	**10**	**332**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively

Table 6-46
Vernal Pool Tadpole Shrimp Permanent Effects in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)				Mather Core Recovery Area (acres)				Cosumnes/Rancho-Seco Core Recovery Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	53,367	8,164	Qualitative	8,164	17,023	8,118	Qualitative	8,118	36,344	46	Qualitative	46
Vernal Pool*	2,464	150	72	222	709	144	72	216	1,755	6	0	6
Swale	740	113	38	151	324	112	38	150	416	1	0	1
Streams/Creeks (VPIH)	61	13	3	16	61	13	3	16	0	0	0	0
Vernal Pool Ecosystem	**56,632**	**8,440**	**113**	**8,553**	**18,117**	**8,387**	**113**	**8,500**	**38,515**	**53**	**0**	**53**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

Table 6-47
Permanent Effects to Vernal Pool Tadpole Shrimp Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)				Critical Habitat Unit 8 (acres)				Critical Habitat Unit 9B (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	28,971	707	Qualitative	707	1,146	663	Qualitative	663	27,825	44	Qualitative	44
Vernal Pool	1,320	24	1	25	31	18	1	19	1,289	6	0	6
Swale	343	8	2	10	14	7	2	9	329	1	0	1
Streams/Creek (VPIH)	12	4	0	4	12	4	0	4	0	0	0	0
Vernal Pool Ecosystem	**30,646**	**743**	**3**	**746**	**1,203**	**692**	**3**	**695**	**29,443**	**51**	**0**	**51**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

As shown in Table 6-45, approximately 142 acres of vernal pool tadpole shrimp modeled aquatic habitat will be indirectly impacted in the Plan Area, most of which will occur in the UDA (132 acres) as a result of Urban Development Covered Activities. Outside the UDA, 10 acres of vernal pool tadpole shrimp modeled aquatic habitat will be indirectly impacted. In addition to the 142 acres of indirect effects quantified above in Table 6-45, Covered Activities in the Plan Area will cause other permanent indirect effects to vernal pool tadpole shrimp that are not easily quantified (Table 6-48).

As discussed previously for vernal pool fairy shrimp (see Section 6.6.9), these “other” indirect effects to vernal pool tadpole shrimp (Table 6-46) will be greatest within the UDA because most Covered Activities will occur within the UDA, resulting in extensive contact between new urban development and the vernal pool tadpole shrimp present on existing preserves, on SSHCP proposed preserves (see Chapter 7), and on other habitat areas that will remain inside the UDA.

The Plan Permittees expect that the indirect effects of Covered Activities on vernal pool tadpole shrimp will be minor outside the UDA, based on two primary factors. First, no Urban Development Covered Activities will occur outside the UDA, so indirect effects will be limited to those from rural roadways and water pipeline projects. Second, the existing preserves and SSHCP proposed preserves outside the UDA are much larger than the existing and proposed UDA preserves (see Chapter 7), which dramatically reduces edge effects of Covered Activities on the Vernal Pool Ecosystem within Preserves. Most indirect effects to vernal pool tadpole shrimp outside the UDA will occur to vernal pool tadpole shrimp aquatic habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which are expected to increase contaminants in road runoff, potential spread of invasive plants, pesticide use, etc. that will affect vernal pool tadpole shrimp habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing vernal pool tadpole shrimp habitat within the project footprint. Some of these “other” indirect effects will occur within the road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to vernal pool hydrology reported in Table 6-45). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on vernal pool tadpole shrimp that are not quantified are described qualitatively in Table 6-48, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or proposed SSHCP preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect vernal pool tadpole shrimp. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize “other” indirect impacts.

Temporary Effects

Vernal pool tadpole shrimp occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to vernal pool tadpole shrimp. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to Vernal Pool hydrology reported in Table 6-45).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on vernal pool tadpole shrimp are qualitatively described in Table 6-49.

Table 6-48
Permanent Indirect Effects on Vernal Pool Tadpole Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality). Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to vernal pool tadpole shrimp habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in occupied pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter vernal pool tadpole shrimp aquatic habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP Preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	The Landscape Preserves established outside the UDA, including in the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on vernal pool tadpole shrimp. Within the UDA, habitat fragmentation will affect vernal pool tadpole shrimp because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2) will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on the vernal pool tadpole shrimp population in the Mather Core Recovery Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA Covered Activities would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on vernal pool tadpole shrimp habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on vernal pool tadpole shrimp will be minimized through implementation of the Preserve System Management Program,

Table 6-48
Permanent Indirect Effects on Vernal Pool Tadpole Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		which will include a commitment to develop memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Vernal pool tadpole shrimp will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs minimize hydrologic alterations to the micro-watersheds of existing and proposed vernal pool preserves, but indirect effects will occur to an estimated 142 acres of vernal pool tadpole shrimp modeled aquatic habitat (Table 6-45). However, the vernal pool tadpole shrimp Conservation Strategy (Chapter 7) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on vernal pool tadpole shrimp are expected from increased human activity on Preserves or preserves setbacks. Implementation of AMMs ensures that increased human activity in and near Preserves is limited and that it does not substantially affect vernal pool tadpole shrimp habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 5, NATURE TRAIL-6 (Nature Trail Public Education)	Increases in inundation period may facilitate wildlife community alterations, including invasion by non-native predators of vernal pool tadpole shrimp such as non-native fishes (e.g., mosquitofish) and bullfrogs (Balfour and Morey 1999). Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter vernal pool tadpole shrimp aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in vernal pool tadpole shrimp habitat will not occur.

Table 6-48
Permanent Indirect Effects on Vernal Pool Tadpole Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plant valley grasslands of the Vernal Pool Ecosystem will affect critical hydroperiods for supporting the vernal pool tadpole shrimp's lifecycle. Implementation of AMMs will minimize proliferation of non-native plants, and preserve management for thatch, such as grazing or prescribed fire, will reduce biomass of upland non-native plants. These will substantially reduce effects of non-native plants on vernal pool tadpole shrimp. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7). Nitrogen deposition associated with increased vehicle emissions from vehicles associated with new urban development traveling along Plan Area rural roadway projects will also result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the vernal pool ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 5, NATURE TRAIL-6 (Nature Trail Public Education)	As described in Wildlife Community Alterations, invasion by non-native predators of vernal pool tadpole shrimp such as non-native fishes (e.g., mosquitofish) and bullfrogs (Balfour and Morey 1999) is avoided through preservation of existing vernal pool inundation period and water chemistry.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.

Table 6-48
Permanent Indirect Effects on Vernal Pool Tadpole Shrimp

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use	Adverse effects on vernal pool tadpole shrimp or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-49
Temporary Effects to Vernal Pool Tadpole Shrimp

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials)	Runoff from construction activities into vernal pool tadpole shrimp habitat will be fully avoided through implementation of AMMs.

Table 6-49
Temporary Effects to Vernal Pool Tadpole Shrimp

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Inadvertent trampling and compaction of vernal pool vegetation will adversely affect tadpole shrimp propagation by damaging cysts. Implementation of AMMs ensures that trampling and compaction do not occur. No effect on vernal pool tadpole shrimp.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	Condition 3, BMP-5 (Dust Control)	Construction dust effects on vernal pool vegetation communities and vernal pool water quality will reduce habitat quality for vernal pool tadpole shrimp. Implementation of AMMs ensures that dust is controlled and will not affect vernal pool tadpole shrimp.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Increased human activity in construction and maintenance areas would affect vernal pool habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets accessing occupied pools would cause general disturbance and affect water quality. Implementation of AMMs ensures that increased human presence does not occur. No effect on vernal pool tadpole shrimp.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Trash and debris would adversely affect vernal pool tadpole habitat quality through direct effects on water quality and by possibly attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled. No effect on vernal pool tadpole shrimp.

6.6.12 Ricksecker's Water Scavenger Beetle

Permanent Effects

Permanent direct and indirect effects of Covered Activities on Ricksecker's water scavenger beetle will include modification or significant degradation of modeled habitat and the direct and indirect take of all Ricksecker's water scavenger beetle individuals occupying that modified or degraded habitat. Ricksecker's water scavenger beetle has not been documented within the UDA, but it is assumed to be present in all modeled habitat.

All modeled habitats for Ricksecker's water scavenger beetle are within the Vernal Pool Ecosystem, which includes the Vernal Pool, Swale, and hydrologically connected Valley Grassland land cover types (see Section 3.2 and Figures 3-2 and 3-12). In addition to direct removal of Vernal Pool Ecosystem land cover types, edge effects on vernal pool micro-watersheds remove part or all of the perched aquifer, existing hydrology, and ecosystem that supports vernal pool and swale habitat. Over time, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter the chemistry of the vernal pool; reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for Ricksecker's water scavenger beetle. These indirect effects on vernal pool and swale habitat are included in all permanent effects acreages presented in this section.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 17,233 acres of Ricksecker's water scavenger beetle modeled habitat within the Plan Area (see Table 6-50), including 761 acres of Ricksecker's water scavenger beetle aquatic habitats (i.e., vernal pools and swales) and 16,472 acres of surrounding valley grassland land cover that support the hydrology and ecology of the aquatic habitats. Covered Activity impacts on Ricksecker's water scavenger beetle modeled habitat will occur primarily inside the UDA, with a total 16,901 acres of permanent effects on Vernal Pool Ecosystem in the UDA and a total of 332 acres of permanent effects on Vernal Pool Ecosystem outside the UDA.

Relatively little is known about specific threats to Ricksecker's water scavenger beetle in the Plan Area other than removal and degradation of vernal pools. However, based on its known life history, it will be affected by several permanent indirect effects on modeled habitat (Table 6-51). Potential permanent indirect effects of the Covered Activities include habitat fragmentation and isolation, lighting, increased human activity (including collection by humans, recreation, and increased trash/debris), hydrologic alterations, pollutants and toxins, traffic and vehicle collisions, mesopredators, altered fire regime, invasive plant and animal species, and wildlife community alterations (including increased predation).

Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on Ricksecker's water scavenger beetle is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas and the requirement of extensive infrastructure. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities that increase the risk of accidental fire ignitions and other road-related effects (e.g., vehicle collisions, road runoff, potential spread of invasive plants, etc.) that will affect Ricksecker's water scavenger beetle individuals and habitat. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on Ricksecker's water scavenger beetle habitat (although some of these indirect effects are already accounted for in the indirect effect acreage reported in Table 6-50).

Management and monitoring activities in the Preserves and Preserve Setbacks have the potential to indirectly affect Ricksecker's water scavenger beetle. Vegetation management, for example, will include livestock grazing. While Ricksecker's water scavenger beetle benefits from some level of grazing, and which will be an important management tool (see Chapter 8), grazing management activities that affect stocking rates and distributional patterns (e.g., placement of water and mineral sources, fencing, handling facilities etc.) will also adversely affect Ricksecker's water scavenger beetle.

Temporary Effects

Ricksecker's water scavenger beetle occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to Ricksecker's water scavenger beetle. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects and the area of indirect impacts to vernal pool hydrology reported in Table 6-51).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on Ricksecker's water scavenger beetle are qualitatively described in Table 6-52.

Table 6-50
Ricksecker's Water Scavenger Beetle Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland*	97,349	16,472	Qualitative	16,472	24,584	16,186	Qualitative	16,186	72,765	286	Qualitative	286
Vernal Pool	4,536	389	94	483	935	355	85	440	3,601	34	9	43
Swale	1,252	234	44	278	461	232	43	275	791	2	1	3
Vernal Pool Ecosystem	**103,137**	**17,095**	**138**	**17,233**	**25,980**	**16,773**	**128**	**16,901**	**77,157**	**322**	**10**	**332**

* Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively.

Table 6-51
Permanent Indirect Effects on Ricksecker's Water Scavenger Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to Ricksecker's water scavenger beetle habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in occupied pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter Ricksecker's water scavenger beetle aquatic habitat and that water chemistry of vernal pool aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses)	The Landscape Preserves established outside the UDA, including in the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on Ricksecker's water scavenger beetle. Within the UDA, habitat fragmentation will affect Ricksecker's water scavenger beetle because all UDA Preserves will be bordered by urban development, which will be reduced

Table 6-51
Permanent Indirect Effects on Ricksecker's Water Scavenger Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2) will be reduced through EDGE AMMs and ROAD AMMs.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA Covered Activities would not affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on Ricksecker's water scavenger beetle habitat could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on Ricksecker's water scavenger beetle will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Ricksecker's water scavenger beetle will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs minimize hydrologic alterations to the micro-watersheds of existing and proposed vernal pool preserves, but indirect effects will occur to an estimated 138 acres of Ricksecker's water scavenger beetle modeled aquatic habitat (Table 6-5). However, the Ricksecker's water scavenger beetle Conservation Strategy (Chapter 7) will offset these unavoidable impacts.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks)	The use of outdoor lighting could affect Ricksecker's water scavenger beetle by causing mortality due to exhaustion, attraction of predators, or disruption of biological cycles.

Table 6-51
Permanent Indirect Effects on Ricksecker's Water Scavenger Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-8 (Outdoor Lighting) Condition 4, ROAD-1 (Road Project Location)	
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	No effects on Ricksecker's water scavenger beetle are expected from increased human activity on Preserves or Preserve Setbacks. Implementation of AMMs ensures that increased human activity in and near Preserves is limited and that it does not substantially affect Ricksecker's water scavenger beetle habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	Increases in inundation period may facilitate wildlife community alterations, including invasion by non-native predators of Ricksecker's water scavenger beetle such as non-native fishes (e.g., mosquitofish) and bullfrogs (Balfour and Morey 1999). Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter Ricksecker's water scavenger beetle aquatic habitat, that water chemistry of vernal pool aquatic habitat will not be affected, and that resultant wildlife community alterations in Ricksecker's water scavenger beetle habitat will not occur.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants in valley grasslands of the Vernal Pool Ecosystem will affect critical hydroperiods for supporting the Ricksecker's water scavenger beetle lifecycle. Implementation of AMMs will minimize proliferation of non-native plants, and preserve management for thatch, such as grazing or prescribed fire, will reduce biomass of upland non-native plants. These will substantially reduce effects on non-native plants on Ricksecker's water scavenger beetle. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).

Table 6-51
Permanent Indirect Effects on Ricksecker's Water Scavenger Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		Nitrogen deposition associated with increased vehicle emissions from vehicles associated with new urban development traveling along Plan Area rural roadway projects will also result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the vernal pool ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described in Wildlife Community Alterations, invasion by non-native predators of Ricksecker's water scavenger beetle such as non-native fishes (e.g., mosquitofish) and bullfrogs (Balfour and Morey 1999) is avoided through preservation of existing vernal pool inundation period and water chemistry.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	Adverse effects on Ricksecker's water scavenger beetle or the vernal pool plant and animal ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs.

Table 6-51
Permanent Indirect Effects on Ricksecker's Water Scavenger Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-3 (Roadside Pesticide Use	
Vehicle and Aircraft Collisions with Wildlife	None required for this species.	No effect on this species.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-52
Temporary Effects to Ricksecker's Water Scavenger Beetle

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into Ricksecker's water scavenger beetle habitat will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Inadvertent trampling and compaction of vernal pool vegetation will adversely affect Ricksecker's water scavenger beetle propagation by damaging eggs. Implementation of AMMs ensures that trampling and compaction do not occur. No effect on Ricksecker's water scavenger beetle.
Construction Noise	None required for this species.	No effect on this species.

Table 6-52
Temporary Effects to Ricksecker's Water Scavenger Beetle

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	Condition 3, BMP-6 (Construction Lighting) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction lighting directed toward Ricksecker's water scavenger beetle habitat can cause mortality to Ricksecker's water scavenger beetle due to exhaustion, attraction of predators, or disruption of biological cycles. Implementation of AMMs will minimize construction lighting effects on Ricksecker's water scavenger beetle by ensuring that construction lighting is directed away from adjacent natural habitats.
Construction Dust	Condition 3, BMP-5 (Dust Control)	Construction dust effects on vernal pool vegetation communities and vernal pool water quality will reduce habitat quality for Ricksecker's water scavenger beetle. Implementation of AMMs ensures that dust is controlled and will not affect Ricksecker's water scavenger beetle.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Increased human activity in construction and maintenance areas would affect vernal pool habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets accessing occupied pools would cause general disturbance and affect water quality. Implementation of AMMs ensures that increased human presence does not occur. No effect to Ricksecker's water scavenger beetle.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Trash and debris would adversely affect Ricksecker's water scavenger beetle habitat quality through direct effects on water quality and by possibly attracting nuisance pest species. Temporary fencing will also entrap some newly emerged adults as they fly to different vernal pools. Implementation of AMMs ensures that construction trash and debris will be controlled, and that there will be no substantial effect on Ricksecker's water scavenger beetle.

6.6.13 Valley Elderberry Longhorn Beetle

Permanent Effects

Permanent direct and indirect effects of Covered Activities on valley elderberry longhorn beetle will include modification or significant degradation of modeled habitat and the direct and indirect take of all valley elderberry longhorn beetle individuals occupying that modified or degraded habitat. Modeled habitats for valley elderberry longhorn beetle are limited to the three Riparian land cover types: Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 591 acres of modeled habitat for valley elderberry longhorn beetle within the Plan Area (see Table 6-53). Covered Activity impacts on valley elderberry longhorn beetle modeled habitat will occur primarily inside the UDA, with a total of approximately 550 acres of permanent effects in the UDA and a total of 41 acres of permanent effects outside the UDA.

The 218 acres of effects on Mine Tailing Riparian Woodland will account for 40% of the total effects on valley elderberry longhorn beetle modeled habitat within the Plan Area. A total of 184 acres of Mixed Riparian Scrub and 189 acres of Mixed Riparian Woodland will be directly affected.

Valley elderberry longhorn beetle in the Plan Area will be affected by several permanent indirect effects on modeled habitat (Table 6-54). Notable permanent indirect effects of the Covered Activities include habitat fragmentation and isolation, hydrologic alterations, pollutants and toxins, lighting, increased human activity (including recreation, risk of collection, and increased trash/debris), invasive plant and wildlife species, and wildlife community alterations (including increased predation).

Table 6-53
Valley Elderberry Longhorn Beetle Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Mine Tailing Riparian Woodland	641	218	Qualitative	218	220	218	Qualitative	218	421	0	Qualitative	0
Mixed Riparian Woodland	5,785	184	Qualitative	184	244	146	Qualitative	146	5,541	38	Qualitative	38
Mixed Riparian Scrub	1,451	189	Qualitative	189	241	186	Qualitative	186	1,210	3	Qualitative	3
TOTAL	**7,877**	**591**	**Qualitative**	**591**	**705**	**550**	**Qualitative**	**550**	**7,172**	**41**	**Qualitative**	**41**

Table 6-54
Permanent Indirect Effects on Valley Elderberry Longhorn Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality). Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	Valley elderberry longhorn beetle is sensitive to altered hydrology affecting the quality of riparian habitats, and particularly effects on its host plant, elderberry. Such changes will occur over the long term as a result of hydrologic alterations related to runoff regimes from irrigation and runoff from impervious surfaces (e.g., roads, parking lots, etc.). The close proximity of planned roads and development to habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters flows in riparian areas and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution does not enter valley elderberry longhorn beetle habitat and that the host plant is not affected.

Table 6-54
Permanent Indirect Effects on Valley Elderberry Longhorn Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams) Condition 8, UTILITY-2 (Utility Maintenance on Preserves)	
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams)	Covered Activities will result in fragmentation and isolation of modeled valley elderberry longhorn beetle habitat. After emergence from pupal cells, adults readily fly from shrub to shrub to feed on leaves and flowers, but their ability to fly between disjunct habitat patches is limited. The SSHCP Preserves large habitat blocks and ensures habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7.This, in concert with a range of AMMs that protect Preserves from edge effects, will maintain contiguous modeled habitat patches within drainages and minimize this effect.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread)	Covered Activities are expected to increase the frequency of fires in the Plan Area due to increased population and risk of ignitions. However, the beetle's host plant, blue elderberry (*Sambucus nigra* ssp. *cerulean*), is generally a fire-tolerant species and is able to

Table 6-54
Permanent Indirect Effects on Valley Elderberry Longhorn Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks)	regenerate by resprouting and seed germination following fire (Crane 1989). Severe fires that expose and kill the root system and stem buds from which resprouting occurs could affect existing plants, although seed viability appears to be unaffected (Crane 1989). Valley elderberry longhorn beetle will also be adversely affected when fires kill the aboveground part of the plant supporting individuals (Crane 1989). Combined with their limited dispersal capability, fires that extirpate isolated local populations will result in permanent loss of a local population due to a lack of recolonization. Wildfire is not expected to be common in the riparian habitats where valley elderberry longhorn beetle lives, however. If wildfire does occur, adverse effects of wildfire suppression will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	None required for this species.	No effect on this species.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 4, ROAD-1 (Road Project Location)	The use of outdoor lighting could affect valley elderberry longhorn beetle by causing mortality related to exhaustion, attraction of predators, or disruption of biological cycles.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-11 (Speed Limit) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan)	Increased human activity will indirectly affect riparian habitats through introduction of invasive plant species such as Himalayan blackberry, illegal dumping, accidental and intentional wildfire ignitions, and potentially collecting of adult beetles. Implementation of AMMs ensures that increased human activity in and near Preserves and Stream Setbacks is limited and that it does not substantially affect valley elderberry longhorn beetle habitat or individual beetles.

Table 6-54
Permanent Indirect Effects on Valley Elderberry Longhorn Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams)	
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor)	Altered hydrology related to Urban Development Covered Activities will facilitate invasion of Argentine ants, which prey on valley elderberry longhorn beetle larvae (Huxel 2000). AMMs that avoid changes to hydrology regimes and habitat will minimize effects on wildlife community structure. Further, implementation of EDGE measures and other measures that minimize habitat disturbance will allow native species to better compete with Argentine ants and limit invasions.

Table 6-54
Permanent Indirect Effects on Valley Elderberry Longhorn Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams)	
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams)	Covered Activities will increase human activity near riparian areas, which increases the risk of introduction and proliferation of invasive plant species, such as Himalayan blackberry, giant reed (*Arundo donax*), tamarisk (*Tamarix* spp.), and pampas grass (*Cortaderia* spp.). These species quickly take over riparian corridors and outcompete elderberry bushes for resources, including water and space. Implementation of AMMs, especially the EDGE measures and Stream Setbacks, will minimize invasive plant effects on valley elderberry longhorn beetle habitat in the Plan Area.
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-1 (Construction Fencing) Condition 4, ROAD-1 (Road Project Location) Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams)	Irrigation and urban runoff will increase populations of Argentine ant, which is a known predator of beetle larvae (Huxel 2000). As stated for Wildlife Community Alterations, AMMs that avoid changes to hydrology regimes and habitat will minimize effects on wildlife community structure. Further, implementation of EDGE measures and other measures that minimize habitat disturbance will allow native species to better compete with Argentine ants and limit invasions.
Mesopredators	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	Mesopredators prey on bird species that eat elderberries and disperse elderberry seeds. Therefore, an increase in mesopredators related to Covered Activities will adversely affect habitat availability for valley

Table 6-54
Permanent Indirect Effects on Valley Elderberry Longhorn Beetle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-2 (Wildlife Crossing Structures)	elderberry longhorn beetle. Implementation of AMMs will minimize increases in mesopredator abundance in Preserves and resultant effects on valley elderberry longhorn beetle habitat.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams)	Adverse effects on the valley elderberry longhorn beetle or its elderberry host plant from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-11 (Speed Limit) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 8, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 8, STREAM-2 (UDA Stream Setbacks) Condition 8, STREAM-3 (Minor Tributaries to UDA Streams)	Increased vehicle traffic associated with Urban Development Covered Activities and Rural Transportation Projects will result in increased vehicle strikes on adult valley elderberry longhorn beetles. This effect will be minimized through establishment of large, interconnected Preserves that are protected by EDGE measures and Stream Setbacks.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-55
Temporary Effects to Valley Elderberry Longhorn Beetle

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Runoff from construction activities into valley elderberry longhorn beetle habitat will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Inadvertent trampling and compaction of riparian vegetation could include damage to elderberry bushes. Implementation of AMMs ensures that trampling and compaction do not occur. No effect on valley elderberry longhorn beetle.
Construction Noise	None required for this species.	No effect on this species.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	Condition 3, BMP-6 (Construction Lighting) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Construction lighting directed toward valley elderberry longhorn beetle can cause mortality to valley elderberry longhorn beetle due to exhaustion, attraction of predators, or disruption of biological cycles. Implementation of AMMs will minimize construction lighting effects on valley elderberry longhorn beetle by ensuring that construction lighting is directed away from adjacent natural habitats.
Construction Dust	Condition 3, BMP-5 (Dust Control)	Construction dust effects on elderberry bushes and riparian water quality

Table 6-55
Temporary Effects to Valley Elderberry Longhorn Beetle

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	will reduce habitat quality for valley elderberry longhorn beetle. However, low to moderate levels of dust have been shown to not substantially affect elderberry density and condition, or beetle presence (Talley and Holyoak 2009). Implementation of AMMs ensures that dust is controlled and will not affect valley elderberry longhorn beetle.
Increased Human Presence during Construction	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Increased human activity in construction and maintenance areas would affect habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets disturb occupied elderberry bushes and would cause general disturbance water quality effects. Implementation of AMMs ensures that pets are not brought to construction sites. No effect on valley elderberry longhorn beetle.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	Trash and debris will adversely affect habitat through direct effects on water quality and by possibly attracting nuisance pest species, including Argentine ants. Implementation of AMMs ensures that construction trash and debris will be controlled and that there will be no substantial effect to Ricksecker's water scavenger beetle.

Temporary Effects

Valley elderberry longhorn beetle occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to valley elderberry longhorn beetle. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects reported in Table 6-53).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on valley elderberry longhorn beetle are qualitatively described in Table 6-55.

6.6.14 California Tiger Salamander

Permanent Effects

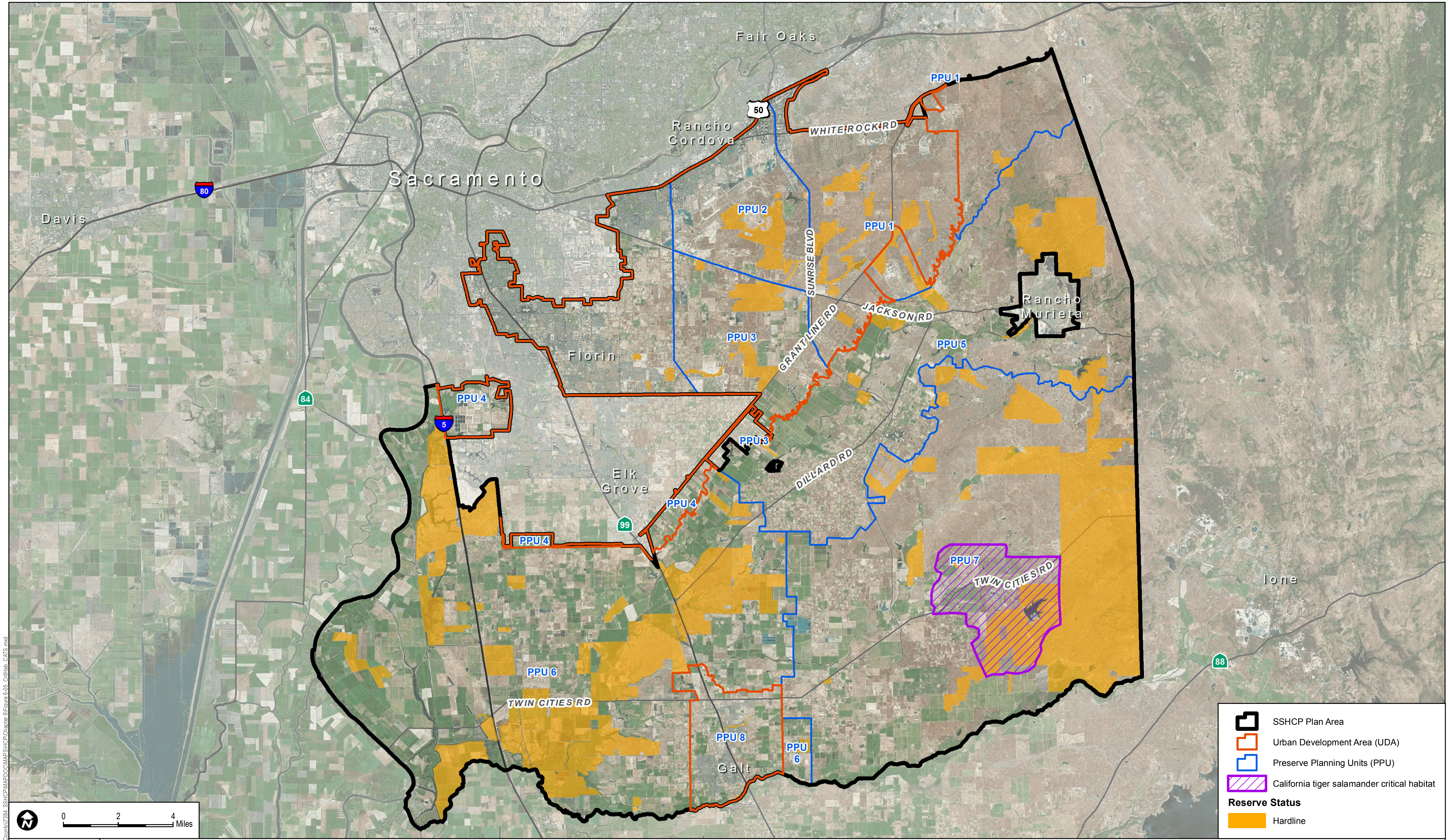
Permanent direct and indirect effects of Covered Activities on California tiger salamander will include modification or significant degradation of modeled aquatic and upland habitats (see Section 3.2 and Figures 3-2 and 3-16). Modeled species habitat for California tiger salamander includes aquatic habitat comprising Vernal Pools and Seasonal Wetlands, and upland habitat including Valley Grassland, Blue Oak Woodland, and Blue Oak Savanna habitat within 1.5 miles of modeled aquatic habitat. California tiger salamander historically occurred throughout the Plan Area; however, all of the extant occurrence records within the Plan Area (a total of 28) are located outside the UDA in PPU 7 (see Section 3.4.3).

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 1,757 acres (out of a total of 89,794 acres) of total modeled aquatic and upland habitats within the Plan Area (Table 6-56), including 80 acres (out of a total of 4,424 acres) of modeled aquatic habitat and approximately 1,677 acres (out of a total of 85,370) of modeled upland habitat. Effects of Covered Activities on modeled upland habitat will occur primarily inside the UDA, with a total of approximately 1,366 acres (out of a total of approximately 1,488 acres) of permanent effects inside the UDA and a total of approximately 311 acres (out of a total of approximately 83,882 acres) of permanent effects outside the UDA. Permanent effects of Covered Activities on modeled aquatic habitat will also occur primarily inside the UDA, with 55 acres (out of a total of approximately 63 acres) of permanent effects inside the UDA and a total of 23 acres (out of a total of approximately 4,361 acres) of permanent effects outside the UDA. No effects on documented occurrences within the Plan Area will occur as a result of Covered Activities. Although the majority of modeled habitats inside the UDA would be directly affected, the lack of any recent occurrences of California tiger salamander and the high existing level of anthropogenic effects in this portion of the UDA indicates that these modeled habitat effects are unlikely to have substantial, if any, effects on extant California tiger salamander populations in the Plan Area.

Covered Activities will permanently affect approximately 80 acres of modeled aquatic habitat within the Plan Area including 59 acres of vernal pool habitat (out of a total of 3,033) and 21 acres of seasonal wetland (out of a total of 1,391 acres). Additionally, Covered Activities will also have permanent indirect effects on 2 acres of vernal pool habitat within the Plan Area, all of which will occur outside the UDA, as shown in Table 6-56. Covered Activities in the Plan Area will cause other permanent indirect effects to California tiger salamander that cannot be easily quantified.

The approximately 1,757 total acres of permanent effects to the California tiger salamander includes removal of a total of 52 acres of modeled upland and aquatic habitat within the Cosumnes/Rancho-Seco Core Recovery Area, outside the UDA. Of the 52 acres of permanent effects to modeled habitat within the Cosumnes/Rancho-Seco Core Recovery Area, 46 acres are modeled upland habitat and 6 acres are modeled aquatic habitat (Table 6-57).

The Plan Area also includes 7,420 acres of federally designated Critical Habitat (USFWS 2005) outside the UDA and south of the Cosumnes River. However, designated Critical Habitat will not be directly affected by Covered Activities within the Plan Area outside the UDA. The 7,420 acres of Critical Habitat for California tiger salamander occurs within Critical Habitat Unit 3, (Table 6-58 and Figure 6-5) and includes approximately 246 acres of modeled aquatic habitat and 7,174 acres of modeled upland habitat. Covered Activities will not affect either modeled upland or aquatic habitats within designated Critical Habitat. As a result, no direct or indirect effects to California tiger salamander Critical Habitat (upland and aquatic habitats) are expected to occur as a result of Covered Activities within the Plan Area. Additionally, Covered Activities will not affect any documented occurrences of the California tiger salamander in Critical Habitat.



SOURCE: Bing Maps, County of Sacramento 2014, USFWS 2012

FIGURE 6-5

Critical Habitat for California tiger salamander

SSHCP South Sacramento Habitat Conservation Plan

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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Table 6-56
California Tiger Salamander Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Upland Habitat												
Blue Oak Savanna	3,322	0	Qualitative	0	0	0	Qualitative	0	3,322	0	Qualitative	0
Blue Oak Woodland	3,774	0	Qualitative	0	0	0	Qualitative	0	3,774	0	Qualitative	0
Valley Grassland	78,274	1,677	Qualitative	1,677	1,488	1,366	Qualitative	1,366	76,786	311	Qualitative	311
Total Upland Habitat	*85,370*	*1,677*	*Qualitative*	*1,677*	*1,488*	*1,366*	*Qualitative*	*1,366*	*83,882*	*311*	*Qualitative*	*311*
Aquatic Habitat												
Vernal Pool	3,033	57	2	59	36	34	0	34	2,997	23	2	25
Seasonal Wetland	1,391	21	Qualitative	21	27	21	Qualitative	21	1,364	0	Qualitative	0
Total Aquatic Habitat	*4,424*	*78*	*2*	*80*	*63*	*55*	*Qualitative*	*55*	*4,361*	*23*	*2*	*25*
GRAND TOTAL	**89,794**	**1,755**	**2**	**1,757**	**1551**	**1,421**	**0**	**1,421**	**88,243**	**334**	**2**	**336**

Table 6-57
California Tiger Salamander Permanent Effects in Core Recovery Areas

Habitat Model Land Cover Types	Cosumnes/Rancho-Seco Core Recovery Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*
Upland Habitat				
Blue Oak Savanna	2,067	0	Qualitative	0
Blue Oak Woodland	414	0	Qualitative	0
Valley Grassland*	36,298	46	Qualitative	46
Total Upland Habitat	*38,779*	*46*	*Qualitative*	*46*
Aquatic Habitat				
Vernal Pool	1,748	6	0	6
Seasonal Wetland	132	0	Qualitative	0
Total Aquatic Habitat	*1,880*	*6*	*0*	*6*
GRAND TOTAL	**40,659**	**52**	**0**	**52**

* Total effects to Valley Grassland include an unknown but small amount of effect that was analyzed qualitatively.

Table 6-58
Permanent Effects to California Tiger Salamander Critical Habitat

Habitat Model Land Cover Types	Critical Habitat Unit 3 (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*
Upland Habitat				
Blue Oak Savanna	0	0	Qualitative	0
Blue Oak Woodland	0	0	Qualitative	0
Valley Grassland*	7,174	0	Qualitative	0
Total Upland Habitat	*7,174*	*0*	*Qualitative*	*0*
Aquatic Habitat				
Vernal Pool	215	0	0	0
Seasonal Wetland	31	0	Qualitative	0
Total Aquatic Habitat	*246*	*0*	*0*	*0*
GRAND TOTAL	**7,420**	**0**	**0**	**0**

* Total effects to Valley Grassland include an unknown but small amount of effect that was analyzed qualitatively.

In addition to direct removal of modeled vernal pool habitat, vernal pools within Vernal Pool Ecosystem habitats will also be indirectly affected. Within the Plan Area, Covered Activities will indirectly affect 2 acres of aquatic habitat (out of a total of 4,361 acres) located outside the UDA. However, not all of the vernal pools modeled as habitat would actually provide suitable breeding habitat for California tiger salamanders since many of these pools may lack sufficient depth and inundation periods to support breeding. Edge effects on vernal pool micro-watersheds can remove part or all of the perched aquifer, existing hydrology, and ecosystem that supports vernal pool habitat. Over time, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter water chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for breeding. In addition to the 2.1 acres of indirect effects quantified above in Table 6-56, Covered Activities in the Plan Area will cause other permanent indirect effects to California tiger salamander that are not easily quantified (Table 6-58).

Indirect effects to California tiger salamander modeled habitat inside the UDA will be higher than outside the UDA, because the majority of indirect effects to California tiger salamander modeled habitat resulting from Covered Activities (Urban Development) will occur inside the UDA. However, since extant California tiger salamander populations have not been documented inside the UDA, indirect environmental stressors will have negligible effects on this species or its remaining habitat (Table 6-59). Most indirect effects to California tiger salamander outside the UDA will occur to modeled aquatic habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which is expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, increased risk of accidental fire ignitions, and other road-related effects that will affect California tiger salamander habitat. As a result, indirect effects will likely be restricted to a fairly narrow linear area of varying length. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on existing California tiger salamander habitat within the project footprint. Some of these "other" indirect effects will occur within the road right-of-way area (already quantified as permanently affected in the direct effects and the area of indirect effects to vernal pool hydrology reported in Tables 6-56 through 6-58). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on California tiger salamander that are not quantified are described qualitatively in Table 6-59, along with AMMs that avoid and minimize these effects.

Based on the previously provided information, the Plan Permittees expect that the indirect effects of Covered Activities on California tiger salamander will be minor inside the UDA (due primarily to the lack of occurrences). Indirect effects of Covered Activities outside the UDA will also be minor since the amount of affected acreage is relatively small, and edge effects will be minimized by the establishment of large Preserves and the much lower development densities south of the Cosumnes River.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or proposed SSHCP preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect California tiger salamander. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Table 6-59
Permanent Indirect Effects on California Tiger Salamander

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-2 (Vernal Pool Inocula Bank) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Altered hydrology and water quality degradation will adversely affect the suitability of aquatic habitats to support successful reproduction for this species. Altered hydrology adversely affects vernal pools, seasonal wetlands, stock ponds, and California tiger salamanders by reducing pool water depths and altering the length of the inundation period which can affect the ability of larvae to complete metamorphosis prior to the pool drying, and by increasing the potential for predation due to shallower water depths. Water quality degradation including introduction of various pollutants, toxins, pesticides, and fertilizers, will adversely affect vernal pool communities and reproductive success of California tiger salamanders. The close proximity of planned roads and development to California tiger salamander habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution does not enter California tiger salamander aquatic habitat and that water chemistry of aquatic habitats will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks)	Habitat fragmentation and isolation should be a relatively minor effect to California tiger salamander aquatic habitat and to California tiger salamanders since this indirect effect was considered in the SSHCP preserve design strategy, including preserving large habitat blocks and ensuring habitat connectivity throughout the Preserve System. The Landscape Preserves established outside the UDA, including the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on California tiger salamander. The effects of roads fragmenting modeled habitat in Preserves outside the UDA will be reduced through implementation of EDGE and ROAD AMMs.

Table 6-59
Permanent Indirect Effects on California Tiger Salamander

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-8 (Outdoor Lighting) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location)	Within the UDA, habitat fragmentation will only affect a small amount of remaining modeled habitat; however, since this species has not been documented within the UDA and the remaining habitat is unoccupied, indirect effects will be minimal. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on the California tiger salamander population in the Cosumnes/Rancho-Seco Core Recovery Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Repeated wildfires could eliminate or reduce the quality of upland refugia and foraging habitat for California tiger salamanders by direct mortality to small mammal populations (primarily ground squirrels and pocket gophers (*Geomyidae* spp.)) and to available prey items. As discussed in Section 6.3, Covered Activities outside the UDA will not substantially affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on remaining California tiger salamander habitat will result from wildfire suppression (e.g., fire trucks, retardant, fire breaks); however, since this habitat is unoccupied and this species is not known to occur within the UDA, no effects will occur to California tiger salamanders. Effects of wildfire suppression on California tiger salamander habitat will be minimized through implementation of these AMMs and the Preserve System Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection)	Increased upland erosion, runoff, and subsequent sedimentation of vernal pools will also occur as a result of Covered Activities within the micro-watershed of vernal pool habitats. Erosion in the micro-watershed around individual vernal pools and seasonal wetlands will result in increased sedimentation of the pool, which will reduce water depths and shorten the inundation period ultimately affecting the suitability of the pool to support successful reproduction of

Table 6-59
Permanent Indirect Effects on California Tiger Salamander

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-2 (Vernal Pool Inocula Bank) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	California tiger salamanders. Vernal pool habitat that supports California tiger salamander will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and proposed vernal pool preserves.
Chronic Ground Vibration and Noise	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) CTS-1 (California Tiger Salamander Surveys)	Vibration and noise could indirectly affect the use of aquatic and upland habitats by California tiger salamanders (e.g., disruption of nocturnal movement patterns and diurnal cycles). As with many frogs and salamanders, California tiger salamanders are sensitive to vibration (especially when aestivating in underground refugia). Vibration can adversely affect California tiger salamanders by forcing them to leave existing underground refugia and move to other locations further away from the vibration source, which can make them more susceptible to predation and desiccation especially during the summer and fall months. Migrating California tiger salamanders and those in underground refugia sites will be indirectly affected by any activities that create chronic ground vibration and noise. Implementation of AMMs will minimize chronic ground vibration and noise in close proximity to California tiger salamander upland habitat.
Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks)	The use of outdoor lighting could indirectly affect the use of vernal pools and upland habitat by California tiger salamanders (e.g., disruption of nocturnal movement patters and diurnal cycles). As with many frogs and salamanders, California tiger salamanders are

Table 6-59
Permanent Indirect Effects on California Tiger Salamander

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-8 (Outdoor Lighting) Condition 4, ROAD-1 (Road Project Location)	sensitive to light (primarily when migrating to and from breeding locations). With the exception of wet periods when California tiger salamanders move aboveground during daylight, the majority of aboveground movement (primarily to and from breeding pools) occurs at night. The use of outdoor lighting in California tiger salamander upland habitat will indirectly affect California tiger salamanders primarily by restricting aboveground movement during the night when most migration occurs. Implementation of AMMs will ensure that outdoor lighting effects on California tiger salamander movement will be minimized.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design)	Increased human activity (including trash, debris, pets, off-highway vehicles (OHVs), and trampling) within the micro-watershed of vernal pool and seasonal wetland habitats will adversely affect these habitats and California tiger salamanders. The presence of trash in the vicinity of vernal pools and seasonal wetlands can attract predators. Additionally, pets also prey on California tiger salamanders but can also physically affect vernal pool habitats, and OHV use can disrupt soils and drainage pathways increasing erosion and introduce harmful substances to the micro-watershed. Access to the preserve will be allowed via low effect trails. Implementation of AMMs will ensure that increased human activity in and near Preserves is limited and that it does not substantially affect California tiger salamander aquatic habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks)	Vernal pool community alterations are most likely to affect California tiger salamanders through changes in prey availability as a result of habitat degradation, and through introduction of non-native aquatic species that predate on the eggs and larvae of California tiger salamanders. Wildlife community alterations that reduce the number and types of prey items and favor potential competitors such as bullfrogs, could adversely affect California tiger salamander breeding habitat. Increases in inundation period may facilitate wildlife community alterations, including invasion by

Table 6-59
Permanent Indirect Effects on California Tiger Salamander

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-8 (Outdoor Lighting) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location)	non-native predators of California tiger salamander such as American bullfrogs and non-native fishes including western mosquitofish. Implementation of EDGE and ROAD AMMs, including those that require control of stormwater runoff, will ensure pollution will not enter California tiger salamander aquatic habitat. Additionally, water chemistry of aquatic habitats will not be affected, invasive species spread will be controlled, and resultant wildlife community alterations will not occur.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-2 (Vernal Pool Inocula Bank)	Unmanaged proliferation of non-native plant Valley Grasslands of the Vernal Pool Ecosystem will affect critical hydroperiods that support breeding by California tiger salamanders. Implementation of AMMs will minimize proliferation of non-native plants, and preserve management for thatch, such as grazing or prescribed fire, will reduce biomass of upland non-native plants. These will substantially reduce effects of non-native plants on California tiger salamander breeding habitat. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7). Implementation of AMMs will minimize the potential for indirect effects of invasive plants on California tiger salamander habitat. Nitrogen deposition associated with increased vehicle emissions from vehicles associated with new urban development traveling along Plan Area Rural roadway projects will also result in competitive advantages for non-native invasive plants. The unavoidable effects of Nitrogen deposition will be minimized through monitoring and adaptive management of the vernal pool ecosystem on Preserves and through AMMs related to invasive species.

Table 6-59
Permanent Indirect Effects on California Tiger Salamander

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	As described in Wildlife Community Alterations, invasion by non-native predators of California tiger salamander such as American bullfrogs and non-native fishes including western mosquitofish will be avoided through preservation of existing vernal pool inundation period and water chemistry. Implementation of AMMs will minimize the potential for indirect effects from invasive animals.
Mesopredators	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	Adverse effects on California tiger salamander juveniles and adults will occur as a result of the presence of mesopredators during periods of surface activity movement to and from breeding pools. Implementation of AMMs will minimize the potential for predation by mesopredators at road crossing locations.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread)	California tiger salamanders are susceptible to Ranavirus infection, specifically the *Ambystoma tigrinum* virus (ATV). Implementation of this AMM will minimize the potential for introduction of this virus into local California tiger salamander populations.
Pesticides and Fertilizers	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Indirect effects on California tiger salamander, vernal pool plant and animal ecosystem, and seasonal wetlands from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near Preserves will be avoided by implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks)	Vehicles can adversely affect California tiger salamanders, primarily by running them over during night-time migrations to and from breeding pools. The primary approach to reducing effects on roads due to vehicle collisions is to provide culvert undercrossings

Table 6-59
Permanent Indirect Effects on California Tiger Salamander

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	in areas where salamanders are moving across roads to and from breeding pools. Indirect effects on California tiger salamander associated with vehicle collisions will be avoided by locating planned road projects in the least environmentally sensitive location relative to California tiger salamander habitat. Additionally, installing wildlife crossing structures outside the UDA where California tiger salamanders are present will provide for continued dispersal and movement of this species throughout the SSHCP Plan Area, as required by the SSHCP Biological Goals and Measurable Objectives (see Chapter 7). Implementation of AMMs will minimize potential indirect effects associated with vehicle collisions.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-60
Temporary Effects to California Tiger Salamander

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 1, LID-1 (Stormwater Quality). Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control)	Potential erosion, runoff, and water quality effects on California tiger salamander aquatic habitat resulting from construction activities will be fully avoided through implementation of AMMs.

Table 6-60
Temporary Effects to California Tiger Salamander

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing) CTS-7 (Rodent Control)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing)	Inadvertent trampling of vernal pool vegetation will adversely affect California tiger salamander eggs and larvae. Implementation of AMMs ensures that trampling of vegetation outside the project footprint will not occur.
Construction Noise	Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-7 (Biological Monitor) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing)	Loud noise can affect California tiger salamanders when they are above ground. Implementation of AMMs will minimize construction noise effects in the vicinity of California tiger salamander habitat.
Construction Ground Vibration	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing)	Ground vibrations can force California tiger salamanders to leave underground refugia to move away from the vibration source, exposing them to potential predation by predators. Implementation of AMMs will minimize construction ground vibration effects near California tiger salamander habitat.
Construction Lighting	Condition 3, BMP-6 (Construction Lighting) Condition 3, BMP-7 (Biological Monitor)	Construction lighting directed towards California tiger salamander upland habitat can restrict the ability of California tiger salamanders

Table 6-60
Temporary Effects to California Tiger Salamander

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-8 (Training of Construction Staff) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing)	to move above ground (i.e., migrate to and from breeding pools). Implementation of AMMs will minimize construction lighting effects on California tiger salamander by ensuring that construction lighting is directed away from adjacent natural habitats.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing)	Construction dust effects on vernal pool vegetation communities and vernal pool and seasonal wetland water quality will reduce habitat quality for California tiger salamander. Implementation of AMMs ensures that dust is controlled.
Increased Human Presence during Construction	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing) CTS-6 (California Tiger Salamander Encounter Protocol) CTS-7 (Rodent Control)	Increased human activity in construction and maintenance areas would affect vernal pool and seasonal wetland habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets that access occupied pools would cause general disturbance and affect water quality. Implementation of AMMs ensures that increased human presence does not occur.
Construction Trash and Debris	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) CTS-1 (California Tiger Salamander Daily Construction Schedule) CTS-2 (California Tiger Salamander Monitoring) CTS-3 (California Tiger Salamander Exclusion Fencing)	Trash and debris would adversely affect California tiger salamanders by degrading water quality and by attracting nuisance pest species. Implementation of AMMs will ensure that construction trash and debris will be monitored and controlled.

Temporary Effects

California tiger salamander occurrences near proposed ground-disturbing Covered Activities (outside the UDA) will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to the California tiger salamander. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently affected in the direct effects and the area of indirect effects to Vernal Pool and Seasonal Wetland hydrology reported in Table 6-56). Specific AMMs have been developed to minimize potential effects on California tiger salamander, including CTS-1, daily construction schedule when Covered Activities occur during the breeding and dispersal season; CTS-2, monitoring requirements when Covered Activities occur during the breeding and dispersal season; CTS-3, use of exclusion fencing when Covered Activities occur during the breeding and dispersal season; CTS-4, procedures to avoid entrapment of California tiger salamanders when Covered Activities occur during the breeding and dispersal season; CTS-5, California tiger salamander encounter protocol when Covered Activities occur during the breeding and dispersal season; and CTS-6, the use of non-entangling erosion control materials.

These potential construction-related environmental stressors were generally described in Section 6.3.2, and their additional effects on California tiger salamander are qualitatively described in Table 6-60.

6.6.15 Western Spadefoot

Permanent Effects

Permanent direct and indirect effects of Covered Activities on western spadefoot will include modification or significant degradation of modeled aquatic and upland habitats (see Section 3.2 and Figure 3-17) and the direct and indirect take of western spadefoot individuals occupying that modified or degraded habitat.

Modeled species habitat for western spadefoot includes aquatic habitat comprising Seasonal Wetlands, Swale, Open Water, Streams/Creeks, and Streams/Creeks (VPIH), and upland habitat consisting of Valley Grassland, Blue Oak Woodland, and Blue Oak Savanna habitat within 1,600 meters (5,249 feet) of modeled aquatic habitat. However, the primary breeding habitats for western spadefoot usually include vernal pools, seasonal wetlands, and various depressional features (temporary rain pools) that remain inundated for a sufficient period (at least 30 days) to complete metamorphosis. Western spadefoots may also breed in pools in swales, various shallow open water habitats, streams/creeks, and a variety of other features including tire ruts, although use of these habitats may be sporadic. Western spadefoot occur throughout the Plan Area, although the majority of the occurrence records (21 out of a total of 29 records within the Plan Area) are located outside the UDA, mostly within PPU 7 (see Section 3.4.3).

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 23,207 acres of total modeled aquatic and upland habitats within the Plan Area (Table 6-61), including 1,164 acres (out of a total of 13,479 acres) of modeled aquatic habitat and approximately 22,043 acres (out of a total of 149,603 acres) of modeled upland habitat. Permanent effects of Covered Activities on modeled upland habitat will occur primarily inside the UDA, with a total of approximately 21,329 acres (out of a total of 30,345 acres) of permanent effects inside the UDA and a total of approximately 714 acres outside the UDA. Covered Activity effects on modeled aquatic habitat will also occur primarily within the UDA, with approximately 1,089 acres (out of a total of approximately 2,026 acres) of permanent effects inside the UDA; and a total of 75 acres (out of a total of 11,453 acres) of permanent effects outside the UDA.

Aquatic and upland habitat within the two Core Recovery Areas is important for western spadefoot as evidenced by the 18 occurrences in the Cosumnes/Rancho-Seco Core Recovery Area and 8 occurrences in the Mather Core Recovery Area (Figure 3-17). Covered Activities within these two Core Recovery Areas will permanently affect approximately 8,600 acres (out of a total of 60,042 acres) of modeled upland and aquatic habitat (Table 6-62). Within the Mather Core Recovery Area, Covered Activities will permanently affect approximately 8,547 acres of habitat, including approximately 8,127 acres of upland habitat and 420 acres of aquatic habitat. Outside the UDA and within the Cosumnes/Rancho-Seco Core Recovery Area, Covered Activities will permanently affect approximately 53 acres of habitat including 46 acres of upland habitat and approximately 7 acres of aquatic habitat. Similar to other western spadefoot habitat within the Plan Area, the majority of indirect effects within the two Core Recovery Areas will occur within the UDA in the Mather Core Recovery Area.

Table 6-61

Western Spadefoot Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Upland Habitat												
Blue Oak Savanna	5,637	38	Qualitative	38	18	2	Qualitative	2	5,619	36	Qualitative	36
Blue Oak Woodland	9,132	9	Qualitative	9	0	0	Qualitative	0	9,132	9	Qualitative	9
Valley Grassland	135,094	21,996	Qualitative	21,996	30,327	21,327	Qualitative	21,327	104,767	669	Qualitative	669
Total Upland Habitat	*149,863*	*22,043*	*Qualitative*	*22,043*	*30,345*	*21,329*	*Qualitative*	*21,329*	*119,518*	*714*	*Qualitative*	*714*
Aquatic Habitat												
Vernal Pool	4,536	389	94	483	935	355	85	440	3,601	34	9	43
Swale	1,252	234	44	278	461	232	43	275	791	2	1	3
Seasonal Wetland	2,600	105	Qualitative	105	162	102	Qualitative	102	2,438	3	Qualitative	4
Open Water	2,344	155	Qualitative	155	237	154	Qualitative	154	2,107	1	Qualitative	1
Streams/Creeks	2,674	117	Qualitative	117	163	92	Qualitative	92	2,511	25	Qualitative	25
Streams/Creeks (VPIH)	73	22	4	26	68	22	4	26	5	0	0	0
Total Aquatic Habitat	*13,479*	*1,022*	*142*	*1,164*	*2,026*	*957*	*132*	*1,089*	*11,453*	*65*	*10*	*75*
GRAND TOTAL	**163,342**	**23,065**	**142**	**23,207**	**32,371**	**22,286**	**132**	**22,418**	**130,971**	**779**	**10**	**789**

Table 6-62
Western Spadefoot Permanent Effects in Core Recovery Areas

Habitat Model Land Cover Types	All Core Recovery Areas (acres)				Mather Core Recovery Area (acres)				Cosumnes/Rancho-Seco Core Recovery Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Upland Habitat												
Blue Oak Savanna	2386	9	Qualitative	9	319	9	Qualitative	9	2,067	0	Qualitative	0
Blue Oak Woodland	419	0	Qualitative	0	5	0	Qualitative	0	414	0	Qualitative	0
Valley Grassland	53,367	8,164	Qualitative	8,164	17,023	8,118	Qualitative	8,118	36,344	46	Qualitative	46
Total Upland Habitat	*56,172*	*8,173*	*Qualitative*	*8,173*	*17,347*	*8,127*	*Qualitative*	*8,127*	*38,825*	*46*	*Qualitative*	*46*
Aquatic Habitat												
Vernal Pool	2,464	150	72	222	709	144	72	216	1,755	6	0	6
Swale	740	113	38	151	324	112	38	150	416	1	0	1
Seasonal Wetland	139	6	Qualitative	6	7	6	Qualitative	6	132	0	Qualitative	0
Open Water	270	26	Qualitative	26	92	26	Qualitative	26	178	0	Qualitative	0
Streams/Creeks	196	6	Qualitative	6	28	6	Qualitative	6	168	0	Qualitative	0
Streams/Creeks (VPIH)	61	13	3	16	61	13	3	16	0	0	0	0
Total Aquatic Habitat	*3,870*	*314*	*113*	*427*	*1,221*	*307*	*113*	*420*	*2,649*	*7*	*0*	*7*
GRAND TOTAL	**60,042**	**8,487**	**113**	**8,600**	**18,568**	**8,434**	**113**	**8,547**	**41,474**	**53**	**0**	**53**

Western spadefoots in the Plan Area will be affected by permanent indirect effects to modeled habitat, as well as harm and harassment of individuals. Covered Activities will have permanent indirect effects on 142 acres of modeled aquatic habitat. Most of these permanent effects will occur primarily inside the UDA, with a total of approximately 132 acres (out of a total of 2,026 acres) of modeled aquatic habitat inside the UDA. Outside the UDA, approximately 10 acres of modeled aquatic habitat will be permanently affected.

However, not all of the modeled aquatic habitat would actually provide suitable breeding habitat for western spadefoot since many of these pools may lack sufficient depth and inundation periods to support breeding. Edge effects on vernal pool micro-watersheds can remove part or all of the perched aquifer, existing hydrology, and ecosystem that supports vernal pool habitat. Edge effects on vernal pool micro-watersheds remove part or all of the perched aquifer, existing hydrology, and ecosystem that supports Vernal Pool, Swale, and Stream/Creek (VPIH) habitat. Over time, effects on the micro-watersheds will indirectly change the timing, duration, and depth of vernal pool filling; alter water chemistry of the vernal pool; and reduce the frequency of flows between swales and vernal pools and connectivity between the pools. Collectively, these effects will result in the affected aquatic habitat becoming unsuitable for western spadefoot breeding. In addition to the 142 acres of indirect effects quantified in Table 6-61 and 6-62, Covered Activities in the Plan Area will cause other permanent indirect effects to western spadefoot that are not easily quantified (Table 6-63).

Although indirect effects will occur throughout the Plan Area, their potential to have substantial effects on western spadefoot is greatest within the UDA due to the closer and more extensive contact between urban development that will occur within the UDA and adjacent to preserved areas and the requirement of extensive infrastructure. It is expected that most of the indirect effects outside the UDA south of the Cosumnes River will be fairly minor since the amount of affected acreage is relatively small, and edge effects will be minimized by the establishment of large Preserves and the much lower development densities south of the Cosumnes River. Most indirect effects to western spadefoot outside the UDA will occur to modeled aquatic habitats located along Rural Transportation Projects, including improved roadways that will support higher traffic densities, which is expected to increase contaminants in road runoff, potential spread of invasive plants, increased pesticide use, increased risk of accidental fire ignitions, and other road-related effects that will affect western spadefoot habitat. As a result, indirect effects will likely be restricted to a fairly narrow linear area of varying length. In particular, improvement of Clay Station Road that passes through the Landscape Preserve in PPU 7 (see Chapter 7) will have permanent indirect effects on vernal pool habitat (although some of these indirect effects are already accounted for in the indirect effect acreage reported in Table 6-61). Some of these "other" indirect effects will occur within the road right-of-way area (already quantified as permanently affected in the direct effects and the area of indirect effects to vernal pool hydrology reported in

Table 6-61). Remaining indirect effects of Rural Transportation Projects and other Covered Activities on western spadefoot that are not quantified are described qualitatively in Table 6-63, along with AMMs that avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or proposed SSHCP preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect western spadefoot. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Table 6-63
Permanent Indirect Effects on Western Spadefoot

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-2 (Vernal Pool Inocula Bank) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location) WS-1 (Western Spadefoot Surveys)	Altered hydrology and water quality degradation will adversely affect the suitability of aquatic habitats to support successful reproduction for this species. Altered hydrology adversely affects vernal pools, seasonal wetlands, stock ponds, rain pools, and other suitable aquatic habitats and western spadefoots by reducing pool water depths and altering the length of the inundation period which can affect the ability of larvae to complete metamorphosis prior to the pool drying, and by increasing the potential for predation due to shallower water depths. Water quality degradation, including introduction of various pollutants, toxins, pesticides, and fertilizers. will adversely affect vernal pool communities and reproductive success of western spadefoots. The close proximity of planned roads and development to habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution does not enter western spadefoot aquatic habitat and that water chemistry of aquatic habitats will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside	Habitat fragmentation and isolation should be a relatively minor effect to western spadefoot aquatic habitat and to western spadefoots since this indirect affect was considered in the SSHCP preserve design strategy, including preserving large habitat blocks and ensuring habitat connectivity throughout the Preserve System. The Landscape Preserves established inside the UDA including the Mather Core Recovery Area, and outside the UDA including the Cosumnes/Rancho-Seco Core Recovery Area, will avoid effects of habitat fragmentation on western spadefoot. The effects of roads

Table 6-63
Permanent Indirect Effects on Western Spadefoot

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-8 (Outdoor Lighting) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) WS-1 (Western Spadefoot Surveys)	fragmenting modeled habitat in Preserves outside the UDA will be reduced through implementation of EDGE and ROAD AMMs. Within the UDA, habitat fragmentation will affect a small amount of remaining modeled habitat; however, since this species has not been documented within the UDA and the remaining habitat is unoccupied, indirect effects will be minimal. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on the western spadefoot population in both the Mather and Cosumnes/Rancho-Seco Core Recovery Areas.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Repeated wildfires could eliminate or reduce the quality of upland refugia and foraging habitat for western spadefoots by direct mortality to small mammal populations (primarily ground squirrels and pocket gophers) and to available prey items. As discussed in Section 6.3, Covered Activities outside the UDA will not substantially affect wildfire frequency, duration, or intensity. Within the UDA, potential effects of increased wildfire on western spadefoot habitat will result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on western spadefoot habitat will be minimized through implementation of AMMs and the Preserve System Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection)	Increased erosion, runoff, and subsequent sedimentation of vernal pools will also occur as a result of Covered Activities within the micro-watershed of vernal pool habitats. Erosion in the micro-watershed around individual vernal pools and seasonal wetlands will result in increased sedimentation of the pool, which will reduce water depths and shorten the inundation period, ultimately affecting the suitability of the pool to support successful reproduction of

Table 6-63
Permanent Indirect Effects on Western Spadefoot

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-2 (Vernal Pool Inocula Bank) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	western spadefoots. Vernal pool habitat that supports western spadefoot will be indirectly affected by any activities that interrupt the perched aquifer supporting vernal pool hydrology. Implementation of AMMs will minimize hydrologic alterations to the micro-watersheds of existing and proposed vernal pool preserves.
Chronic Ground Vibration and Noise	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) WS-1 (Western Spadefoot Surveys)	Vibration and noise could indirectly affect the use of aquatic and upland habitats by western spadefoot (e.g., disruption of nocturnal movement patters and diurnal cycles). As with many frogs and salamanders, western spadefoots are sensitive to vibration (especially when aestivating in underground refugia). Vibration can adversely affect western spadefoots by forcing them to leave existing underground refugia and move to other locations further away from the vibration source, which can make them more susceptible to predation and desiccation especially during the summer and fall months. Migrating western spadefoots and those in underground refugia sites will be indirectly affected by any activities that create chronic ground vibration and noise. Implementation of AMMs will minimize the effects of chronic ground vibration and noise in close proximity to western spadefoot upland habitat.

Table 6-63
Permanent Indirect Effects on Western Spadefoot

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 4, ROAD-1 (Road Project Location)	The use of outdoor lighting could indirectly affect the use of vernal pools and upland habitat by western spadefoots (e.g., disruption of nocturnal movement patterns and diurnal cycles). As with many frogs and salamanders, western spadefoots are sensitive to light (primarily when migrating to and from breeding locations). With the exception of wet periods when western spadefoots move aboveground during daylight, the majority of aboveground movement (primarily to and from breeding pools) occurs at night. The use of outdoor lighting in western spadefoot upland habitat will indirectly affect western spadefoots primarily by restricting aboveground movement during the night when most migration occurs. Implementation of AMMs will ensure that outdoor lighting effects on western spadefoot movement will be minimized.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Increased human activity (including trash, debris, pets, OHVs, and trampling) within the micro-watershed of vernal pool and seasonal wetland habitats will adversely affect these habitats and western spadefoots. The presence of trash in the vicinity of vernal pools and seasonal wetlands can attract predators. Additionally, pets also prey on western spadefoots but can also physically affect vernal pool habitats, and OHV use can disrupt soils and drainage pathways increasing erosion and introduce harmful substances to the micro-watershed. Access to the preserve will be allowed via low effect trails. Implementation of AMMs will ensure that increased human activity in and near Preserves is limited and that it does not substantially affect western spadefoot aquatic habitat.

Table 6-63
Permanent Indirect Effects on Western Spadefoot

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-9 (Soil Compaction Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location)	Vernal pool community alterations are most likely to affect western spadefoots through changes in prey availability as a result of habitat degradation, and through introduction of non-native aquatic species that predate on the eggs and larvae of western spadefoot. Wildlife community alterations that reduce the number and types of prey items and favor potential competitors such as bullfrogs, could adversely affect western spadefoot breeding habitat. Increases in inundation period may facilitate wildlife community alterations, including invasion by non-native predators of western spadefoot such as American bullfrogs and non-native fishes including western mosquitofish. Implementation of EDGE and ROAD AMMs, including those that require control of stormwater runoff, will ensure pollution will not enter western spadefoot aquatic habitat, water chemistry of aquatic habitats will not be affected, invasive species spread will be controlled, and resultant wildlife community alterations in western spadefoot aquatic habitat will not occur.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-2 (Vernal Pool Inocula Bank)	Unmanaged proliferation of non-native plant Valley Grasslands of the Vernal Pool Ecosystem will affect critical hydroperiods that support breeding by western spadefoot. Implementation of AMMs will minimize proliferation of non-native plants, and preserve management for thatch, such as grazing or prescribed fire, will reduce biomass of upland non-native plants. These will substantially reduce effects of non-native plants on western spadefoot breeding habitat. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7). Nitrogen deposition associated with increased vehicle emissions

Table 6-63
Permanent Indirect Effects on Western Spadefoot

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		from vehicles associated with new urban development traveling along Plan Area rural roadway projects will also result in competitive advantages for non-native invasive plants. The unavoidable effects of nitrogen deposition will be minimized through monitoring and adaptive management of the vernal pool ecosystem on Preserves and through AMMs related to invasive species.
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	As described in Wildlife Community Alterations, invasion by non-native predators of western spadefoot such as American bullfrogs and non-native fishes including western mosquitofish will be avoided through preservation of existing vernal pool inundation period and water chemistry and implementation of AMMs.
Mesopredators	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	Adverse effects on western spadefoot juveniles and adults will occur as a result of the presence of some mesopredators during periods of surface activity movement to and from breeding pools. Larvae are consumed by several aquatic and terrestrial predators both native and introduced, including California tiger salamander larvae, American bullfrogs, and wading birds. However, post-metamorphic juveniles and adults produce skin secretions that may make them unpalatable to some predators. Mesopredators that have been documented predating on western spadefoot include raccoons and dabbling ducks (especially mallards (*Anas platyrhynchos*)). Implementation of AMMs will minimize the potential for predation by mesopredators at road crossing locations.
Wildlife Disease	None required for this species.	No effect on this species.

Table 6-63
Permanent Indirect Effects on Western Spadefoot

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Pesticides and Fertilizers	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Indirect effects on western spadefoot, vernal pool plant and animal ecosystem, and seasonal wetlands from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near Preserves will be avoided by implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	Vehicles can adversely affect western spadefoots, primarily by running them over during night-time migrations to and from breeding pools. The primary approach to reducing effects on roads due to vehicle collisions is to provide culvert undercrossings in areas where salamanders are moving across roads to and from breeding pools. Indirect effects on western spadefoot associated with vehicle collisions will be avoided by locating planned road projects in the least environmentally sensitive location relative to western spadefoot habitat. Additionally, installing wildlife crossing structures outside the UDA where western spadefoots are present will provide for continued dispersal and movement of this species throughout the SSHCP Plan Area, as required by the SSHCP Biological Goals and Measurable Objectives (see Chapter 7). Implementation of AMMs will minimize indirect effects associated with vehicle collisions.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-64
Temporary Effects to Western Spadefoot

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-3 (Trenchless Construction Methods) Condition 8, UTILITY-4 (Siting of Entry and Exit Location) WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing)	Potential erosion, runoff, and water quality effects on western spadefoot aquatic habitat resulting from construction activities will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing)	Inadvertent trampling of vernal pool vegetation will adversely affect western spadefoot eggs and larvae. Implementation of AMMs ensures that trampling of vegetation outside the project footprint will not occur.

Table 6-64
Temporary Effects to Western Spadefoot

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Construction Noise	Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-7 (Biological Monitor) WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing)	Loud noise can affect western spadefoot when they are aboveground. Implementation of AMMs will minimize construction noise effects in the vicinity of western spadefoot habitat.
Construction Ground Vibration	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing)	Ground vibrations can force western spadefoots to leave underground refugia to move away from the vibration source, exposing them to potential predation by predators. Implementation of AMMs will minimize construction ground vibration effects near western spadefoot habitat.
Construction Lighting	Condition 3, BMP-6 (Construction Lighting) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing)	Construction lighting directed towards western spadefoot upland habitat can restrict the ability of western spadefoots to move aboveground (i.e., migrate to and from breeding pools). Implementation of AMMs will minimize construction lighting effects on western spadefoot by ensuring that construction lighting is directed away from adjacent natural habitats.
Construction Dust	Condition 3, BMP-5 (Dust Control) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing)	Construction dust effects on vernal pool vegetation communities and vernal pool and seasonal wetland water quality will reduce habitat quality for western spadefoot. Implementation of AMMs ensures that dust is controlled.
Increased Human Presence during Construction	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff)	Increased human activity in construction and maintenance areas would affect vernal pool and seasonal wetland habitat quality through personnel bringing pets (e.g., dogs) to work sites. Pets that

Table 6-64
Temporary Effects to Western Spadefoot

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing) WS-7 (Western Spadefoot Encounter Protocol)	access occupied pools would cause general disturbance and affect water quality. Implementation of AMMs ensures that increased human presence does not occur.
Construction Trash and Debris	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WS-1 (Western Spadefoot Surveys) WS-2 (Western Spadefoot Work Window) WS-3 (Western Spadefoot Monitoring) WS-4 (Western Spadefoot Exclusion Fencing)	Trash and debris would adversely affect western spadefoot habitat by degrading water quality and by attracting nuisance pest species which could adversely affect this species. Implementation of AMMs will ensure that construction trash and debris will be monitored and controlled.

Temporary Effects

Western spadefoot occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to the western spadefoot. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently affected in the direct effects and the area of indirect effects to Vernal Pool and Seasonal Wetland hydrology reported in Table 6-61). Specific AMMs have been developed to minimize potential effects on western spadefoot including WS-1, work window outside the breeding and dispersal season; WS-2, monitoring requirements when Covered Activities occur during the breeding and dispersal season; WS-3, use of exclusion fencing when Covered Activities occur during the breeding and dispersal season; WS-4, procedures to avoid entrapment of western spadefoot when Covered Activities occur in western spadefoot modeled habitat; WS-5, use of non-entangling materials if erosion control BMP-2 is implemented; and WS-6, use of western spadefoot encounter protocol when Covered Activities occur during the breeding and dispersal season.

These potential construction-related environmental stressors were generally described in Section 6.3.2, and their additional effects on western spadefoot are qualitatively described in Table 6-64.

6.6.16 Giant Gartersnake

Permanent Effects

Permanent direct and indirect effects of Covered Activities on giant gartersnake will include modification or significant degradation of modeled aquatic and upland habitats (see Section 3.2 and Figures 3-2 and 3-18) and the direct and indirect take of giant gartersnake individuals occupying that modified or degraded habitat.

Modeled species habitat for giant gartersnake includes aquatic habitat comprising Seasonal Wetlands, Freshwater Marsh, Open Water (excluding ski lakes), and Streams/Creeks; and upland habitat that includes Valley Grassland and Mixed Riparian Scrub habitat within 820 feet of modeled aquatic habitat. Modeled aquatic and upland habitat for giant gartersnake within the Plan Area includes both high-value and non-high-value habitat (Figure 3-18), with the majority of high-value habitat located outside the UDA. Rice fields also provide potential habitat for giant gartersnake; however, since very little rice farming occurs within the Plan Area, impacts to crop land were not calculated. Giant gartersnakes occur throughout the Plan Area, although the majority of the occurrence records (9 out of a total of 11 records within the Plan Area) are located outside the UDA, mostly in PPU 6 (see Section 3.4.4).

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 2,358 acres of total modeled aquatic and upland habitats (which includes both high-value and non-high-value habitat) within the Plan Area (Table 6-65), including approximately 169 acres (out of a total of 7,290 acres) of modeled aquatic habitat and approximately 2,189 acres (out of a total of 27,868 acres) of modeled upland habitat. Covered Activity effects on modeled aquatic habitat will occur primarily within the UDA, with approximately 144 acres (out of a total of 483 acres) of permanent effects inside the UDA, and a total of approximately 25 acres (out of a total of 6,807 acres) of permanent effects outside the UDA. Permanent effects of Covered Activities on modeled upland habitat will also occur primarily inside the UDA, with a total of approximately 1,965 acres (out of a total of 4,053 acres) of permanent effects inside the UDA, and a total of approximately 224 acres (out of a total of 23,816 acres) outside the UDA. Covered Activities will not have a direct permanent effect on any giant gartersnake occurrence records within the Plan Area.

Covered Activities will permanently affect approximately 606 acres of high-value giant gartersnake habitat within the Plan Area (Table 6-66), including approximately 104 acres (out of a total of 3,628 acres) of modeled aquatic habitat and approximately 502 acres (out of a total of 6,853 acres) of modeled upland habitat. Permanent effects of Covered Activities on modeled upland habitat will also occur primarily inside the UDA, with a total of approximately 461 acres (out of a total of 1,056 acres) of permanent effects inside the UDA, and a total of approximately 41 acres (out of a total of 5,797 acres) outside the UDA (Table 6-66). High-value habitat also includes the Badger Creek and Stone Lakes National Wildlife Refuge (NWR) areas where known subpopulations of giant gartersnake have been documented in this portion of the Plan Area (see Section 3.4.4).

Table 6-65
Giant Gartersnake Permanent Effects (Includes Both High-Value and Non-High-Value Habitat)

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect in Plan Area*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect Inside UDA*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect Outside UDA*
Upland Habitat												
Mixed Riparian Scrub	1,044	135	Qualitative	135	171	132	Qualitative	132	873	3	Qualitative	3
Valley Grassland	26,825	2,054	Qualitative	2,054	3,882	1,833	Qualitative	1,833	22,943	221	Qualitative	221
Total Upland Habitat	*27,869*	*2,189*	*Qualitative*	*2,189*	*4,053*	*1,965*	*Qualitative*	*1,965*	*23,816*	*224*	*Qualitative*	*224*
Aquatic Habitat												
Seasonal Wetland	1,625	39	Qualitative	39	87	36	Qualitative	36	1,538	3	Qualitative	3
Freshwater Marsh	2,589	71	Qualitative	71	299	66	Qualitative	66	2,290	5	Qualitative	5
Open Water	1,282	25	Qualitative	25	43	25	Qualitative	25	1,239	0	Qualitative	0
Streams/Creeks	1,794	34	Qualitative	34	54	17	Qualitative	17	1,740	17	Qualitative	17
Total Aquatic Habitat	*7,290*	*169*	*Qualitative*	*169*	*483*	*144*	*Qualitative*	*144*	*6,807*	*25*	*Qualitative*	*25*
GRAND TOTAL	**35,159**	**2,358**	**Qualitative**	**2,358**	**4,536**	**2,109**	**Qualitative**	**2,109**	**30,623**	**249**	**Qualitative**	**249**

Table 6-66
Giant Gartersnake High-Value Habitat Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total*	*Direct Effect*	*Indirect Effect*	*Total Effect*
High-Value Upland Habitat												
Mixed Riparian Scrub	569	127	Qualitative	127	143	126	Qualitative	126	426	1	Qualitative	1
Valley Grassland	6,284	375	Qualitative	375	913	335	Qualitative	335	5,371	40	Qualitative	40
Total High-Value Upland Habitat	*6,853*	*502*	*Qualitative*	*502*	*1,056*	*461*	*Qualitative*	*461*	*5,797*	*41*	*Qualitative*	*41*
High-Value Aquatic Habitat												
Seasonal Wetland	741	27	Qualitative	27	57	24	Qualitative	24	684	3	Qualitative	3
Freshwater Marsh	1,195	58	Qualitative	58	273	55	Qualitative	55	922	3	Qualitative	3
Open Water	697	2	Qualitative	2	5	2	Qualitative	2	692	0	Qualitative	0
Streams/Creeks	995	17	Qualitative	17	34	7	Qualitative	7	961	10	Qualitative	10
Total High-Value Aquatic Habitat[1]	*3,628*	*104*	*Qualitative*	*104*	*369*	*88*	*Qualitative*	*88*	*3,259*	*16*	*Qualitative*	*16*
GRAND TOTAL	**10,481**	**606**	**Qualitative**	**606**	**1,425**	**549**	**Qualitative**	**549**	**9,056**	**57**	**Qualitative**	**57**

Covered Activities in the Plan Area will cause permanent indirect effects to giant gartersnake that are not easily quantified (Table 6-65). Giant gartersnakes in the Plan Area will be affected by permanent indirect effects to both aquatic and upland habitats, as well as harm and harassment of individuals. Indirect effects of the Covered Activities include management and monitoring; habitat fragmentation and isolation; altered hydrology and water quality degradation including introduction of pollutants, toxins, pesticides, and fertilizers; increased human activity (including trash, pets, debris, OHVs, and trampling); altered fire regime; aquatic community alterations (including increased predation); vibration and noise issues; and vehicle collisions.

Although indirect effects to giant gartersnake modeled habitat will occur throughout the Plan Area, their potential to have substantial effects on giant gartersnake is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, accidental fire ignitions, and other road-related effects (e.g., road runoff, potential spread of invasive plants, etc.). The potential permanent indirect effects of Covered Activities are described in Table 6-67, along with AMMs to avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or proposed SSHCP preserves, certain uses will be allowed inside Preserves and in Preserve Setbacks that may indirectly affect giant gartersnake. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize “other” indirect impacts.

Table 6-67
Permanent Indirect Effects on Giant Gartersnake

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 4, ROAD-1 (Road Project Location) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) GGS-8 (Giant Gartersnake Post-Construction Restoration)	Altered hydrology and water quality degradation will adversely affect the suitability of aquatic habitats to support foraging, movement pathways, and winter hibernacula sites for giant gartersnakes. Altered hydrology adversely affects giant gartersnakes by increasing water depths which will affect habitat by inundating small mammal burrows used as winter hibernacula and altering the length of the inundation period. Water quality degradation, including introduction of various pollutants, toxins, pesticides, and fertilizers, will have an adverse effect on giant gartersnakes, although this species has been observed in degraded water quality conditions. The close proximity of planned roads and development to habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution does not enter giant gartersnake aquatic habitat and that water chemistry of aquatic habitats will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves)	Habitat fragmentation and isolation will have several adverse effects on giant gartersnakes although this species can cross upland habitats (typically from 820 feet to 3.1 miles) to reach other suitable aquatic habitats even though they prefer to move along aquatic pathways. These adverse effects include: (1) exposing aquatic habitat located in close proximity to development and roads to disruptive urban edge effects such as altered hydrology (e.g., increased runoff), pollutants, toxins, and pesticides and fertilizers, and human activities (trampling, OHVs, pets, trash and debris, etc.), collisions with vehicles even though this species is not likely to cross paved roads, and urban-related predators; (2) increased vulnerability to negative demographic trends, including genetic bottlenecks, genetic drift, and inbreeding depression in areas

Table 6-67
Permanent Indirect Effects on Giant Gartersnake

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) GGS-8 (Giant Gartersnake Post-Construction Restoration)	where other aquatic habitats are not within approximately a mile of occupied aquatic habitat; and (3) disruption of natural interconnectivity of occupied aquatic habitats important for dispersal and colonization, thus reducing the natural genetic exchange of giant gartersnakes between aquatic habitats. Many effects of habitat fragmentation and isolation on giant gartersnakes, including most of the edge effects, are most likely to occur inside the UDA where the preserves will be bordered by urban development and roads are planned to cross some proposed preserves, such as the Core Preserve in PPU 3.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Altered fire regimes can have adverse effects on riparian vegetation by removing important cover and protection for giant gartersnakes. Repeated wildfires can affect upland habitat by eliminating or reducing the numbers of small fossorial mammals (primarily ground squirrels and pocket gophers) and associated burrows which provide winter aestivation habitat for giant gartersnake. Repeated fires in upland habitat can also alter watershed hydrology and adversely affect aquatic habitats. Effects of wildfire suppression on giant gartersnake habitat will be minimized through implementation of these AMMs and the Preserve System Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	None required for this species.	No effect on this species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) GGS-1 (Giant Gartersnake Surveys)	Vibration and noise issues will indirectly affect the use of upland habitats by giant gartersnake (e.g., disruption of movement patterns and diurnal cycles). As with many amphibians and reptiles, giant gartersnakes are sensitive to vibration (especially when aestivating in underground refugia) and noise. Vibration can adversely affect giant gartersnakes by forcing them to leave existing underground refugia, basking areas, and cover habitat, and to move to other locations further away from the vibration source,

Table 6-67
Permanent Indirect Effects on Giant Gartersnake

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		which can make them more susceptible to predation. Since giant gartersnakes are sensitive to disturbance and tend to remain hidden under cover while out of the water, noise can drive them from cover habitat and into open areas where they are more susceptible to predation. Implementation of these AMMs will minimize the potential for indirect effects from vibration and noise.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Increased human activity (including trash, debris, pets, OHVs, and trampling) in the vicinity of suitable aquatic habitats (Streams/Creeks, Freshwater Marshes, Seasonal Wetlands, and Open Water) and adjacent upland (aestivation) habitats will adversely affect the secretive giant gartersnake. The presence of trash in the vicinity of aquatic habitats can attract predators of giant gartersnake, and the presence of pets also results in predation of giant gartersnakes. OHV use can disrupt soils, runoff patterns, and small mammal activity and can affect drainage pathways, increasing erosion and introducing harmful substances to the watershed and aquatic habitats. Access to the preserve will be allowed via low effect trails. Implementation of AMMs will reduce potential effects of increased human activity within Preserves.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-9 (Soil Compaction)	Aquatic community alterations are most likely to affect giant gartersnakes through changes in prey base (which consists of amphibians, tadpoles, and small fish) resulting from habitat degradation, and through introduction or increases in the numbers of non-native aquatic predators, such as bullfrogs, that predate on young giant gartersnakes (neonates). Wildlife community alterations that reduce the number and types of prey items and favor potential competitors such as American bullfrogs, will adversely affect giant gartersnakes and associated aquatic habitat. Successful implementation of the Conservation Strategy described in Chapter 7 and the Monitoring and Management Program described in

Table 6-67
Permanent Indirect Effects on Giant Gartersnake

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) GGS-8 (Giant Gartersnake Post-Construction Restoration)	Chapter 8 will be key in addressing potential wildlife community alterations. Implementation of EDGE and ROAD AMMs, including those that require control of stormwater runoff, will ensure pollution will not enter giant gartersnake aquatic habitat, water chemistry of aquatic habitats will not be affected, invasive species spread will be controlled, and resultant wildlife community alterations in giant gartersnake aquatic habitat will not occur.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) GGS-8 (Giant Gartersnake Post-Construction Restoration)	Unmanaged proliferation of non-native aquatic vegetation will affect aquatic habitat for giant gartersnakes by outcompeting native vegetation and creating movement barriers for giant gartersnakes. Implementation of AMMs will minimize proliferation of non-native aquatic vegetation and reduce effects of non-native aquatic vegetation on giant gartersnake aquatic habitat relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	As described in Wildlife Community Alterations, invasion by non-native predators of giant garter snake such as American bullfrogs, non-native fishes including largemouth bass (*Micropterus salmoides*) and catfish (*Siluriformes* spp.), and the southern watersnake (*Nerodia fasciata*) can have adverse effects on aquatic communities and on the giant gartersnake. The introduction of predatory fish into giant gartersnake habitat generally results in eradication of giant gartersnakes. Additionally, invasive aquatic species typically consume the same aquatic organisms as the giant gartersnake which can substantially alter the prey base for giant gartersnakes. Indirect effects to giant gartersnakes and their habitat associated with invasive aquatic species will be minimized through the implementation of AMMs.

Table 6-67
Permanent Indirect Effects on Giant Gartersnake

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Mesopredators	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition, 4 ROAD-2 (Wildlife Crossing Structures)	Adverse effects on giant gartersnakes will occur as a result of the presence of mesopredators in aquatic habitats and during periods of upland movement and activity. Potential domestic and native mesopredators of giant gartersnake include domestic cats, river otters (*Lontra canadensis*), raccoons, skunks, opossums, and foxes, as well as several bird species. Implementation of these AMMs will minimize the potential for predation by mesopredators.
Wildlife Disease	None required for this species.	No effect on this species.
Pesticides and Fertilizers	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Indirect effects on giant gartersnake and suitable aquatic habitats will occur from pesticides (such as glyphosate) and fertilizer runoff (by killing potential prey items) from agriculture and from new urban developments in or near Preserves. These will be avoided by implementation of these AMMs.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition, 4 ROAD-2 (Wildlife Crossing Structures) GGS-1 (Giant Gartersnake Surveys)	Even though giant gartersnakes tend to avoid roads (especially paved roads), vehicles can adversely affect this species, primarily by running them over during early morning periods or after leaving aestivation burrows when metabolic rates are low. Recent research indicates that wildlife crossing structures may be effective in reducing road mortality of some snakes, including giant garter snake. Implementation of AMMs will reduce the potential for vehicle collisions with giant gartersnake.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-68
Temporary Effects to Giant Gartersnake

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-4 (Siting of Entry and Exit Location) GGS-1 (Giant Gartersnake Surveys) GGS-2 (Giant Gartersnake Work Window) GGS-3 (Giant Gartersnake Monitoring) GGS-4 (Giant Gartersnake Habitat Dewatering and Exclusion)	Potential erosion, runoff, and water quality effects on giant gartersnake aquatic habitat resulting from construction activities will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) GGS-1 (Giant Gartersnake Surveys) GGS-2 (Giant Gartersnake Work Window) GGS-3 (Giant Gartersnake Monitoring) GGS-4 (Giant Gartersnake Habitat Dewatering and Exclusion)	Inadvertent trampling of vegetation can adversely affect cover habitat used by giant gartersnakes. Implementation of AMMs ensures that trampling of potential cover vegetation for giant gartersnakes will not occur.
Construction Noise	Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-7 (Biological Monitor) GGS-1 (Giant Gartersnake Surveys) GGS-2 (Giant Gartersnake Work Window) GGS-3 (Giant Gartersnake Monitoring) GGS-4 (Giant Gartersnake Habitat Dewatering and Exclusion)	Loud noise can potentially affect giant gartersnakes while aboveground and possibly in underground refugia by forcing them to leave the area. Implementation of AMMs will reduce construction noise effects in the vicinity of giant gartersnake habitat.

Table 6-68
Temporary Effects to Giant Gartersnake

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Construction Ground Vibration	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) GGS-1 (Giant Gartersnake Surveys) GGS-2 (Giant Gartersnake Work Window) GGS-3 (Giant Gartersnake Monitoring) GGS-4 (Giant Gartersnake Habitat Dewatering and Exclusion)	Ground vibration can force giant gartersnakes to leave underground refugia to move away from the vibration source, exposing them to potential predation. Implementation of AMMs will reduce ground vibration effects from construction activities near giant gartersnake habitat.
Construction Lighting	Condition 3, BMP-6 (Construction Lighting) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) GGS-1 (Giant Gartersnake Surveys) GGS-2 (Giant Gartersnake Work Window) GGS-3 (Giant Gartersnake Monitoring) GGS-4 (Giant Gartersnake Habitat Dewatering and Exclusion)	Construction lighting directed towards giant gartersnake upland habitat can restrict the ability of giant gartersnakes to forage aboveground during the night. Implementation of AMMs will minimize construction lighting effects on giant gartersnakes by ensuring that construction lighting is directed away from adjacent natural habitats.
Construction Dust	None required for this species.	No effect on this species.
Increased Human Presence during Construction	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) GGS-1 (Giant Gartersnake Surveys) GGS-2 (Giant Gartersnake Work Window) GGS-3 (Giant Gartersnake Monitoring) GGS-4 (Giant Gartersnake Habitat Dewatering and Exclusion) GGS-7 (Giant Gartersnake Encounter Protocol)	Due to the giant gartersnake's secretive nature and its sensitivity to human presence, increased human activity in construction and maintenance areas will affect the utilization of adjacent upland habitat by giant gartersnakes. Additionally, personnel bringing pets (e.g., dogs) to work sites could also adversely affect giant gartersnakes. Implementation of AMMs ensures that increased human presence does not occur.
Construction Trash and Debris	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) GGS-1 (Giant Gartersnake Surveys) GGS-2 (Giant Gartersnake Work Window) GGS-3 (Giant Gartersnake Monitoring) GGS-4 (Giant Gartersnake Habitat Dewatering and Exclusion)	Trash and debris would adversely affect giant gartersnakes by attracting nuisance pest species which could adversely affect this species. Implementation of AMMs will ensure that construction trash and debris will be monitored and controlled.

Temporary Effects

Giant gartersnake occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to the giant gartersnake. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently affected in the direct effects and the area of indirect effects to Seasonal Wetland, Freshwater Marsh, Open Water, and Streams/Creeks hydrology reported in Table 6-65). Specific AMMs have been developed to minimize potential effects on giant gartersnake including GGS-1, surveys to delineate aquatic habitat and adjacent areas within 300 feet of a project footprint; GGS-2, work window during the snake's active season; GGS-3, monitoring requirements when Covered Activities occur in giant gartersnake modeled habitat; GGS-4, habitat dewatering procedures and installation of exclusion fencing; GGS-5, procedures to avoid entrapment of giant gartersnake in modeled habitat; GGS-6, use of non-entangling erosion control material; GGS-7, giant gartersnake encounter protocol during construction activities; and GGS-8, post construction restoration of temporarily disturbed areas.

These potential construction-related environmental stressors were generally described in Section 6.3.2, and their additional effects on western spadefoot are qualitatively described in Table 6-68.

6.6.17 Western Pond Turtle

Permanent Effects

Permanent direct and indirect effects of Covered Activities on western pond turtle will include modification or significant degradation of modeled aquatic and upland habitats (see Section 3.2 and Figures 3-2 and 3-19) and the direct and indirect take of western pond turtle individuals occupying that modified or degraded habitat.

Modeled species habitat for western pond turtle includes aquatic habitat comprising Freshwater Marsh, Open Water, and Streams/Creeks; and upland habitat that includes Blue Oak Woodland, Blue Oak Savanna, Valley Grassland, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub habitat. Western pond turtles occur throughout much of the Plan Area, although the majority of the occurrence records (14 out of a total of 16 records within the Plan Area) are located outside the UDA, primarily in PPUs 6 and 7 (Figure 3-19).

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 10,972 acres of total modeled aquatic and upland habitats within the Plan Area, including approximately 316 acres (out of a total of 6,355 acres) of modeled aquatic habitat and approximately 10,656 acres (out of a total of 110,846 acres) of modeled upland habitat (Table 6-69). Permanent effects of Covered Activities on modeled aquatic habitat will occur primarily within the UDA, with approximately 282 acres (out of a total of 638 acres) of permanent effects inside the UDA, and a total of approximately 34 acres (out of a total of 5,717 acres) of permanent effects outside the UDA. Covered Activity effects on modeled upland habitat will also occur primarily inside the UDA, with a total of approximately 10,064 acres (out of a total of 13,503 acres) of permanent effects inside the UDA, and a total of approximately 592 acres (out of a total of 97,343 acres) outside the UDA. Although the majority of modeled habitats inside the UDA would be directly affected, the few occurrence records and the high existing level of anthropogenic effects in this portion of the UDA indicates that these modeled habitat effects are unlikely to have substantial, if any, effect on extant western pond turtle populations in the Plan Area.

Table 6-69
Western Pond Turtle Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Plan-Wide Upland Habitat												
Blue Oak Woodland	7,610	9	Qualitative	9	0	0	Qualitative	0	7,610	9	Qualitative	9
Blue Oak Savanna	4,825	35	Qualitative	35	0	0	Qualitative	0	4,825	35	Qualitative	35
Valley Grassland	91,580	10,256	Qualitative	10,256	13,034	9,747	Qualitative	9,747	78,546	509	Qualitative	509
Mine Tailing Riparian Woodland	306	41	Qualitative	41	41	41	Qualitative	41	265	0	Qualitative	0
Mixed Riparian Woodland	5,347	170	Qualitative	170	232	134	Qualitative	134	5,115	36	Qualitative	36
Mixed Riparian Scrub	1,178	145	Qualitative	145	196	142	Qualitative	142	982	3	Qualitative	3
Total Upland Habitat	*110,846*	*10,656*	*Qualitative*	*10,656*	*13,503*	*10,064*	*Qualitative*	*10,064*	*97,343*	*592*	*Qualitative*	*592*
Plan-Wide Aquatic Habitat												
Freshwater Marsh	2,240	95	Qualitative	95	327	87	Qualitative	87	1,913	8	Qualitative	8
Open Water	1,441	104	Qualitative	104	148	103	Qualitative	103	1,293	1	Qualitative	1
Stream/Creeks	2,674	117	Qualitative	117	163	92	Qualitative	92	2,511	25	Qualitative	25
Total Aquatic Habitat	*6,355*	*316*	*Qualitative*	*316*	*638*	*282*	*Qualitative*	*282*	*5,717*	*34*	*Qualitative*	*34*
GRAND TOTAL	**117,201**	**10,972**	**Qualitative**	**10,972**	**14,141**	**10,346**	**Qualitative**	**10,346**	**103,060**	**626**	**Qualitative**	**626**

Western pond turtles in the Plan Area will be affected by permanent indirect effects to both aquatic and upland habitats, as well as harm and harassment of individuals. Potential indirect effects of the Covered Activities include management and monitoring; habitat fragmentation and isolation; altered hydrology and water quality degradation including introduction of pollutants, toxins, pesticides, and fertilizers; increased human activity (including trash, pets, debris, OHVs, and trampling); altered fire regime; aquatic community alterations (including increased predation); vibration and noise issues; and vehicle collisions.

Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on western pond turtle is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be accidental fire ignitions and other road-related effects (e.g., road runoff, potential spread of invasive plants). The potential permanent indirect effects of Covered Activities are described in Table 6-70, along with AMMs to avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing preserves or proposed SSHCP preserves, certain uses will be allowed inside Preserve and in Preserve Setbacks that may indirectly affect western pond turtle. This effects analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Table 6-70
Permanent Indirect Effects on Western Pond Turtle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 4, ROAD-1 (Road Project Location) Condition 7, STREAM-1 (Laguna Creek Wildlife Corridor) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams) Condition 8, UTILITY-2 (Utility Maintenance on Preserves)	Altered hydrology and water quality degradation will adversely affect the suitability of aquatic habitats to support foraging and movement pathways. Altered hydrology will adversely affect western pond turtles by affecting water levels and movement through aquatic pathways to other aquatic habitats and dispersal of juvenile turtles to other habitats. Water quality degradation including introduction of various pollutants, toxins, pesticides, and fertilizers will have an adverse effect on western pond turtles (which prefer good water quality conditions), especially for developing hatchling turtles. The close proximity of planned roads and development to habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that alters normal hydroperiods in pools and contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution does not enter western pond turtle aquatic habitat and that water chemistry of aquatic habitats will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP Preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread)	Habitat fragmentation and isolation will have several adverse effects on western pond turtles although this species will move short distances through upland habitats to reach other suitable aquatic habitats, even though they prefer to move along aquatic pathways. These adverse effects include: (1) exposing aquatic habitat located close to development and roads to disruptive urban edge effects such as altered hydrology (e.g., increased runoff), pollutants, toxins, pesticides and fertilizers, and human activities (trampling, OHVs, pets, trash and debris, etc.); (2) collisions with vehicles when crossing paved roads; (3) interactions with urban-related predators; (4) increased vulnerability to negative demographic trends, including genetic bottlenecks, genetic drift, and inbreeding depression in areas where aquatic links to other occupied aquatic habitats are not available; and (5) disruption of

Table 6-70
Permanent Indirect Effects on Western Pond Turtle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 7, STREAM-2 (UDA Stream Setbacks) Condition 7, STREAM-3 (Minor Tributaries to UDA Streams)	natural interconnectivity of occupied aquatic habitats important for dispersal and colonization, thus reducing the natural exchange of western pond turtles between aquatic habitats. Many of the effects of habitat fragmentation and isolation on western pond turtles, including the majority of the edge effects, are most likely to occur inside the UDA where the Preserves will be bordered by urban development and roads are planned to cross some proposed preserves.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Altered fire regimes can have adverse effects on western pond turtles by removing riparian vegetation that provides important cover and protection adjacent to aquatic habitats and removing upland vegetation (shrubs, woodlands, etc.) used for cover. Increased fires could also adversely affect nest sites (where hatchlings may reside for several months following emergence) and upland overwintering sites (where they bury themselves in loose soil until the weather warms). Repeated fires in upland habitat can also alter watershed hydrology and adversely affect aquatic habitats. Effects of wildfire suppression on western pond turtle habitat will be minimized through implementation of these AMMs and the Preserve Management Plan, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	None required for this species.	No effect on this species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) WPT-1 (Western Pond Turtle Surveys)	As with many amphibians and reptiles, western pond turtles are sensitive to vibration and noise. Vibration and noise issues will indirectly affect the use of aquatic and upland habitats by western pond turtle (e.g., disruption of movement patterns and basking and foraging activities, disturbance of nest sites where hatchlings may reside for several months following emergence or abandonment of nest sites, and disturbance of upland overwintering sites (where they bury themselves in loose soil until the weather warms).

Table 6-70
Permanent Indirect Effects on Western Pond Turtle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		Depending on the proximity of the vibration source, western pond turtles may abandon sites and move further away from the vibration source, which can make them more susceptible to predation. Since western pond turtles are sensitive to disturbance, noise can disturb basking sites and potentially overwintering sites. Implementation of these AMMs will minimize the potential for indirect effects from vibration and noise.
Lighting	None required for this species.	No effect on this species.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Increased human activity (including trash, debris, pets, OHVs, trampling, and just the presence of humans) in the vicinity of suitable aquatic habitats (streams/creeks, freshwater marshes, and open water) and adjacent upland (aestivation) habitats will adversely affect western pond turtles. Since western pond turtles are very shy and cryptic, just the presence of humans and other activities near aquatic habitats can adversely affect western pond turtle foraging and basking activities. Increased human activity will also indirectly affect overwintering sites (where they bury themselves in loose soil until the weather warms) and nest sites (where hatchlings may reside for several months following emergence). The presence of trash in the vicinity of aquatic habitats can attract predators of western pond turtles, and the presence of pets can also result in predation of western pond turtles. Trash in the vicinity of aquatic habitats can attract predators of western pond turtles. OHV use can disrupt soils and runoff patterns, and western pond turtle aestivation sites and can affect drainage pathways, increasing erosion and introducing harmful substances to the watershed and aquatic habitats. Access to the Preserve will be allowed via low effect trails. Implementation of AMMs will reduce potential effects of increased human activity on western pond turtles in Preserves.

Table 6-70
Permanent Indirect Effects on Western Pond Turtle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location)	Aquatic community alterations are most likely to affect western pond turtles through changes in prey base (primarily larvae of aquatic insects, earthworms, mollusks, crustaceans, and vertebrates such as tadpoles, frogs, small fish, and various aquatic/emergent plants) resulting from habitat degradation, and through introduction or increases in the numbers of non-native aquatic predators, such as the American bullfrog and introduced warm freshwater fish, such as bass, which prey on small juvenile turtles and hatchlings. Wildlife community alterations that reduce the number and types of prey items and favor potential competitors such as American bullfrogs and warm water fish species will adversely affect western pond turtles and associated aquatic habitat. Successful implementation of the Conservation Strategy described in Chapter 7 and the Monitoring and Management Program described in Chapter 8 will be key in addressing potential wildlife community alterations. Implementation of EDGE and ROAD AMMs, including those that require control of stormwater runoff, will ensure pollution will not enter western pond turtle aquatic habitat, water chemistry of aquatic habitats will not be affected, invasive species spread will be controlled, and resultant wildlife community alterations in western pond turtle aquatic habitat will not occur.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native aquatic vegetation will affect shallow water areas which provide nursery habitat for hatchlings. Implementation of AMMs will minimize proliferation of non-native aquatic vegetation and reduce effects of non-native aquatic vegetation on hatchling nursery habitat relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses)	As described in Wildlife Community Alterations, the introduction of non-native predators can have adverse effects on aquatic

Table 6-70
Permanent Indirect Effects on Western Pond Turtle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	communities and on western pond turtle. Many species of animals are predators of western pond turtles, including most animals that are sufficiently large to consume either a hatchling or adult. Most mustelids inhabiting areas near aquatic habitats, including river otters and mink (*Mustelidae* spp.), are predators of adult western pond turtles. Many other mammals including canids and many bird species such as great blue herons (*Ardea herodias)*, may be an important predator of hatchlings. Introduced American bullfrogs, smallmouth bass (*Micropterus dolomieu*), and largemouth bass have been documented predating on hatchlings. Raccoons and striped skunks have been documented as nest predators. In human-altered landscapes, predation may be higher due to a greater abundance of medium-sized predators. Indirect effects to western pond turtles and their habitat associated with invasive aquatic species will be minimized through the implementation of AMMs.
Mesopredators	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition, 4 ROAD-2 (Wildlife Crossing Structures)	Adverse effects on western pond turtles will occur as a result of the presence of mesopredators in aquatic habitats and during periods of upland movement and activity. Potential domestic and native mesopredators of western pond turtles include river otters, raccoons, skunks, as well as several large bird species (e.g., great blue herons). Implementation of these AMMs will minimize the potential for predation by mesopredators.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread)	The pet trade also threatens western pond turtles through the release of non-native pet turtles into natural areas. This practice could increase competition for limited resources and introduce diseases to native turtles. Introduction of pet turtles, release of captive-reared turtles, and translocations from one location to another may increase the risk of disease transmission. Implementation of AMMs will reduce the potential for transmission of diseases from non-native turtles to western pond turtles.

Table 6-70
Permanent Indirect Effects on Western Pond Turtle

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Pesticides and Fertilizers	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Indirect effects on western pond turtles and suitable aquatic habitats that occur from pesticides (such as glyphosate) and fertilizer runoff (by killing potential prey items and potentially affecting hatchling turtles) from agriculture and from new urban developments in or near Preserves will be avoided by implementation of these AMMs.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) WPT-1 (Western Pond Turtle Surveys) WPT-7 (Western Pond Turtle Modeled Habitat Speed Limit)	Even though western pond turtles tend to avoid roads (especially paved roads), vehicles can adversely affect this species, primarily by running them over during surface movements or after leaving nest sites. Road mortality is an important threat particularly in urban and recreational areas. Implementation of AMMs will reduce the potential for vehicle collisions with western pond turtles.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-71
Temporary Effects to Western Pond Turtle

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 3, BMP-2 (Erosion Control)	Potential erosion, runoff, and water quality effects on western pond turtle aquatic habitat resulting from construction activities will be fully avoided through implementation of AMMs.

Table 6-71
Temporary Effects to Western Pond Turtle

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location) Condition 8, UTILITY-2 (Utility Maintenance on Preserves) Condition 8, UTILITY-4 (Siting of Entry and Exit Location) WPT-1 (Western Pond Turtle Surveys) WPT-2 (Western Pond Turtle Work Window) WPT-3 (Western Pond Turtle Monitoring) WPT-4 (Western Pond Turtle Habitat Dewatering and Exclusion)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WPT-1 (Western Pond Turtle Surveys) WPT-2 (Western Pond Turtle Work Window) WPT-3 (Western Pond Turtle Monitoring) WPT-4 (Western Pond Turtle Habitat Dewatering and Exclusion)	Inadvertent trampling of vegetation outside the project footprint can adversely affect overwintering sites (where they bury themselves in loose soil until the weather warms) and nest sites where hatchlings may reside for several months following emergence, and hatchlings using vegetation for cover or while moving to aquatic locations. Implementation of AMMs ensures that trampling of vegetation will not occur outside the project footprint.
Construction Noise	Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-7 (Biological Monitor) WPT-1 (Western Pond Turtle Surveys) WPT-2 (Western Pond Turtle Work Window) WPT-3 (Western Pond Turtle Monitoring) WPT-4 (Western Pond Turtle Habitat Dewatering and Exclusion)	Loud noise can potentially affect western pond turtles while basking at aquatic sites, at nest sites where hatchlings may reside for several months following emergence, and at overwintering sites (where they bury themselves in loose soil until the weather warms) by forcing them to leave the area. Implementation of AMMs will reduce construction noise effects in the vicinity of western pond turtle habitat.
Construction Ground Vibration	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WPT-1 (Western Pond Turtle Surveys) WPT-2 (Western Pond Turtle Work Window) WPT-3 (Western Pond Turtle Monitoring) WPT-4 (Western Pond Turtle Habitat Dewatering and Exclusion)	Ground vibration can force western pond turtles to leave shoreline basking sites, nest sites (where hatchlings may reside for several months following emergence), and upland overwintering sites (where they bury themselves in loose soil until the weather warms) and move to other locations away from the vibration source, exposing them to potential predation. Implementation of AMMs will

Table 6-71
Temporary Effects to Western Pond Turtle

Environmental Stressor	Effect Reduced By	Potential Effect on Species
		reduce ground vibration effects from construction activities near western pond turtle habitat.
Construction Lighting	None required for this species.	No effect on this species.
Construction Dust	None required for this species.	No effect on this species.
Increased Human Presence during Construction	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WPT-1 (Western Pond Turtle Surveys) WPT-2 (Western Pond Turtle Work Window) WPT-3 (Western Pond Turtle Monitoring) WPT-4 (Western Pond Turtle Habitat Dewatering and Exclusion) WPT-7 (Western Pond Turtle Modeled Habitat Speed Limit) WPT-8 (Western Pond Turtle Encounter Protocol)	Due to the secretive and shy nature of the western pond turtle and its sensitivity to human presence, increased human activity in construction and maintenance areas will affect the use of basking sites and upland overwintering sites (where they bury themselves in loose soil until the weather warms). Additionally, personnel bringing pets (e.g., dogs) to work sites could also adversely affect western pond turtle hatchlings, juveniles, and adults. Implementation of AMMs ensures that increased human presence does not occur.
Construction Trash and Debris	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) WPT-1 (Western Pond Turtle Surveys) WPT-2 (Western Pond Turtle Work Window) WPT-3 (Western Pond Turtle Monitoring) WPT-4 (Western Pond Turtle Habitat Dewatering and Exclusion)	Trash and debris would adversely affect western pond turtles by attracting nuisance pest species which could adversely affect this species. Implementation of AMMs will ensure that construction trash and debris will be monitored and controlled.

Temporary Effects

Western pond turtle occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to the western pond turtle. Additionally, overwintering sites (where juveniles and adults bury themselves in loose soil) and nest sites where hatchlings may reside for several months following emergence, may also be temporarily affected by Covered Activities. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently affected in the direct effects and the area of indirect effects to freshwater marsh, open water, and stream/creek hydrology reported in Table 6-69). Specific AMMs have been developed to minimize potential effects on western pond turtles including WPT-2, western pond turtle surveys; WPT-2, work window outside western pond turtle's active season; WPT-3, monitoring requirements when Covered Activities occur; WPT-4, habitat dewatering and exclusion fencing when Covered Activities occur in aquatic habitat; WPT-5, procedures to avoid entrapment of western pond turtles when Covered Activities occur in modeled habitat; WPT-6, use of non-entangling materials if erosion control BMP-2 is implemented; WPT-7, modeled habitat speed limit; and WPT-9 western pond turtle encounter protocol when western pond turtles are encountered.

These potential construction-related environmental stressors were generally described in Section 6.3.2, and their additional effects on western pond turtle are qualitatively described in Table 6-71.

6.6.18 Cooper's Hawk

Permanent Effects

Permanent direct and indirect effects of Covered Activities on Cooper's hawk (*Accipiter cooperii*) will include modification or removal of modeled habitat, increased human activity, invasive plants and animals introduced into modeled habitat, vehicle and aircraft collisions with Cooper's hawk, and increased risk of wildlife disease.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 638 acres of modeled habitat for Cooper's hawk in the Plan Area out of a total of 22,646 acres available, including 600 acres of modeled nesting/foraging habitat and 38 acres of modeled foraging habitat (Table 6-72). The 98% of direct effects on modeled nesting/foraging habitat will occur inside the UDA. Nearly all modeled foraging habitat for Cooper's hawk is located outside the UDA in areas that will not be affected by Covered Activities. Overall, outside the UDA, 36 of 5,619 acres of foraging habitat and 50 of 16,304 acres of modeled nesting/foraging habitat will be directly affected. Inside the UDA, 550 of 705 acres of modeled nesting/foraging habitat and 2 acres of 18 acres of modeled foraging habitat will be directly affected.

Table 6-72
Cooper's Hawk Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Nesting/Foraging Habitat												
Blue Oak Woodland	9,132	9	Qualitative	9	0	0	Qualitative	0	9,132	9	Qualitative	9
Mixed Riparian Woodland	5,785	184	Qualitative	184	244	146	Qualitative	146	5,541	38	Qualitative	38
Mixed Riparian Scrub	1,451	189	Qualitative	189	241	186	Qualitative	186	1,210	3	Qualitative	3
Mine Tailing Riparian Woodland	641	218	Qualitative	218	220	218	Qualitative	218	421	0	Qualitative	0
Total Nesting/Foraging Habitat	*17,009*	*600*	*Qualitative*	*600*	*705*	*550*	*Qualitative*	*550*	*16,304*	*50*	*Qualitative*	*50*
Foraging Habitat												
Blue Oak Savanna	5,637	38	Qualitative	38	18	2	Qualitative	2	5,619	36	Qualitative	36
Total Foraging Habitat	*5,637*	*38*	*Qualitative*	*38*	*18*	*2*	*Qualitative*	*2*	*5,619*	*36*	*Qualitative*	*36*
GRAND TOTAL	**22,646**	**638**	**Qualitative**	**638**	**723**	**552**	**Qualitative**	**552**	**21,923**	**86**	**Qualitative**	**86**

In addition to the direct effects quantified in Table 6-72, Covered Activities will indirectly affect Cooper's hawk nesting/foraging and foraging habitats, and will also indirectly injure, kill, or harass individual Cooper's hawk in the Plan Area (Table 6-73). These effects will be reduced through implementation of the AMMs described in Table 6-73. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on Cooper's hawk is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, human activity, trash, and utility strikes.

In addition to the general AMMs (Section 5.4.1), raptor-specific measures (Section 5.4.2) will be implemented to minimize permanent direct and indirect effects on Cooper's hawk due to Covered Activities. Mortality and injury of individual Cooper's hawks will occur in the Plan Area due to Covered Activities; however, mortality and injury will be minimized through the implementation of AMMs. There is also a small risk of take in the form of harassment over the duration of the Permit Term (e.g., inhibiting individuals from nesting or foraging in some areas). Some nest sites will be directly affected by Covered Activities because Cooper's hawk is a nesting resident in the Plan Area.

Table 6-73
Permanent Indirect Effects on Cooper's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter waterways that run through riparian areas where Cooper's hawk prey could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) RAPTOR-1 (Raptor Surveys)	Although Cooper's hawks are highly mobile and able to fly over unsuitable landscapes, habitat fragmentation will have at least two adverse effects on the species: (1) potentially exposing suitable nesting habitat to urban edges, thus increasing the potential for disruptive effects, such as noise, lighting, human activities, and urban-related predators; and (2) forcing birds to fly farther to suitable foraging areas, thus increasing energetic demands and time away from the nest, thereby increasing the potential for egg and/or chick predation, as well as increasing other risks, such as collisions with vehicles and man-made structures. The Landscape Preserves established[7] outside the UDA will avoid effects of habitat fragmentation on Cooper's hawk. Within the UDA, habitat fragmentation will affect Cooper's hawk because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP

[7] Note that in the context of this Plan, the word "establish" is synonymous with "create."

Table 6-73
Permanent Indirect Effects on Cooper's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		Preserve System will minimize the effects of habitat fragmentation on Cooper's hawk in the Plan Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Within the UDA, wildfire can eliminate or reduce suitable nesting substrates for Cooper's hawk. Repeated or intense wildfires will also affect foraging habitat quality through direct mortality of prey (e.g., birds, small mammals, reptiles, and amphibians) and general habitat degradation. Effects of increased wildfire on Cooper's hawk habitat will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Does not apply to this species.	No effect on this species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Noise could indirectly affect the use of nesting and foraging habitat by Cooper's hawk. Implementation of these AMMs will minimize chronic noise in close proximity to Cooper's hawk habitat.
Lighting	EDGE-8 (Outdoor Lighting) RAPTOR-1 (Raptor Surveys)	Lighting will affect Cooper's hawks if it is near a nest (the lighted area will depend on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation), and will primarily act to disrupt normal nighttime rest and sleep patterns, and increase stress levels. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally active birds, causing them to abandon the nest and/or become disoriented. Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittee determines lighting is necessary for public safety or security. During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to Cooper's hawk.

Table 6-73
Permanent Indirect Effects on Cooper's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects on Cooper's hawk are expected from increased human activity on Preserves and Preserve Setbacks. Potential effects include nest disturbance, introduction of invasive species, and collisions with vehicles. Implementation of AMMs ensures that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect Cooper's hawks or their habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) RAPTOR-1 (Raptor Surveys)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community by increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Implementation of AMMs such as those that require Trail Public Education will ensure human activity will have minimal effects to the wildlife community within Cooper's hawk habitat. Competition from non-native predators (dogs, coyotes) on prey species, and invasive plant and animal species that either outcompete or create unsuitable habitat for prey could also affect Cooper's hawk.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within Cooper's hawk habitat in the Plan Area. A change in vegetation structure could have an effect on prey species use of habitat and also restrict maneuverability of Cooper's hawk through the forest. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).

Table 6-73
Permanent Indirect Effects on Cooper's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described previously in Wildlife Community Alterations, invasion by non-native predators of Cooper's hawk and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects to Cooper's hawk and its prey by mesopredators will be minimized by implementing AMMs that reduce interaction between Cooper's hawk and urban wildlife (raccoon, opossum, fox) and pets.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Diseases transmitted from humans and pets could affect Cooper's hawk, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. Cooper's hawk is susceptible to avian flu and the protozoan *Trichomonas gallinae*. The SSHCP will have little direct control over potential disease transmission from ingested prey, such as pigeons and doves, because active control of these well-established and very common species is not likely feasible and therefore would not be an effective management action. However, potential transmission of diseases from human and pets in Preserves will be minimized by controlling access to Preserves through Condition 2 and Condition 5. Implementation of these AMMs will minimize the potential for introduction of this virus into local Cooper's hawk populations.

Table 6-73
Permanent Indirect Effects on Cooper's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on Cooper's hawk or their modeled habitat from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided by the implementation of AMMs.
Vehicle and Aircraft Collisions With Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) RAPTOR-1 (Raptor Surveys)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by Cooper's hawks near heavily trafficked areas and in urbanized areas. Covered Activities will therefore increase the frequency of vehicle and window strikes by Cooper's hawks. Indirect effects on Cooper's hawk associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to Cooper's hawk habitat. Otherwise, Cooper's hawk will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7).
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) RAPTOR-1 (Raptor Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all raptors, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on Cooper's hawk by incorporating the most current practices for avoiding avian powerline collisions.

Temporary Effects

In addition to the permanent removal of habitat described previously, Cooper's hawk nesting/foraging habitat or nest sites within 500 feet of proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects that will result in additional disturbance to habitat or additional injury, mortality, or harassment of individual Cooper's hawks. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects reported in Table 6-72).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on Cooper's hawk are qualitatively described in Table 6-74.

Table 6-74
Temporary Effects to Cooper's Hawk

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into Cooper's hawk riparian habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	None required for this species.	No effect on this species.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Loud noise can affect Cooper's hawk foraging patterns. Implementation of AMMs will minimize construction noise effects in the vicinity of Cooper's hawk foraging habitat.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	BMP-6 (Construction Lighting) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to Cooper's hawk.
Construction Dust	None required for this species.	No effect on this species.
Increased Human Presence During Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff)	Ground-disturbing activities that could affect Cooper's hawk involving increased human presence will be reduced by

Table 6-74
Temporary Effects to Cooper's Hawk

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	SPECIES-2 (No Pets in Construction Areas) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring	implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring	Trash and debris would adversely affect Cooper's hawk habitat quality through direct effects, such as attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.19 Ferruginous Hawk

Permanent Effects

Permanent direct and indirect effects of Covered Activities on ferruginous hawk (*Buteo regalis*) will include modification or removal of modeled habitat, increased human activity, invasive plants and animals introduced into modeled habitat, vehicle and aircraft collisions with ferruginous hawk, and increased risk of wildlife disease.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 25,491 acres of modeled foraging habitat for ferruginous hawk in the Plan Area (Table 6-75). Most of the direct effects on modeled foraging habitat will occur inside the UDA. Overall, 863 acres of modeled foraging habitat for ferruginous hawk outside the UDA will be directly affected. Inside the UDA, 24,628 of 35,221 acres of modeled foraging habitat will be directly affected.

Table 6-75
Ferruginous Hawk Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect**	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect**	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect**	*Indirect Effect*	*Total Effect*
Valley Grassland	135,112	22,014	Qualitative	22,014	30,345	21,345	Qualitative	21,345	104,767	669	Qualitative	669
Irrigated Pasture-Grassland	15,991	2,749	Qualitative	2,749	3,218	2,594	Qualitative	2,594	12,773	155	Qualitative	155
Seasonal Wetland	2,600	105	Qualitative	105	162	102	Qualitative	102	2,438	3	Qualitative	3
Vernal Pool	4,536	389	0	389	935	355	0	355	3,601	34	0	34
Swale	1,252	234	0	234	461	232	0	232	791	2	0	2
Total Nesting/ Foraging Habitat	**159,491**	**25,491**	**0**	**25,491**	**35,121**	**24,628**	**0**	**24,628**	**124,370**	**863**	**0**	**863**

* Indirect effects to Vernal Pool and Swale are not presented for this species, as interruption of the supporting hydrology would result in conversion to Valley Grassland, which is assumed in the SSHCP to provide comparable foraging habitat.

In addition to the direct effects quantified in Table 6-75, Covered Activities will indirectly affect ferruginous hawk foraging habitats, and will also injure, kill, or harass ferruginous hawk individuals in the Plan Area (Table 6-76). These effects will be reduced through implementation of the AMMs described in Table 6-76. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on ferruginous hawk is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, human activity, trash, and utility strikes.

In addition to the general AMMs (Section 5.4.1), raptor-specific measures (Section 5.4.2) will be implemented to minimize permanent direct and indirect effects on ferruginous hawk due to Covered Activities. Mortality and injury of individual ferruginous hawks will occur in the Plan Area due to Covered Activities; however mortality and injury will be minimized through the implementation of AMMs. There is also a small risk of take in the form of harassment over the duration of the Permit Term (e.g., inhibiting individuals from foraging in some areas).

Table 6-76
Permanent Indirect Effects on Ferruginous Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter waterways that run through riparian areas where ferruginous hawk prey could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) RAPTOR-1 (Raptor Surveys)	Habitat fragmentation will have adverse effects on this species, forcing birds to fly farther to suitable foraging areas, thus increasing energetic demands, as well as increasing other risks, such as collisions with vehicles and man-made structures. The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on ferruginous hawk. Within the UDA, habitat fragmentation will affect ferruginous hawk because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on ferruginous hawk in the Plan Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Repeated or intense wildfires will affect foraging habitat quality through direct mortality of prey (e.g., birds, small mammals, reptiles, and amphibians) and general habitat degradation. Effects of increased wildfire on ferruginous hawk habitat will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.

Table 6-76
Permanent Indirect Effects on Ferruginous Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Effects on ferruginous hawks due to vernal pool hydrologic alterations are mainly associated with prey base. Hydrologic alterations could affect patterns of foraging for small mammals that make up the prey base for ferruginous hawks. Implementation of AMMs will significantly reduce effects of vernal pool hydrologic alterations on prey species.
Chronic Ground Vibration and Noise	Does not apply to this species. Noise would only affect nesting birds and ferruginous hawks are winter visitors to the Plan Area.	No effect on this species.
Lighting	EDGE-8 (Outdoor Lighting) BMP-6 (Construction Lighting) RAPTOR-1 (Raptor Surveys)	Lighting will mildly affect ferruginous hawks, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation, and will act primarily to disrupt normal nighttime rest and sleep patterns and increase stress levels. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally-active birds, causing them to become disoriented. Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittee determines lighting is necessary for public safety or security. During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to ferruginous hawk.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-11 (Speed Limit) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects on ferruginous hawk from increased human activity on Preserves and Preserve Setbacks are expected. Potential effects include introduction of invasive species and collisions with vehicles. Implementation of AMMs ensures that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect ferruginous hawks or their habitat.

Table 6-76
Permanent Indirect Effects on Ferruginous Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) RAPTOR-1 (Raptor Surveys)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community by increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Implementation of AMMs such as those that require Trail Public Education will ensure human activity will have minimal effects to the wildlife community within ferruginous hawk habitat. Competition from non-native predators (e.g., dogs, coyotes) on prey species, and invasive plant and animal species that either outcompete or create unsuitable habitat for prey could also affect ferruginous hawk.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within ferruginous hawk habitat in the Plan Area. A change in vegetation structure could have an effect on prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	As described previously in Wildlife Community Alterations, invasion by non-native predators of ferruginous hawk and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.

Table 6-76
Permanent Indirect Effects on Ferruginous Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects to ferruginous hawk and its prey by mesopredators will be minimized by implementing AMMs that reduce interaction between ferruginous hawk and urban wildlife (raccoon, opossum, fox) and pets.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	Diseases transmitted from humans and pets could affect ferruginous hawk and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. Ferruginous hawks are susceptible to avian flu and the protozoan *Trichomonas gallinae*. The SSHCP will have little direct control over potential disease transmission from ingested prey, such as pigeons and doves, because active control of these well-established and very common species is not likely feasible and therefore would not be an effective management action. However, potential transmission of diseases from human and pets in Preserves will be minimized by controlling access to Preserves through Conditions 2 and 5. Implementation of these AMMs will minimize the potential for introduction of these diseases into local ferruginous hawk populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on ferruginous hawk or the Valley Grassland Ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near the SSHCP Preserves will be avoided through the implementation of AMMs.

Table 6-76
Permanent Indirect Effects on Ferruginous Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Vehicle and Aircraft Collisions With Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures) RAPTOR-1 (Raptor Surveys)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by ferruginous hawks near heavily trafficked areas and in urbanized areas. Covered Activities will therefore increase the frequency of vehicle and window strikes by ferruginous hawks. Indirect effects on ferruginous hawk associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to ferruginous hawk habitat. Otherwise, ferruginous hawk will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7).
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) RAPTOR-1 (Raptor Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all raptors, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on ferruginous hawk by incorporating the most current practices for avoiding avian powerline collisions.

Temporary Effects

Ferruginous hawks wintering and foraging in the Plan Area will be affected by several temporary construction-related effects that could result in additional habitat disturbance or additional injury, mortality, or harassment of individual ferruginous hawks (Table 6-77). These potential construction-related effects were generally described in Section 6.3.2 and include dust; noise and ground vibration; general human activity; inadvertent grading, clearing, or trampling of habitat; and trash and debris.

Table 6-77
Temporary Effects to Ferruginous Hawk

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into ferruginous hawk riparian habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of vegetation could cause ferruginous hawk prey to avoid habitat. Implementation of AMMs ensures that trampling and compaction do not occur.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Loud noise can affect ferruginous hawk foraging patterns. Implementation of AMMs will minimize construction noise effects in the vicinity of ferruginous hawk foraging habitat.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	BMP-6 (Construction Lighting) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to ferruginous hawk.
Construction Dust	None required for this species.	No effect on this species.

Table 6-77
Temporary Effects to Ferruginous Hawk

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Increased Human Presence During Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Ground-disturbing activities that could affect ferruginous hawk involving increased human presence will be reduced by implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Trash and debris would adversely affect ferruginous hawk habitat quality through direct effects, such as attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled.

Temporary direct effects on ferruginous hawk will occur in two main ways: (1) directly inhibiting use of foraging sites, and (2) effects on foraging habitat quality. Ferruginous hawks could avoid foraging in areas near construction activities, especially those involving mass grading and noisy construction equipment and a high number of construction personnel and vehicles. Noise associated with large-scale construction activities, such as mass grading, as well as noisy maintenance Covered Activities, affects foraging by ferruginous hawks by causing them to avoid noisy areas. However, such noise effects will be temporary and limited to areas immediately adjacent to noisy Covered Activities and will not have a substantial adverse effect on ferruginous hawk foraging behavior, given the remaining large expanse of suitable foraging habitat in the SSHCP Preserve System and Plan Area in general (see Chapter 7).

Foraging habitat quality will be reduced in areas bordering construction sites, including degradation of vegetation communities from dust and the absence or reduced abundance of important prey, such as rabbits, California ground squirrels (*Otospermophilus beecheyi*), and pocket gophers (*Geomyidae* spp.). These prey species could actively avoid construction areas due to effects, such as noise, lighting, and human activity, or because forage quality (e.g., fresh herbaceous vegetation) in areas near construction has been degraded by dust or inadvertent grading, clearing, or trampling. In addition, trash and debris at construction sites will attract urban-tolerant species, such as coyotes, that will compete with ferruginous hawks for prey. A variety of design and setback requirements and construction-related AMMs will be implemented to address temporary direct effects on ferruginous hawk habitat and individuals.

6.6.20 Swainson's Hawk

Permanent Effects

Permanent direct and indirect effects of Covered Activities on Swainson's hawk (*Buteo swainsoni*) will include modification or removal of modeled habitat, increased human activity, invasive plants and animals introduced into modeled habitat, vehicle and aircraft collisions with Swainson's hawk, and increased risk of wildlife disease.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 31,112 acres of total modeled habitat for Swainson's hawk in the Plan Area, including 373 acres of modeled nesting habitat and 30,739 acres of modeled foraging habitat (Table 6-78). Of the 30,739 acres of effects to modeled foraging habitat, 7,413 acres are high-value foraging habitat (Table 6-79). The 7,413 acres of high-value habitat effects are out of a total of 70,127 acres of high-value habitat in the Plan Area. Therefore, Covered Activities will affect relatively less of the high-value habitat compared to the overall effects on modeled foraging habitat in the Plan. Most of the permanent effects on modeled nesting and foraging habitat will occur inside the UDA, including 332 acres out of a total of 486 acres of modeled nesting habitat and 29,550 acres out of a total of 40,602 acres of modeled foraging habitat. Permanent effects on modeled nesting and foraging habitat that will occur outside of the UDA include impacts to 41 out of 6,748 acres of modeled nesting habitat, 1,189 out of 165,387 acres of modeled foraging habitat, and 659 out of 62,393 acres of high-value habitat.

Table 6-78
Swainson's Hawk Habitat Permanent Effects

Habitat Model Land Cover Types*	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect***	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect***	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect***	*Indirect Effect*	*Total Effect*
Nesting Habitat												
Mixed Riparian Woodland	5,785	184	Qualitative	184	244	146	Qualitative	146	5,541	38	Qualitative	38
Mixed Riparian Scrub	1,449	189	Qualitative	189	242	186	Qualitative	186	1,207	3	Qualitative	3
Total Nesting Habitat	**7,234**	**373**	**Qualitative**	**373**	**486**	**332**	**Qualitative**	**332**	**6,748**	**41**	**Qualitative**	**41**
Foraging Habitat												
Valley Grassland	133,705	21,977	Qualitative	21,977	30,345	21,345	Qualitative	21,345	103,360	632	Qualitative	632
Cropland	47,905	5,285	Qualitative	5,285	5,481	4,922	Qualitative	4,922	42,424	363	Qualitative	363
Irrigated Pasture-Grassland	15,991	2,749	Qualitative	2,749	3,218	2,594	Qualitative	2,594	12,773	155	Qualitative	155
Vernal Pool	4,536	389	0	389	935	355	0	355	3,601	34	0	34
Seasonal Wetland	2,600	105	Qualitative	105	162	102	Qualitative	102	2,438	3	Qualitative	3
Swale	1,252	234	0	234	461	232	0	232	791	2	0	2
Total Foraging Habitat	**205,989**	**30,739**	**0**	**30,739**	**40,602**	**29,550**	**0**	**29,550**	**165,387**	**1,189**	**0**	**1,189**
GRAND TOTAL	**213,223**	**31,112**	**0**	**31,112**	**41,088**	**29,882**	**0**	**29,882**	**172,135**	**1,230**	**0**	**1,230**

* The Swainson's hawk habitat model only includes land covers at elevations below 500 feet (see Section 3.4.5).

** Indirect effects to Vernal Pool and Swale are not presented for this species, as interruption of the supporting hydrology would result in conversion to Valley Grassland, which is assumed in the SSHCP to provide comparable foraging habitat.

Table 6-79
Swainson's Hawk High-Value Habitat Permanent Effects

Habitat Model Land Cover Types*	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect***	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect***	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect***	*Indirect Effect*	*Total Effect*
Foraging Habitat												
Cropland	38,669	3,648	Qualitative	3,648	3,491	3,313	Qualitative	3,313	35,178	335	Qualitative	335
Valley Grassland	20,190	2,269	Qualitative	2,269	2,627	2,060	Qualitative	2,060	17,563	209	Qualitative	209
Irrigated Pasture-Grassland	8,382	1,378	Qualitative	1,378	1,434	1,281	Qualitative	1,281	6,948	97	Qualitative	97
Vernal Pool	1,002	56	0	56	58	41	0	41	944	15	0	15
Seasonal Wetland	1,740	51	Qualitative	51	105	48	Qualitative	48	1,635	3	Qualitative	3
Swale	144	11	0	11	19	11	0	11	125	0	0	0
GRAND TOTAL	**70,127**	**7,413**	**0**	**7,413**	**7,734**	**6,754**	**0**	**6,754**	**62,393**	**659**	**0**	**659**

* High-value habitat for Swainson's hawk is modeled foraging habitat occurring in the western portion of the Plan Area (within PPUs 4, 6, and 8) (see Section 3.4.5). The Swainson's hawk habitat model only includes land covers at elevations below 500 feet (see Section 3.4.5).

** Indirect effects to Vernal Pool and Swale are not presented for this species, as interruption of the supporting hydrology would result in conversion to Valley Grassland, which is assumed in the SSHCP to provide comparable foraging habitat.

In addition to the direct effects quantified in Table 6-79, Covered Activities will indirectly affect Swainson's hawk nesting, foraging, and high-value habitats, and will also injure, kill, or harass Swainson's hawk individuals in the Plan Area (Table 6-80). These effects will be reduced through implementation of the AMMs described in Table 6-80. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on Swainson's hawk is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, human activity, trash, and utility strikes.

In addition to the general AMMs (Section 5.4.1), raptor-specific measures (Section 5.4.2) will be implemented to minimize permanent direct and indirect effects on Swainson's hawk due to Covered Activities. Mortality and injury of individual Swainson's hawks will occur in the Plan Area due to Covered Activities; however, mortality and injury will be minimized through the implementation of AMMs. There is also a small risk of take in the form of harassment over the duration of the Permit Term (e.g., inhibiting individuals from nesting or foraging in some areas). Some nest sites will be directly affected by Covered Activities because Swainson's hawk is a nesting resident in the Plan Area.

Table 6-80
Permanent Indirect Effects on Swainson's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Altered hydrology will adversely affect Swainson's hawks by reducing habitat quality of Mixed Riparian Woodland and Mixed Riparian Scrub land covers (nesting) and Vernal Pool and Valley-Grassland land covers (foraging). Riparian habitats are important nesting substrates for Swainson's hawks that will be degraded by altered hydrology, including significant increases or decreases in hydrology that will alter riparian community structure. Loss of riparian habitat is one of the factors contributing to the Swainson's hawk decline in the Central Valley (Bloom 1980; England et al. 1995). Altered hydrology will also affect foraging habitat. In particular, voles (*Muridae* ssp.), which are important prey for Swainson's hawk, occur in irrigated pastures, wet meadows, and dense grasslands that provide substantial cover and refugia. If these habitats become too dry and sparse, vole populations decline and will be replaced by less suitable prey. The close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter waterways that run through agricultural areas where Swainson's hawk prey could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control In Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) SWHA-1 (Swainson's Hawk Surveys)	Although Swainson's hawks are highly mobile and able to fly over unsuitable landscapes, habitat fragmentation and isolation will have at least two adverse effects on the species: (1) cause active nests to be close to habitat edges, thus exposing the nest to other disruptive edge effects, such as noise, lighting, and human activities; and (2) force birds to fly farther to suitable foraging areas, thus increasing energetic demands and time away from the nest and increasing the potential for egg and/or chick predation. Further, small, otherwise suitable, active nesting sites in fragmented habitat patches will be abandoned, functionally reducing the numbers of suitable nesting areas in the Plan Area. The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on Swainson's hawk. Within the UDA, habitat fragmentation will affect Swainson's hawk because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads

Table 6-80
Permanent Indirect Effects on Swainson's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on Swainson's hawk in the Plan Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring Of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Repeated or intense wildfires will affect foraging habitat quality through direct mortality of prey (e.g., insects, birds, small mammals, reptiles, and amphibians) and general habitat degradation. Effects of increased wildfire on Swainson's hawk habitat will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting Of Entry And Exit Location)	Effects on Swainson's hawks due to vernal pool hydrologic alterations are mainly associated with prey base. Hydrologic alterations could affect patterns of foraging for small mammals that make up the prey base for Swainson's hawks. Implementation of AMMs will significantly reduce effects of vernal pool hydrologic alterations on prey species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Noise could indirectly affect the use of nesting and foraging habitat by Swainson's hawk. Implementation of these AMMs will minimize chronic noise in close proximity to Swainson's hawk habitat.
Lighting	EDGE-8 (Outdoor Lighting) SWHA-1 (Swainson's Hawk Surveys)	Lighting could affect Swainson's hawks, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation, and will primarily act to disrupt normal nighttime rest and sleep patterns and increase stress levels. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally-active birds, causing them to become disoriented or leave a nest. Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittee determines lighting is necessary for public safety or security.

Table 6-80
Permanent Indirect Effects on Swainson's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to Swainson's hawk.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior To Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring Of Nature Trail Impacts)	Effects on Swainson's hawk are expected from increased human activity on Preserves and Preserve Setbacks. Potential effects include introduction of invasive species and collisions with vehicles. Implementation of AMMs ensures that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect Swainson's hawks or their habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control In Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access To Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring Of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) SWHA-1 (Swainson's Hawk Surveys)	Wildlife community alterations are most likely to affect Swainson's hawk through changes in prey availability as a result of habitat degradation. For example, voles in irrigated pastures, wet meadows, and dense grasslands may be replaced by less suitable prey, such as native and non-native mice and rats that occur in lower densities and are mostly active at night, if factors, such as altered hydrology and wildfire, degrade habitat for voles. Wildlife community alterations that favor potential competitors, such as red-tailed hawks (*Buteo jamaicensis*) and red-shouldered hawks (*Buteo lineatus*) (both of which are relatively urban-tolerant), and potential nest predators, such as great horned owl (*Bubo virginianus*), ravens, and American crows (*Corvus brachyrhynchos*), will also adversely affect Swainson's hawk. Implementation of AMMs such as those that require Trail Public Education will ensure human activity will have minimal effects to the wildlife community within Swainson's hawk habitat. Competition from non-native predators (e.g., dogs, coyotes) on prey species, and invasive plant and animal species that either outcompete or create unsuitable habitat for prey could also affect Swainson's hawk.

Table 6-80
Permanent Indirect Effects on Swainson's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring Of Nature Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within Swainson's hawk habitat in the Plan Area. A change in vegetation structure could have an effect on prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control In Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring Of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described previously in Wildlife Community Alterations, invasion by non-native predators of Swainson's hawk and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring Of Nature Trail Impacts)	Effects to Swainson's hawk and its prey by mesopredators will be minimized by implementing AMMs that reduce interaction between Swainson's hawk and urban wildlife (raccoon, opossum, fox) and pets.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks)	Diseases transmitted from humans and pets could affect Swainson's hawk, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. Swainson's hawks are susceptible to avian flu and the protozoan

Table 6-80
Permanent Indirect Effects on Swainson's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior To Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring Of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	*Trichomonas gallinae*. The SSHCP will have little direct control over potential disease transmission from ingested prey, such as pigeons and doves, because active control of these well-established and very common species is not likely feasible and therefore would not be an effective management action. However, potential transmission of diseases from human and pets in Preserves will be minimized by controlling access to Preserves through Conditions 2 and 5. Implementation of these AMMs will minimize the potential for introduction of these diseases into local Swainson's hawk populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control In Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins In Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on Swainson's hawk or the agriculture and Valley Grassland Ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments and Cropland in or near SSHCP Preserves will be avoided through the implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures) SWHA-1 (Swainson's Hawk Surveys)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by Swainson's hawks near heavily trafficked areas and in urbanized areas. Covered Activities will therefore increase the frequency of vehicle and window strikes by Swainson's hawks. The main approach to reducing the risk of vehicle collisions with Swainson's hawk is through an SSHCP Preserve System design that takes the existing spatial relationship between nesting and foraging areas into consideration (Chapter 3), such that the need to fly over or near heavily trafficked roads is reduced. This can be accomplished by ensuring close proximity of suitable nesting and foraging habitats in areas with few major roads. Indirect effects on Swainson's hawk associated with vehicle collisions and

Table 6-80
Permanent Indirect Effects on Swainson's Hawk

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to Swainson's hawk habitat. Otherwise, Swainson's hawk will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7).
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) SWHA-1 (Swainson's Hawk Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all raptors, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on Swainson's hawk by incorporating the most current practices for avoiding avian powerline collisions.

Temporary Direct Effects on Swainson's Hawk

In addition to the permanent removal of habitat and nest sites described previously, Swainson's hawk foraging habitat, nesting habitat, or nest sites located within 600 feet of proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects that could result in additional habitat disturbance or additional injury, mortality, or harassment of individual Swainson's hawks (Table 6-81). These potential construction-related effects were generally described in Section 6.3.2 and include dust; noise and ground vibration; construction lighting; general human activity; inadvertent grading, clearing, or trampling of habitat; and trash and debris. Design and setback requirements SWHA-1 (Swainson's Hawk Surveys), SWHA-2 (Swainson's Hawk Pre-Construction Surveys), SWHA-3 (Swainson's Hawk Nest Buffer), and SWHA-4 (Swainson's Hawk Nest Buffer Monitoring) will generally avoid potential adverse edge effects from development and roads listed previously by minimizing the contact zone between construction activities and habitat used for nesting and foraging by Swainson's hawk.

Table 6-81
Temporary Effects to Swainson's Hawk

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into Swainson's hawk nesting and foraging habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of vegetation could cause Swainson's hawk prey to avoid habitat. Implementation of AMMs ensures that trampling and compaction do not occur.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location)	Loud noise can affect nesting Swainson's hawk, potentially causing them to abandon the nest. Abandonment (even temporary) of active nests increases the risk to eggs, nestlings, fledglings, and other dependent young. Implementation of AMMs will minimize

Table 6-81
Temporary Effects to Swainson's Hawk

Environmental Stressor	Effect Reduced By	Potential Effect on Species
		construction noise effects in the vicinity of Swainson's hawk nesting habitat.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	BMP-6 (Construction Lighting) SWHA-1 (Swainson's Hawk Surveys) SWHA-2 (Swainson's Hawk Pre-Construction) Surveys SWHA-3 (Swainson's Hawk Nest Buffer) SWHA-4 (Swainson's Hawk Nest Buffer) Monitoring	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid abandonment of nests and disorienting effects to Swainson's hawk.
Construction Dust	Condition 3, BMP-5 (Dust Control)	Dust can affect foraging habitat and prey taken by Swainson's hawk. Excessive dust generated by construction can decrease the vigor and productivity of vegetation communities through effects on light penetration, as well as photosynthesis, respiration, and transpiration; increased penetration of phytotoxic gaseous pollutants; and increased incidence of pests and diseases. These effects reduce habitat quality for important small rodent prey, such as young ground squirrels, pocket gophers, deer mice (*Peromyscus* ssp.), and voles, as well insects, such as grasshoppers (*Orthoptera* ssp.) and crickets (*Gryllidae* ssp.).
Increased Human Presence During Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) SWHA-1 (Swainson's Hawk Surveys) SWHA-2 (Swainson's Hawk Pre-Construction) Surveys SWHA-3 (Swainson's Hawk Nest Buffer) SWHA-4 (Swainson's Hawk Nest Buffer)	Ground-disturbing activities that could affect Swainson's hawk involving increased human presence will be reduced by implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) SWHA-1 (Swainson's Hawk Surveys) SWHA-2 (Swainson's Hawk Pre-Construction) Surveys SWHA-3 (Swainson's Hawk Nest Buffer) SWHA-4 (Swainson's Hawk Nest Buffer)	Trash and debris would adversely affect Swainson's hawk habitat quality through direct effects, such as attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.21 White-Tailed Kite

Permanent Effects

Permanent direct and indirect effects of Covered Activities on white-tailed kite (*Elanus leucurus*) will include modification or removal of modeled habitat, increased human activity, invasive plant and animal introduction into modeled habitat, vehicle and aircraft collisions with white-tailed kite, and increased risk of wildlife disease.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 31,419 acres of total modeled habitat for white-tailed kite in the Plan Area (Table 6-82). Most of the direct effects on modeled foraging habitat will occur inside the UDA. Overall, 1,217 acres of modeled habitat for white-tailed kite outside the UDA will be directly affected. Inside the UDA, 31,102 of 41,325 acres of modeled habitat will be directly affected.

Table 6-82
White-Tailed Kite Permanent Effects

Habitat Model Land Cover Types*	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect***	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect***	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect***	*Indirect Effect*	*Total Effect*
Nesting Habitat												
Blue Oak Woodland	9,132	9	Qualitative	9	0	0	Qualitative	0	9,132	9	Qualitative	9
Mixed Riparian Woodland	5,785	149	Qualitative	149	244	146	Qualitative	146	5,541	3	Qualitative	3
Mine Tailing Riparian Woodland	641	218	Qualitative	218	220	218	Qualitative	218	421	0	Qualitative	0
Total Nesting Habitat	*15,558*	*376*	*Qualitative*	*376*	*464*	*364*	*Qualitative*	*364*	*15,094*	*12*	*Qualitative*	*12*
Nesting/Foraging Habitat												
Mixed Riparian Scrub	1,451	189	Qualitative	189	241	186	Qualitative	186	1,210	3	Qualitative	3
Total Nesting/Foraging Habitat	*1,451*	*189*	*Qualitative*	*189*	*241*	*186*	*Qualitative*	*186*	*1,210*	*3*	*Qualitative*	*3*
Foraging Habitat												
Valley Grassland	135,112	**21,954**	Qualitative	**21,954**	**30,345**	**21,345**	Qualitative	**21,345**	**104,767**	**609**	Qualitative	**609**
Cropland	47,905	**5,285**	Qualitative	**5,285**	**5,481**	**4,922**	Qualitative	**4,922**	**42,424**	**363**	Qualitative	**363**
Irrigated Pasture-Grassland	15,991	**2,749**	Qualitative	**2,749**	**3,218**	**2,594**	Qualitative	**2,594**	**12,773**	**155**	Qualitative	**155**
Blue Oak Savanna	5,637	**38**	Qualitative	**38**	**18**	**2**	Qualitative	**2**	**5,619**	**36**	Qualitative	**36**
Vernal Pool	4,536	**389**	**0**	**389**	**935**	**355**	**0**	**355**	**3,601**	**34**	**0**	**34**
Seasonal Wetland	2,600	**105**	Qualitative	**105**	**162**	**102**	Qualitative	**102**	**2,438**	**3**	Qualitative	**3**
Swale	1,252	**234**	**0**	**234**	**461**	**232**	**0**	**232**	**791**	**2**	**0**	**2**
Total Foraging Habitat	*213,033*	*30,754*	*0*	*30,754*	*40,620*	*29,552*	*0*	*29,552*	*172,413*	*1,202*	*0*	*1,202*
GRAND TOTAL	**230,042**	**31,319**	**0**	**31,319**	**41,325**	**30,102**	**0**	**30,102**	**188,717**	**1,217**	**0**	**1,217**

In addition to the direct effects quantified in Table 6-82, Covered Activities will indirectly affect white-tailed kite nesting, nesting/foraging, and foraging habitats, and will also injure, kill, or harass individuals in the Plan Area (Table 6-83). These effects will be reduced through implementation of the AMMs described in Table 6-83. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on white-tailed kite is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, human activity, trash, and utility strikes.

In addition to the general AMMs (Section 5.4.1), raptor-specific measures (Section 5.4.2) will be implemented to minimize permanent direct and indirect effects on white-tailed kite due to Covered Activities. Mortality and injury of individual white-tailed kite will occur in the Plan Area due to Covered Activities; however, mortality and injury will be minimized through the implementation of AMMs. There is also a small risk of take in the form of harassment over the duration of the Permit Term (e.g., inhibiting individuals from nesting or foraging in some areas). Some nest sites will be directly affected by Covered Activities because white-tailed kite is a nesting resident in the Plan Area.

Table 6-83
Permanent Indirect Effects on White-Tailed Kite

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter waterways that run through riparian areas where white-tailed kite prey could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) RAPTOR-1 (Raptor Surveys)	Habitat fragmentation will have adverse effects on this species forcing birds to fly farther to suitable foraging areas, thus increasing energetic demands, as well as increasing other risks, such as collisions with vehicles and man-made structures. The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on white-tailed kite. Within the UDA, habitat fragmentation will affect white-tailed kite because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on white-tailed kite in the Plan Area. White-tailed kites are more sensitive to habitat fragmentation and isolation than Cooper's hawk or Swainson's hawk during the nest season because white-tailed kites do most of their foraging within 0.5 mile of the

Table 6-83
Permanent Indirect Effects on White-Tailed Kite

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		nest site (Hawbecker 1942). Nest sites that do not have sufficient nearby foraging habitat due to habitat fragmentation will be abandoned or have reduced nest success. Further, potential permanent indirect effects on favored prey, such as voles, would be similar to those described previously for Swainson's hawk, including degradation of foraging habitat resulting from altered hydrology and wildfire regimes. AMMs in Condition 2 and in specific RAPTOR measures will reduce effects of habitat fragmentation on white-tailed kite.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Repeated or intense wildfires will affect foraging habitat quality through direct mortality of prey (e.g., birds, small mammals, reptiles, and amphibians) and general habitat degradation. Effects of increased wildfire on white-tailed kite habitat will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Effects on white-tailed kite due to vernal pool hydrologic alterations are mainly associated with prey base. Hydrologic alterations could affect patterns of foraging for small mammals that make up the prey base for white-tailed kite. Implementation of AMMs will significantly reduce effects of vernal pool hydrologic alterations on prey species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Noise could indirectly affect the use of nesting and foraging habitat by white-tailed kite. Implementation of these AMMs will minimize chronic noise in close proximity to white-tailed kite habitat.

Table 6-83
Permanent Indirect Effects on White-Tailed Kite

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Lighting	EDGE-8 (Outdoor Lighting) BMP-6 (Construction Lighting) RAPTOR-1 (Raptor Surveys)	Lighting will mildly affect white-tailed kite, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation, and will act primarily to disrupt normal nighttime rest and sleep patterns and increase stress levels. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally-active birds, potentially causing them to become disoriented. Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittee determines lighting is necessary for public safety or security. During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to white-tailed kite.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-11 (Speed Limit) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects on white-tailed kite are expected from increased human activity on Preserves and Preserve Setbacks. Potential effects include introduction of invasive species and collisions with vehicles. Implementation of AMMs ensures that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect white-tailed kite or their habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community by increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Implementation of AMMs such as those that require Trail Public Education will ensure human

Table 6-83
Permanent Indirect Effects on White-Tailed Kite

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) RAPTOR-1 (Raptor Surveys)	activity will have minimal effects to the wildlife community within white-tailed kite habitat. Competition from non-native predators (e.g., dogs, coyotes) on prey species, and invasive plant and animal species that either outcompete or create unsuitable habitat for prey could also affect white-tailed kite.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within white-tailed kite habitat in the Plan Area. A change in vegetation structure could have an effect on prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described previously in Wildlife Community Alterations, invasion by non-native predators of white-tailed kite and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects to white-tailed kite and its prey by mesopredators will be minimized by implementing AMMs that reduce interaction between white-tailed kite and urban wildlife (raccoon, opossum, fox) and pets.

Table 6-83
Permanent Indirect Effects on White-Tailed Kite

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	Diseases transmitted from humans and pets could affect white-tailed kite, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. White-tailed kite are susceptible to avian flu and the protozoan *Trichomonas gallinae*. The SSHCP will have little direct control over potential disease transmission from ingested prey, such as pigeons and doves, because active control of these well-established and very common species likely is not feasible and therefore would not be an effective management action. However, potential transmission of diseases from human and pets in Preserves will be minimized by controlling access to Preserves through Condition 2 and Condition 5. Implementation of these AMMs will minimize the potential for introduction of these diseases into local white-tailed kite populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on white-tailed kite or the Valley Grassland Ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided through the implementation of AMMs.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by white-tailed kite near heavily trafficked areas and in urbanized areas. Covered Activities will therefore increase the frequency of vehicle and window strikes by white-tailed kite. White-tailed kites foraging in fields near

Table 6-83
Permanent Indirect Effects on White-Tailed Kite

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	RAPTOR-1 (Raptor Surveys)	major roads or near development would be at higher risk of collisions. As described previously, increased collision risks are inevitable with urbanization and are difficult to predict or control directly because birds fly some distance between nesting locations and preferred foraging areas. Indirect effects on white-tailed kite associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to white-tailed kite habitat. Otherwise, white-tailed kite will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7).
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) RAPTOR-1 (Raptor Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all raptors, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on white-tailed kite by incorporating the most current practices for avoiding avian powerline collisions.

Temporary Effects

In addition to the permanent removal of habitat described previously, white-tailed kite foraging, nesting, and nesting/foraging habitats near proposed ground-disturbing Covered Activities be adversely affected by several temporary construction-related effects that will result in additional habitat disturbance or additional injury, mortality, or harassment of individual white-tailed kites (Table 6-84). These potential construction-related effects were generally described in Section 6.3.2 and include dust; noise; construction lighting; general human activity (including trash and debris); inadvertent grading, clearing, or trampling of habitat; and hydrologic alterations, such as increased runoff and associated pollutants and toxic compounds. Temporary direct effects on white-tailed kite will generally be similar to the temporary direct effects on Cooper's hawk described in Section 6.6.18. However, noise and ground vibration, lighting, and increased human activity in construction areas or during operations and maintenance activities will have a more pronounced effect on white-tailed kites at nest and roost sites than the more urban-tolerant Cooper's hawk. For example, human disturbance in urban areas has caused white-tailed kites to abandon some communal roost sites (Waian 1973; Dunk 1995), and it is reasonable to expect that large-scale construction activities or noisy operation and maintenance activities will have similar effects. On the other hand, white-tailed kites have established nest sites in areas such as parks and areas at the urban fringe (CDFG 2010; Whisler, pers. comm., as cited in Appendix B), although one nest site monitored by Erichsen (pers. comm., as cited in Appendix B) failed to produce young. White-tailed kites are often observed foraging in developed areas with high human, traffic, and noise levels, such as along the side of and in-between the Interstate 5 corridor and major arterial roadways and in agricultural and vacant fields adjacent to residential and commercial development (Behrends, pers. obs.). Therefore, foraging activities in areas bordering construction or operations and maintenance sites will not be substantially affected.

Table 6-84
Temporary Effects to White-Tailed Kite

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into white-tailed kite riparian nesting habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of vegetation could cause white-tailed kite prey to avoid habitat. Implementation of AMMs ensures that trampling and compaction do not occur.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Loud noise can affect nesting white-tailed kites, potentially causing them to abandon the nest. Implementation of AMMs will minimize construction noise effects in the vicinity of white-tailed kite nesting habitat.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	BMP-6 (Construction Lighting) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid abandonment of nests and disorienting effects to white-tailed kite.
Construction Dust	None required for this species.	No effect on this species.

Table 6-84
Temporary Effects to White-Tailed Kite

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Increased Human Presence during Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) RAPTOR-1 (Raptor Surveys) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Ground-disturbing activities that could affect white-tailed kite involving increased human presence will be reduced by implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Trash and debris would adversely affect white-tailed kite habitat quality through direct effects, such as attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.22 Northern Harrier

Permanent Effects

Permanent direct and indirect effects of Covered Activities on northern harrier (*Circus cyaneus*) will include modification or removal of modeled habitat, increased human activity, invasive plants and animals introduced into modeled habitat, vehicle and aircraft collisions with northern harrier, and increased risk of wildlife disease.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 30,903 acres of total modeled habitat for northern harrier in the Plan Area (Table 6-85). Most of the direct effects on modeled foraging habitat will occur inside the UDA. Overall, 47 acres of modeled foraging habitat for northern harrier outside the UDA will be directly affected. Inside the UDA, 808 of 1,950 acres of modeled foraging habitat will be directly affected. Most of the effects on modeled nesting/foraging habitat in the Plan Area (22,014 acres) will be to Valley Grassland. Of the 210,318 acres of modeled habitat in the Plan Area, total effects to nesting/foraging habitat will be to 30,048 acres, most of which will occur in the UDA.

Table 6-85
Northern Harrier Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Nesting/Foraging Habitat												
Valley Grassland	135,112	22,014	Qualitative	22,014	30,345	21,345	Qualitative	21,345	104,767	669	Qualitative	669
Cropland	47,905	5,285	Qualitative	5,285	5,481	4,922	Qualitative	4,922	42,424	363	Qualitative	363
Irrigated Pasture-Grassland	15,991	2,749	Qualitative	2,749	3,218	2,594	Qualitative	2,594	12,773	155	Qualitative	155
Total Nesting/Foraging Habitat	*199,008*	*30,048*	*Qualitative*	*30,048*	*39,044*	*28,861*	*Qualitative*	*28,861*	*159,964*	*1,187*	*Qualitative*	*1,187*
Foraging Habitat												
Vernal Pool	4,536	389	0	389	935	355	0	355	3,601	34	0	34
Seasonal Wetland	2,600	105	Qualitative	105	162	102	Qualitative	102	2,438	3	Qualitative	3
Freshwater Marsh	2,922	127	Qualitative	127	392	119	Qualitative	119	2,530	8	Qualitative	8
Swale	1,252	234	0	234	461	232	0	232	791	2	0	2
Total Foraging Habitat	*11,310*	*855*	*0*	*855*	*1,950*	*808*	*0*	*808*	*9,360*	*47*	*0*	*47*
GRAND TOTAL	**210,318**	**30,903**	**0**	**30,903**	**40,994**	**29,669**	**0**	**29,669**	**169,324**	**1,234**	**0**	**1,234**

In addition to the direct effects quantified in Table 6-85, Covered Activities will indirectly affect northern harrier nesting/foraging and foraging habitats, and will also injure, kill, or harass northern harrier individuals in the Plan Area (Table 6-86). These effects will be reduced through implementation of the AMMs described in Table 6-86. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on northern harrier is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, human activity, trash, and utility strikes.

In addition to the general AMMs (Section 5.4.1), raptor-specific measures (Section 5.4.2) will be implemented to minimize permanent direct and indirect effects on northern harrier due to Covered Activities. Mortality and injury of individual northern harrier will occur in the Plan Area due to Covered Activities; however, mortality and injury will be minimized through the implementation of AMMs. There is also a small risk of take in the form of harassment over the duration of the Permit Term (e.g., inhibiting individuals from nesting or foraging in some areas). Some nest sites will be directly affected by Covered Activities because northern harrier is a nesting resident in the Plan Area.

Table 6-86
Permanent Indirect Effects on Northern Harrier

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	The close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter waterways that run through vernal pools and wetlands where northern harrier forages and nests.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) RAPTOR-1 (Raptor Surveys)	Habitat fragmentation will have adverse effects on this species forcing birds to fly farther to suitable nesting and foraging areas, thus increasing energetic demands, as well as increasing other risks, such as collisions with vehicles and man-made structures. The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on northern harrier. Within the UDA, habitat fragmentation will affect northern harrier because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on northern harrier in the Plan Area. AMMs in Condition 2 and in specific RAPTOR measures will reduce effects of habitat fragmentation on northern harrier.

Table 6-86
Permanent Indirect Effects on Northern Harrier

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Repeated or intense wildfires will affect foraging habitat quality through direct mortality of prey (e.g., birds, small mammals, reptiles, and amphibians) and general habitat degradation, such as facilitating invasion by non-native exotic plant species. Increased wildfire can have similar effects to altered hydrology on nesting and foraging habitat for northern harriers. Repeated or intense wildfires will affect nesting habitat by removing vegetation cover and degrading hydrologic conditions. As with hydrologic effects, factors that degrade habitat for important prey would reduce foraging habitat quality for northern harrier. Effects of increased wildfire on northern harrier habitat will be minimized through implementation of the Preserve System Monitoring and Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Effects on northern harrier due to vernal pool hydrologic alterations are mainly associated with prey base. Hydrologic alterations could affect patterns of foraging for small mammals that make up the prey base for northern harrier. Implementation of AMMs will significantly reduce effects of vernal pool hydrologic alterations on prey species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Noise could indirectly affect the use of nesting and foraging habitat by northern harrier. Implementation of these AMMs will minimize chronic noise in close proximity to northern harrier habitat.

Table 6-86
Permanent Indirect Effects on Northern Harrier

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Lighting	EDGE-8 (Outdoor Lighting) RAPTOR-1 (Raptor Surveys)	Lighting will mildly affect northern harrier, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation, and will act primarily to disrupt normal nighttime rest and sleep patterns and increase stress levels. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally-active birds, potentially causing them to become disoriented. Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittee determines lighting is necessary for public safety or security. During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to northern harrier.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-11 (Speed Limit) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As a ground nester, northern harrier will be relatively more sensitive to edge effects, such as human disturbances (Davis and Niemela 2008) and urban-related predators. Given the high sensitivity of nesting northern harriers to human activities, nest sites that do not have sufficient buffers from adjacent land uses will be abandoned or have reduced nest success Further, potential permanent indirect effects on favored prey, such as voles, would include degradation of foraging habitat resulting from altered hydrology and increased wildfire. Effects on northern harrier are expected from increased human activity on Preserves and Preserve Setbacks. Potential effects include introduction of invasive species and collisions with vehicles. Implementation of AMMs ensures that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect northern harrier or their habitat.

Table 6-86
Permanent Indirect Effects on Northern Harrier

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) RAPTOR-1 (Raptor Surveys)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community by increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Implementation of AMMs such as those that require Trail Public Education will ensure human activity will have minimal effects to the wildlife community within northern harrier habitat. Competition from non-native predators (e.g., dogs, coyotes) on prey species, and invasive plant and animal species that either outcompete or create unsuitable habitat for prey could also affect northern harrier.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within northern harrier habitat in the Plan Area. A change in vegetation structure could have an effect on prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As a ground nester, northern harrier will be relatively more sensitive to edge effects, such as human disturbances (Davis and Niemela 2008) and urban-related predators. Given the high sensitivity of nesting northern harriers to human activities, nest sites that do not have sufficient buffers from adjacent land uses will be abandoned or have reduced nest success. Further, potential permanent indirect effects on favored prey, such as voles, would include degradation of foraging habitat resulting from altered hydrology and increased wildfire. As described previously in Wildlife Community Alterations, invasion by non-native

Table 6-86
Permanent Indirect Effects on Northern Harrier

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		predators of northern harrier and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects to northern harrier nests and its prey by mesopredators will be minimized by implementing AMMs that reduce interaction between northern harrier and urban wildlife (raccoon, opossum, fox) and pets.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	Diseases transmitted from humans and pets could affect northern harrier, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. Northern harriers are susceptible to avian flu and the protozoan *Trichomonas gallinae*. The SSHCP will have little direct control over potential disease transmission from ingested prey, such as pigeons and doves, because active control of these well-established and very common species likely is not feasible and therefore would not be an effective management action. However, potential transmission of diseases from human and pets in Preserves will be minimized by controlling access to Preserves through Conditions 2 and 5. Implementation of these AMMs will minimize the potential for introduction of these diseases into local northern harrier populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread)	Adverse effects on northern harrier or the Valley Grassland Ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided through the implementation of AMMs.

Table 6-86
Permanent Indirect Effects on Northern Harrier

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures) RAPTOR-1 (Raptor Surveys)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by northern harrier near heavily trafficked areas and in urbanized areas. Covered Activities will therefore increase the frequency of vehicle and window strikes by northern harrier. Northern harriers foraging in fields near major roads or near development would be at higher risk of collisions. Indirect effects on northern harrier associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to northern harrier habitat. Otherwise, northern harrier will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7).
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) RAPTOR-1 (Raptor Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all raptors, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on northern harrier by incorporating the most current practices for avoiding avian powerline collisions.

Temporary Effects

In addition to the permanent removal of habitat described previously, northern harrier nesting and foraging habitats near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects that will result in additional habitat disturbance or additional injury, mortality, or harassment of individual northern harriers (Table 6-87). These potential construction-related effects were generally described in Section 6.3.2 and include dust; noise and ground vibration; construction lighting; general human activity (including trash and debris); inadvertent grading, clearing, or trampling of habitat; and hydrologic alterations, such as increased runoff and associated pollutants and toxic compounds. Nests will be more exposed to disturbances related to Covered Activities because they are constructed on the ground in open, vegetated habitats, such as grasslands and agricultural fields, even though the nest itself is typically concealed in dense, tall vegetation. Because human activities, such as passive recreation (e.g., dog-walking) and off-road vehicle driving, near a nest can cause nest failure (Davis and Niemela 2008), it is expected that a construction-related Covered Activities and operations and maintenance involving human activities near nests will also result in nest failures. However, northern harrier foraging behavior will be less affected by construction activities near foraging areas, as they commonly forage for suitable prey, such as voles, brush rabbits (*Sylvilagus bachmani*), and small birds, such as blackbirds and sparrows, in Cropland and other Disturbed habitats near human activities and development.

Table 6-87
Temporary Effects to Northern Harrier

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into northern harrier wetland nesting habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of vegetation could cause northern harrier prey to avoid habitat. Implementation of AMMs ensures that trampling and compaction do not occur.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location)	Loud noise can affect nesting northern harriers, potentially causing them to abandon the nest. Implementation of AMMs will minimize construction noise effects in the vicinity of northern harrier nesting habitat.
Construction Ground Vibration	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Ground vibrations can force northern harriers to leave nests exposed to vibration, exposing them to potential predation by predators and failure of a nest. Implementation of AMMs will minimize construction ground vibration effects near northern harrier nesting habitat.
Construction Lighting	BMP-6 (Construction Lighting) RAPTOR-3 (Raptor Nest/Roost Buffer)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid abandonment of nests and disorienting effects to northern harrier.
Construction Dust	None required for this species.	No effect on this species.

Table 6-87
Temporary Effects to Northern Harrier

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Increased Human Presence during Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring	Ground-disturbing activities that could affect northern harrier involving increased human presence will be reduced by implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Trash and debris would adversely affect northern harrier habitat quality through direct effects, such as attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.23 Western Burrowing Owl

Permanent Effects

Permanent direct and indirect effects of Covered Activities on burrowing owl (*Athene cunicularia*) will include modification or removal of modeled habitat, increased human activity, invasive plants and animals introduced into modeled habitat, vehicle and aircraft collisions with burrowing owl, and increased risk of wildlife disease.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 30,086 acres of total modeled habitat for burrowing owl in the Plan Area. Most of the direct effects on modeled habitat will occur inside the UDA. Overall, 1,223 of 165,583 acres of modeled nesting/foraging habitat for burrowing owl outside the UDA will be directly affected. Inside the UDA, 28,863 of 39,062 acres of modeled nesting/foraging habitat will be directly affected. Most of the effects on modeled nesting/foraging habitat in the Plan Area (22,014 acres of the 204,645 acres of total effects) will be to Valley Grassland, which is the primary habitat used by burrowing owl.

In addition to the direct effects quantified in Table 6-88, Covered Activities will indirectly affect burrowing owl nesting/foraging, and will also injure, kill, or harass burrowing owl individuals in the Plan Area (Table 6-89). These effects will be reduced through implementation of the AMMs described in Table 6-89. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on burrowing owl is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, human activity, trash, and utility strikes.

In addition to the general AMMs (Section 5.4.1), raptor-specific measures (Section 5.4.2) will be implemented to minimize permanent direct and indirect effects on burrowing owl due to Covered Activities. Mortality and injury of individual burrowing owls will occur in the Plan Area due to Covered Activities; however, mortality and injury will be minimized through the implementation of AMMs. There is also a small risk of take in the form of harassment over the duration of the Permit Term (e.g., inhibiting individuals from nesting or foraging in some areas). Some nest sites will be directly affected by Covered Activities because burrowing owl is a nesting resident in the Plan Area.

Table 6-88
Western Burrowing Owl Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Wintering Habitat												
Valley Grassland	135,112	22,014	Qualitative	22,014	30,345	21,345	Qualitative	21,345	104,767	669	Qualitative	669
Blue Oak Savanna	5,637	38	Qualitative	38	18	2	Qualitative	2	5,619	36	Qualitative	36
Vernal Pool	4,536	389	94	483	935	355	85	440	3,601	34	9	43
Swale	1,252	234	44	278	461	232	43	275	791	2	1	3
Seasonal Wetland	2,600	105	0	105	162	102	0	102	2,438	3	0	3
Stream/Creek (VPIH)	73	22	4	26	68	22	4	26	5	0	0	0
Total Wintering Habitat	149,210	22,802	142	22,944	31,989	22,058	132	22,190	117,221	744	10	754
Wintering/Nesting Habitat												
Cropland	47,905	5,285	Qualitative	5,285	5,481	4,922	Qualitative	4,922	42,424	363	Qualitative	363
Irrigated Pasture-Grassland	15,991	2,749	Qualitative	2,749	3,218	2,594	Qualitative	2,594	12,773	155	Qualitative	155
Total Wintering/Nesting Habitat	63,896	8,034	0	8,034	8,699	7,516	0	7,516	55,197	518	0	518
GRAND TOTAL	**213,106**	**30,836**	**142**	**30,978**	**40,688**	**29,574**	**132**	**29,706**	**172,418**	**1,262**	**10**	**1,272**

Table 6-89
Permanent Indirect Effects on Western Burrowing Owl

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses)	The close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially

Table 6-89
Permanent Indirect Effects on Western Burrowing Owl

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter waterways that run through areas where burrowing owl prey could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) WBO-1 (Burrowing Owl Surveys) WBO-2 (Burrowing Owl Pre-Construction Survey) WBO-3 (Burrowing Owl Avoidance) WBO-4 (Burrowing Owl Construction Monitoring) WBO-5 (Burrowing Owl Passive Relocation) WBO-6 (Burrowing Owl Timing of Maintenance) Activities	Burrowing owls are somewhat less sensitive to habitat fragmentation and isolation compared the other wider-ranging covered raptors because most their foraging, at least during the nesting season, occurs in areas immediately surrounding their burrows; in agricultural areas in the San Joaquin and Imperial Valleys, approximately 80% of foraging during the nesting season was within approximately 1,970 feet (600 meters of the nest burrow) (Gervais et al. 2008), which equates to an approximately 280-acre circular foraging area around the nest. However, habitat fragmentation will have adverse effects on this species forcing birds to fly farther to suitable foraging areas, thus increasing energetic demands, as well as increasing other risks, such as collisions with vehicles and man-made structures. The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on burrowing owl. Within the UDA, habitat fragmentation will affect burrowing owl because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on burrowing owl in the Plan Area. Nest sites that do not have sufficient nearby foraging habitat due to habitat fragmentation could be abandoned or have reduced nest success. Further,

Table 6-89
Permanent Indirect Effects on Western Burrowing Owl

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		potential permanent indirect effects on favored prey, such as voles, would include degradation of foraging habitat resulting from altered hydrology and wildfire regimes. AMMs in Condition 2 and in specific RAPTOR measures will reduce effects of habitat fragmentation on burrowing owl.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Repeated or intense wildfires will affect foraging habitat quality through direct mortality of prey (e.g., small mammals, reptiles, and insects) and general habitat degradation. Effects of increased wildfire on burrowing owl habitat will be minimized through implementation of the Preserve System Monitoring and Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Effects on burrowing owl due to vernal pool hydrologic alterations are mainly associated with prey base. Hydrologic alterations could affect patterns of foraging for small mammals and insects that make up the prey base for burrowing owl. Implementation of AMMs will significantly reduce effects of vernal pool hydrologic alterations on prey species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Ground vibration and noise could indirectly affect the use of nesting habitat by burrowing owl. Implementation of these AMMs will minimize chronic noise in close proximity to burrowing owl habitat.

Table 6-89
Permanent Indirect Effects on Western Burrowing Owl

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Lighting	EDGE-8 (Outdoor Lighting) BMP-6 (Construction Lighting) WBO-1 (Burrowing Owl Surveys)	Lighting will mildly affect burrowing owl, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally crepuscular birds, potentially causing them to become disoriented. However, burrowing owls frequently forage near lights that attract large numbers of insects. Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittee determines lighting is necessary for public safety or security. During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to burrowing owl.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-11 (Speed Limit) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects on western burrowing owl are expected from increased human activity on Preserves and Preserve Setbacks. Potential effects include introduction of invasive species and collisions with vehicles. Implementation of AMMs ensures that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect western burrowing owl or their habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community by increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Implementation of AMMs such as those that require Trail Public Education will ensure human activity will have minimal effects to the wildlife community within burrowing owl habitat. Competition from non-native predators (e.g., dogs, coyotes) on western burrowing owls and prey species, and invasive plant and animal species that either

Table 6-89
Permanent Indirect Effects on Western Burrowing Owl

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) WBO-1 (Burrowing Owl Surveys)	outcompete or create unsuitable habitat for prey could also affect burrowing owl.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within burrowing owl habitat in the Plan Area. A change in vegetation structure could have an effect on prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of non-native plant proliferation will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described previously in Wildlife Community Alterations, invasion by non-native predators of burrowing owl and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects to burrowing owl and its prey by mesopredators will be minimized by implementing AMMs that reduce interaction between burrowing owl and urban wildlife (raccoon, opossum, fox) and pets.

Table 6-89
Permanent Indirect Effects on Western Burrowing Owl

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	Diseases transmitted from humans and pets could affect burrowing owl, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. Burrowing owls are susceptible to avian flu and the protozoan *Trichomonas gallinae*. The SSHCP will have little direct control over potential disease transmission from ingested prey, such as pigeons and doves, because active control of these well-established and very common species likely is not feasible and therefore would not be an effective management action. However, potential transmission of diseases from human and pets in Preserves will be minimized by controlling access to Preserves through Conditions 2 and 5. Implementation of these AMMs will minimize the potential for introduction of these diseases into local burrowing owl populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Adverse effects on burrowing owl or the Valley Grassland Ecosystem from pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided through the implementation of AMMs. Use of rodenticides on ground squirrel colonies could indirectly affect western burrowing owl through ingestion of the toxin or reduction of western burrowing owl prey. If the Technical Advisory Committee (Chapter 9) approves a Preserve Management Plan (Chapter 8) that includes use of rodenticides, that use would be subject to limitations in the Preserve Management Plan on timing and area of application, amounts to be used, and acceptable rodenticides. If appropriate, those restrictions could be incorporated into the conservation easement.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by burrowing owl near heavily trafficked areas and in urbanized areas. Burrowing owls will also be at relatively higher risk of vehicle collisions compared to the other covered raptors. Vehicular collisions, which accounted for

Table 6-89
Permanent Indirect Effects on Western Burrowing Owl

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	WBO-1 (Burrowing Owl Surveys)	25% to 60% of burrowing owl mortalities in three studies (Poulin et al. 2011), are a significant cause of mortality because burrowing owls habitually perch and hunt on roadways at night (Bent 1938; Poulin et al. 2011). As described for the other covered raptors, increased collision risks are inevitable with urbanization and are difficult to predict or control directly because birds fly some distance between nesting locations and preferred foraging areas (although less than the other covered raptors). For example, siting roads away from environmentally sensitive locations (ROAD-1) probably would not make a significant contribution to reducing collision risks because burrowing owls will be flying between nesting and foraging burrow locations and preferred foraging areas in unpredictable and uncontrollable patterns and frequencies. Covered Activities will therefore increase the frequency of vehicle and window strikes on burrowing owl. Burrowing owls foraging in fields near major roads or near development would be at higher risk of collisions. Increased collision risks are inevitable with urbanization and are difficult to predict or control directly because birds fly some distance between nesting locations and preferred foraging areas. Indirect effects on burrowing owl associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to burrowing owl habitat. Otherwise, burrowing owl will be preserved from collisions through establishing large, interconnected Preserves (Chapter 7).
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) WBO-1 (Burrowing Owl Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all raptors, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on burrowing owl by incorporating the most current practices for avoiding avian powerline collisions.

Temporary Effects

In addition to the permanent removal of habitat described previously, burrowing owl nesting and foraging habitats near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects that could result in additional habitat disturbance or additional injury, mortality, or harassment of individual burrowing owls (Table 6-90). These potential construction-related effects were generally described in Section 6.3.2 and include dust; noise and ground vibration; construction lighting; general human activity (including trash and debris); and inadvertent grading, clearing, or trampling of habitat. Burrowing owls are often drawn to construction sites, likely due to the availability of disturbed soils and mounds of dirt that make for easy burrowing. Active burrows will be more exposed to disturbances related to Covered Activities because they are typically located on the ground in exposed areas. It is therefore expected that construction-related Covered Activities involving human activities near occupied burrows will also result in burrow abandonment, including potential nest failures. On the other hand, many burrowing owl individuals are relatively tolerant of human activities near nest sites, given that the most productive nesting areas in California are in agricultural areas in the Central Valley and Imperial Valley, and the species persists at least in low numbers in some highly developed urban areas (Gervais et al. 2008). It is expected that different owl individuals would have different levels of tolerance to Covered Activities near nests and winter dens.

Table 6-90
Temporary Effects to Western Burrowing Owl

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into burrowing owl habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of vegetation could cause burrowing owl prey to avoid habitat. Implementation of AMMs ensures that trampling and compaction do not occur.

Table 6-90
Temporary Effects to Western Burrowing Owl

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location) WBO-1 (Burrowing Owl Surveys) WBO-2 (Burrowing Owl Pre-Construction Survey) WBO-3 (Burrowing Owl Avoidance) WBO-4 (Burrowing Owl Construction Monitoring) WBO-5 (Burrowing Owl Passive Relocation) WBO-6 (Burrowing Owl Timing of Maintenance)	Loud noise can affect nesting burrowing owls when they are above ground. Implementation of AMMs will minimize construction noise effects in the vicinity of burrowing owl habitat.
Construction Ground Vibration	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) WBO-1 (Burrowing Owl Surveys) WBO-2 (Burrowing Owl Pre-Construction Survey) WBO-3 (Burrowing Owl Avoidance) WBO-4 (Burrowing Owl Construction Monitoring) WBO-5 (Burrowing Owl Passive Relocation) WBO-6 (Burrowing Owl Timing of Maintenance)	Ground vibrations can force burrowing owls to leave underground burrows that could collapse due to vibration, exposing them to potential predation by predators and failure of a nest. Implementation of AMMs will minimize construction ground vibration effects near burrowing owl nesting habitat.
Construction Lighting	BMP-6 (Construction Lighting) WBO-1 (Burrowing Owl Surveys) WBO-2 (Burrowing Owl Pre-Construction Survey) WBO-3 (Burrowing Owl Avoidance) WBO-4 (Burrowing Owl Construction Monitoring) WBO-5 (Burrowing Owl Passive Relocation) WBO-6 (Burrowing Owl Timing of Maintenance)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid abandonment of nests and disorienting effects to burrowing owl.
Construction Dust	None required for this species.	No effect on this species.
Increased Human Presence during Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) WBO-1 (Burrowing Owl Surveys) WBO-2 (Burrowing Owl Pre-Construction Survey) WBO-3 (Burrowing Owl Avoidance) WBO-4 (Burrowing Owl Construction Monitoring) WBO-5 (Burrowing Owl Passive Relocation) WBO-6 (Burrowing Owl Timing of Maintenance)	Ground-disturbing activities that could affect burrowing owl involving increased human presence will be reduced by implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) WBO-1 (Burrowing Owl Surveys) WBO-2 (Burrowing Owl Pre-Construction Survey) WBO-3 (Burrowing Owl Avoidance) WBO-4 (Burrowing Owl Construction Monitoring) WBO-5 (Burrowing Owl Passive Relocation) WBO-6 (Burrowing Owl Timing of Maintenance)	Trash and debris would adversely affect burrowing owl habitat quality through direct effects, such as attracting nuisance pest species. Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.24 Loggerhead Shrike

Permanent Effects

Permanent direct and indirect effects of Covered Activities on loggerhead shrike will include modification or removal of modeled habitat, increased human activity, invasive animals introduced into modeled habitat, vehicle and aircraft collisions with loggerhead shrike, and increased risk of wildlife disease.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 31,367 acres of modeled habitat for loggerhead shrike in the Plan Area, including approximately 591 acres of nesting habitat, 22,014 acres of modeled nesting/foraging habitat, and 8,762 acres of modeled foraging habitat (Table 6-91). Most of the direct effects for loggerhead shrike, 30,100 acres (96%), will occur inside the UDA, including approximately 550 acres of nesting habitat, 21,345 acres of modeled nesting/foraging habitat, and 8,205 acres of modeled foraging habitat. Outside of the UDA, a total of approximately 1,267 acres of modeled habitat will be directly affected, including approximately 41 acres of nesting habitat, 669 acres of modeled nesting/foraging habitat and 557 acres of modeled foraging habitat. Permanent effects on specific nest sites are not analyzed because the SSHCP database does not contain any confirmed loggerhead shrike nest sites for the Plan Area (Section 3.4.5).

Table 6-91
Loggerhead Shrike Permanent Effects

Habitat Model Land Cover Types	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Nesting Habitat												
Mixed Riparian Woodland	5,785	184	Qualitative	184	244	146	Qualitative	146	5,541	38	Qualitative	38
Mixed Riparian Scrub	1,424	189	Qualitative	189	214	186	Qualitative	186	1,210	3	Qualitative	3
Mine Tailing Riparian Woodland	641	218	Qualitative	218	220	218	Qualitative	218	421	0	Qualitative	0
Total Nesting Habitat	*7,850*	*591*	*Qualitative*	*591*	*678*	*550*	*Qualitative*	*550*	*7,172*	*41*	*Qualitative*	*41*
Nesting/Foraging Habitat												
Valley Grassland	135,112	22,014	Qualitative	22,014	30,345	21,345	Qualitative	21,345	104,767	669	Qualitative	669
Total Nesting/ Foraging Habitat	*135,112*	*22,014*	*Qualitative*	*22,014*	*30,345*	*21,345*	*Qualitative*	*21,345*	*104,767*	*669*	*Qualitative*	*669*
Foraging Habitat												
Cropland	47,905	5,285	Qualitative	5,285	5,481	4,922	Qualitative	4,922	42,424	363	Qualitative	363
Irrigated Pasture-Grassland	15,991	2,749	Qualitative	2,749	3,218	2,594	Qualitative	2,594	12,773	155	Qualitative	155
Vernal Pool	4,536	389	0	389	935	355	0	355	3,601	34	0	34
Seasonal Wetland	2,600	105	Qualitative	105	162	102	Qualitative	102	2,438	3	Qualitative	3
Swale	1,252	234	0	234	461	232	0	232	791	2	0	2
Total Foraging Habitat	*72,284*	*8,762*	*0*	*8,762*	*10,257*	*8,205*	*0*	*8,205*	*62,027*	*557*	*0*	*557*
GRAND TOTAL	**215,246**	**31,367**	**0**	**31,367**	**41,280**	**30,100**	**0**	**30,100**	**173,966**	**1,267**	**0**	**1,267**

In addition to the direct effects quantified in Table 6-91, Covered Activities will indirectly affect loggerhead shrike nesting/foraging, and will also injure, kill, or harass individuals in the Plan Area (Table 6-92). These effects will be reduced through implementation of the AMMs described in Table 6-92. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on loggerhead shrike is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be associated with habitat fragmentation and isolation and areas along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, human activity, trash, and utility strikes, accidental fire ignitions, and potential spread of invasive plants.

In addition to the general AMMs (Section 5.4.1), raptor-specific measures (Section 5.4.2) will be implemented to avoid permanent direct and indirect effects on loggerhead shrike to Covered Activities. With implementation of the proposed AMMs, the proposed Covered Activities will not directly kill or injure individual loggerhead shrikes in the Plan Area. However, there is a small risk of take in the form of harassment over the duration of the permit (e.g., inhibiting individuals from nesting or foraging in some areas). Some nest sites will be directly affected by Covered Activities because suitable loggerhead shrike nesting habitat exists within the Plan Area.

Temporary Effects

In addition to the permanent removal of habitat described previously, loggerhead shrike nesting and foraging habitats near proposed ground-disturbing Covered Activities could be adversely affected by several temporary construction-related effects that would result in additional habitat disturbance or additional injury, mortality, or harassment of individual loggerhead shrikes. These potential construction-related effects include dust; noise and ground vibration; construction lighting; general human activity (including trash and debris); inadvertent grading, clearing, or trampling of habitat; and hydrologic alterations, such as increased runoff and associated pollutants and toxic compounds.

Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently impacted in the direct effects reported in Table 6-91).

These potential construction-related environmental stressors were described previously in Section 6.3.2, and their additional effects on loggerhead shrike are qualitatively described in Table 6-93.

Table 6-92
Permanent Indirect Effects on Loggerhead Shrike

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-2 (Groundwater Recharge) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-2 (Erosion Control) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Pesticide Use)	Long-term hydrologic alterations would degrade the quality of riparian scrub and woodland nesting habitat for loggerhead shrike, as well as alter water quality within the Plan Area. The close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including decreased groundwater recharge that supports riparian vegetation, urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that foster groundwater recharge and the control of pesticide use and stormwater runoff will ensure that riparian habitat does not degrade as a result of reduced groundwater levels and that pollution will not enter waterways that run through areas where loggerhead shrike prey could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 8, UTILITY-1 (Avian Collision Avoidance) RAPTOR-1 (Raptor Surveys)	Loggerhead shrikes are sensitive to habitat fragmentation and isolation because territories in mainland California have been estimated to range from approximately 11 acres to approximately 40 acres, and smaller habitat patches would not support viable nesting pairs. Habitat fragmentation reduces the amount of available foraging habitat near nest sites, potentially forcing birds to travel farther and reducing their fitness due to higher energy costs and reduced time at the nest. In addition, longer travel from nest sites to foraging areas increase their risk of collisions with man-made structures and vehicles, which has been shown to be a significant source of shrike mortality in Virginia and Texas (Humple 2008). The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on loggerhead shrike by preserving large habitat blocks and ensuring connectivity throughout the Preserve System. Within the UDA, habitat fragmentation will affect loggerhead shrike because all UDA Preserves will be bordered by urban

Table 6-92
Permanent Indirect Effects on Loggerhead Shrike

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		development, which will be reduced through implementation of EDGE and UTILITY AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs, UTILITY AMMs, and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on loggerhead shrike in the Plan Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Repeated or intense wildfires will affect foraging and nesting habitat quality and quantity through direct mortality of prey (e.g., small mammals, reptiles, and insects) and general habitat degradation. Because loggerhead shrikes hunt in open habitats characterized by short grasses, forbs, or bare ground, they may be particularly sensitive to habitat degradation resulting from increased wildfire that facilitate invasion by non-native grasses and weeds (Humple 2008); such invasions may reduce availability and detectability of prey, such as large, ground-dwelling insects, as well small mammals, reptiles, and amphibians. Effects of increased wildfire on loggerhead shrike habitat will be minimized through implementation of the Preserve System Monitoring and Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Effects on loggerhead shrike due to vernal pool hydrologic alterations are mainly associated with prey base. Hydrologic alterations could affect patterns of foraging for insects, small birds, and mammals that make up the prey base for loggerhead shrike. Implementation of AMMs will significantly reduce effects of vernal pool hydrologic alterations on prey species.

Table 6-92
Permanent Indirect Effects on Loggerhead Shrike

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Chronic Ground Vibration and Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Ground vibration and noise could indirectly affect the use of nesting habitat by loggerhead shrike. Implementation of these AMMs will minimize chronic noise in close proximity to loggerhead shrike habitat.
Lighting	EDGE-8 (Outdoor Lighting) BMP-6 (Construction Lighting) RAPTOR-1 (Raptor Surveys)	Lighting will mildly affect loggerhead shrike, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally active birds, potentially causing them to abandon nests and/or become disoriented. Lighting could also lure prey insects that the loggerhead shrike depend on, reducing their abundance within loggerhead shrike habitat preserves. Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittees determines lighting is necessary for public safety or security. During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid disorienting effects to loggerhead shrike.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-11 (Speed Limit) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Trail Impacts) Condition 8, UTILITY-1 (Avian Collision Avoidance) EDGE-8 (Outdoor Lighting)	Effects on loggerhead shrike are expected from increased human activity on Preserves and Preserve Setbacks. Potential effects include introduction of invasive species and collisions with vehicles and aboveground utilities. Implementation of AMMs ensures that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect loggerhead shrike or their habitat.

Table 6-92
Permanent Indirect Effects on Loggerhead Shrike

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) RAPTOR-1 (Raptor Surveys)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community by increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Implementation of AMMs such as those that require Trail Public Education will ensure human activity will have minimal effects to the wildlife community within loggerhead shrike habitat. Competition from non-native predators (e.g., cats, dogs, coyotes) on loggerhead shrike and their prey species, and invasive plant and animal species that either outcompete or create unsuitable habitat for prey species could also affect loggerhead shrike.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within loggerhead shrike habitat in the Plan Area. A change in vegetation structure could have an effect on prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	As described previously in Wildlife Community Alterations, invasion by non-native predators of loggerhead shrike and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.

Table 6-92
Permanent Indirect Effects on Loggerhead Shrike

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Effects to loggerhead shrike and its prey by mesopredators will be minimized by implementing AMMs that reduce interaction between loggerhead shrike and urban wildlife (raccoon, opossum, fox, feral cat) and pets.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	Diseases transmitted from humans and pets could affect loggerhead shrike, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. Loggerhead shrikes are susceptible to avian flu and the protozoan *Trichomonas gallinae*. Pandolfino (2008) showed that a decline in the winter abundance of loggerhead shrikes in the Central Valley in the 3 years following the summer of 2005 was correlated with elevated virus infection levels in the Central Valley compared to non-Central Valley Counties, and suggested that West Nile virus played a role in the decline. The SSHCP will have little direct control over potential disease transmission from ingested prey, such as small birds, which are used as prey during the winter months. However, potential transmission of diseases from human and pets in Preserves will be minimized by controlling access to Preserves through Conditions 2 and 5. Implementation of these AMMs will minimize the potential for introduction of these diseases into local loggerhead shrike populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves)	Loggerhead shrike and their prey are susceptible to adverse effects from pesticides as ingestion of pesticide-laden arthropods can lead to toxic effects on adults and in eggs, and it can significantly reduce the local availability of insects (especially grasshoppers). Adverse effects on loggerhead shrike, their prey, or the Valley Grassland Ecosystem from insecticides/pesticides (such

Table 6-92
Permanent Indirect Effects on Loggerhead Shrike

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be minimized through the implementation of AMMs. Specific restrictions on pesticide use in certain preserves may be included in Preserve Management Plans, further minimizing the effects of pesticides on the insect prey of loggerhead shrike.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures) RAPTOR-1 (Raptor Surveys)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by loggerhead shrike near heavily trafficked areas and in urbanized areas. As discussed in Humple (2008), collisions with vehicles are a significant source of loggerhead shrike mortality in Virginia and Texas. Consequently, loggerhead shrike will be at a relatively higher risk of vehicle collisions compared to the other Covered Species, as they use road margin habitat to hunt, as perches are abundant and there is a clear view of the surrounding landscape to visually search for prey. As described for the covered raptors, increased collision risks are inevitable with urbanization and are difficult to predict or control directly because birds fly some distance between nesting locations and preferred foraging areas (although less than the other covered raptors). For example, siting roads away from environmentally sensitive locations (ROAD-1) probably would not make a significant contribution to reducing collision risks because it would not remove the road margin habitat that is used for hunting. Covered Activities will therefore increase the frequency of vehicle and window strikes on loggerhead shrikes as the number roads in the Plan Area will be increased from existing conditions. Indirect effects on loggerhead shrike associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to burrowing owl habitat. Otherwise, loggerhead shrike will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7).

Table 6-92
Permanent Indirect Effects on Loggerhead Shrike

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Aboveground Electrical Utilities Collision And Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) RAPTOR-1 (Raptor Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all avian species, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on loggerhead shrike by incorporating the most current practices for avoiding avian powerline collisions.

Table 6-93
Temporary Effects to Loggerhead Shrike

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	Runoff from construction activities into loggerhead shrike habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit)	Inadvertent trampling and compaction of vegetation could cause loggerhead shrike prey to avoid habitat. Implementation of AMMs ensures that trampling and compaction do not occur.

Table 6-93
Temporary Effects to Loggerhead Shrike

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location)	Loud noise can affect nesting loggerhead shrikes. Implementation of AMMs will minimize construction noise effects in the vicinity of loggerhead shrike nesting habitat.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	BMP-6 (Construction Lighting) RAPTOR-3 (Raptor Nest/Roost Buffer)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid abandonment of nests and disorienting effects to loggerhead shrike. Lighting could also lure prey insects that the loggerhead shrike depend on, reducing their abundance within loggerhead shrike habitat preserves. By directing lighting away from preserves, this effect would be reduced but not eliminated.
Construction Dust	None required for this species.	No effect on this species.
Increased Human Presence During Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) RAPTOR-2 (Raptor Pre-Construction Surveys) RAPTOR-3 (Raptor Nest/Roost Buffer) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Effects associated with increased human presence during construction that could affect loggerhead shrike habitat and behavior will be reduced by implementing AMMs.
Construction Trash And Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) RAPTOR-4 (Raptor Nest/Roost Buffer Monitoring)	Trash and debris would adversely affect loggerhead shrike habitat quality through direct effects, such as attracting nuisance pest species and potential predators (e.g., feral cats). Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.25 Greater Sandhill Crane

Permanent Effects

Permanent direct and indirect effects of Covered Activities on greater sandhill crane (*Grus canadensis*) will include modification or removal of modeled roosting/foraging habitat, modeled roosting habitat, and modeled foraging habitat, habitat fragmentation and isolation, noise, lighting, increased human activity (including trash and debris), altered hydrology, altered fire regime, vehicle collisions, electrocution and collisions associated with aboveground transmission lines, wildlife community alterations, disease, and pesticides.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 7,42 of the 89,765 acres of modeled habitat for greater sandhill crane in the Plan Area, including 124 of the 4,487 acres of modeled roosting/foraging habitat, 66 of the 1,156 acres of modeled roosting habitat, and 7,752 of the 84,122 acres of modeled foraging habitat (Table 6-94). Most of the direct effects for greater sandhill crane, approximately 7,115 acres , will occur inside the UDA, including approximately 115 acres of modeled roosting/foraging habitat, 47 acres of modeled roosting habitat, and 6,953 acres of modeled foraging habitat. Outside of the UDA, a total of approximately 827 acres of modeled habitat will be directly affected, including approximately 9 acres of modeled roosting/foraging habitat, 19 acres of modeled roosting habitat, and 799 acres of modeled foraging habitat.

Of the approximately 7,942 acres of total effects on modeled habitat for greater sandhill crane, approximately 820 acres (10%) are high-value foraging habitat (Table 6-95). The 820 acres of high-value habitat effects are 1% of the approximately 81,473 acres of high-value habitat in the Plan Area.

In addition to the direct effects quantified in Table 6-94 and 6-95, Covered Activities will indirectly affect greater sandhill crane roosting and foraging, and will also injure, kill, or harass individuals in the Plan Area (Table 6-96). Although most indirect effects are qualitatively assessed in Table 6-96, some indirect effects can be quantified (Table 6-94 and 6-95). These effects are specific to roosting habitat within Vernal Pool Ecosystems in that approximately 7 acres of Vernal Pool Ecosystem roosting habitat will be indirectly impacted in the Plan Area—6 acres within the UDA and 1 acre outside the UDA.

All permanent indirect effects (both qualitative and quantitative) to greater sandhill crane will be reduced through implementation of the AMMs described in Table 6-96. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on greater sandhill crane is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. As described in more detail in Table 6-96, greater sandhill cranes are very sensitive to human activities. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that would increase the risk of vehicle collisions, accidental fire ignitions, and other road-related effects (e.g., traffic noise, road runoff, potential spread of invasive plants).

In addition to the general AMMs (Section 5.4.1), greater sandhill crane-specific measures (Section 5.4.2) will be implemented to avoid permanent direct and indirect effects on greater sandhill crane to Covered Activities. With implementation of the proposed AMMs, the proposed Covered Activities will result in a small risk of killing or injuring individual greater sandhill cranes in the Plan Area due to collisions with fixed structures or vehicles. Additionally, there is a small risk of take in the form of harassment over the duration of the permit (e.g., inhibiting individuals from roosting or foraging in some areas). This incrementally increased risk of take is mitigated through the SSHCP Conservation Strategy (Chapter 7).

Temporary Effects

In addition to the permanent removal of habitat described previously, greater sandhill crane roosting and foraging habitats near proposed ground-disturbing Covered Activities could be adversely affected by several temporary construction-related effects that will result in additional habitat disturbance or additional injury, mortality, or harassment of individual greater sandhill cranes (Table 6-97). These potential construction-related effects were generally described in Section 6.3.2 and include dust; noise and ground vibration; construction lighting; general human activity (including trash and debris); inadvertent grading, clearing, or trampling of habitat; and hydrologic alterations, such as increased runoff and associated pollutants and toxic compounds, as well as temporary fencing. Temporary fencing during construction is an additional potential temporary effect that is more specific to greater sandhill crane. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified, as permanently impacted in the direct effects reported in Table 6-94).

These potential construction-related environmental stressors were described generally in Section 6.3.2, and their additional effects on greater sandhill crane are qualitatively described in Table 6-96, as are AMMs that would avoid and/or minimize these temporary effects.

Table 6-94
Greater Sandhill Crane Permanent Effects

Habitat Model Land Cover Types	Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Roosting/Foraging Habitat[1]												
Seasonal Wetland	1,877	51	Qualitative	51	106	48	Qualitative	48	1,771	3	Qualitative	3
Freshwater Marsh	2,610	73	Qualitative	73	276	67	Qualitative	67	2,334	6	Qualitative	6
Total Roosting/ Foraging Habitat	*4,487*	*124*	*Qualitative*	*124*	*382*	*115*	*Qualitative*	*115*	*4,105*	*9*	*Qualitative*	*9*
Roosting Habitat												
Vernal Pool	1,156	59	7	66	58	41	6	47	1,098	18	1	19
Total Roosting Habitat	*1,156*	*59*	*7*	*66*	*58*	*41*	*6*	*47*	*1,098*	*18*	*1*	*19*
Foraging Habitat[2]												
Cropland	42,628	3,764	Qualitative	3,764	3,600	3,421	Qualitative	3,421	39,028	343	Qualitative	343
Valley Grassland	30,586	2,469	Qualitative	2,469	2,718	2,151	Qualitative	2,151	27,868	318	Qualitative	318
Irrigated Pasture-Grassland	10,908	1,519	Qualitative	1,519	1,534	1,381	Qualitative	1,381	9,374	138	Qualitative	138
Total Foraging Habitat	*84,122*	*7,752*	*Qualitative*	*7,752*	*7,852*	*6,953*	*Qualitative*	*6,953*	*76,270*	*799*	*Qualitative*	*799*
Grand Total	**89,765**	**7,935**	**7**	**7,942**	**8,292**	**7,109**	**6**	**7,115**	**81,473**	**826**	**1**	**827**

1 Modeled roosting habitat includes these communities within 2 miles of greater sandhill crane occurrences in the Plan Area.
2 Modeled foraging habitat includes these communities within 1.75 miles of modeled roosting habitat.

Table 6-95
Greater Sandhill Crane Permanent Effects on High-Value Habitat

High-Value Habitat Land Cover Types*	Plan Area (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*
Seasonal Wetland	1,771	1	Qualitative	1
Freshwater Marsh	2,334	1	Qualitative	1
Vernal Pool	1,098	18	1	19
Cropland	3,9028	343	Qualitative	343
Irrigated Pasture-Grassland	9,374	138	Qualitative	138
Valley Grassland	27,868	318	Qualitative	318
Total High-Value Habitat	**81,473**	**819**	**1**	**820**

* High-value habitat is all modeled roosting and foraging habitat above sea level and outside the floodplain and outside the UDA.

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-2 (Groundwater Recharge) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-2 (Erosion Control) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Pesticide Use)	Long-term hydrologic alterations could modify flooding and dewatering events and would degrade the quality of wetland roosting and foraging habitat for greater sandhill crane, as well as alter water quality within the Plan Area. For example, occupied night roosts in the Sacramento-San Joaquin Delta, including the Cosumnes River Preserve and Stone Lakes National Wildlife Refuge in the Plan Area, averaged approximately 3.9 inches (10 centimeters) water depth (range 1.2–8.3 inches [3–21 centimeters) (Ivey et al. 2015). Substantial deviations from these depths could reduce suitability and result in roost abandonment. In addition, the close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides,

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		pesticides, fuel, oil, lubricants, paints, and release agents. Specific effects of these chemicals and pollutants on greater sandhill cranes may have toxic effects either directly (e.g., dermal contact) or through ingestion of contaminated food sources, or may reduce prey/forage abundance. Further, water quality at foraging sites (e.g., Seasonal Wetland) may be an important factor and could be degraded by runoff from development and roads of various pollutants and chemicals, including fuel, oil, lubricants, paints, and release agents, and pesticides. Implementation of AMMs such as those that require control of stormwater runoff, restrict pesticide use, and reduce erosion will preserve roosting and foraging habitat from actions that can result in altered hydrology, and ensure pollution will not enter waterways that could degrade greater sandhill crane roosting and foraging habitat and wetland areas where greater sandhill crane prey and forage could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 8, UTILITY-1 (Avian Collision Avoidance) GSC-1 (Greater Sandhill Crane Surveys)	Greater sandhill cranes are sensitive to habitat fragmentation and isolation, especially between roosting and foraging sites. Habitat fragmentation reduces the size of available roosting sites and available foraging habitat near nest sites. Ivey et al. (2015) found that habitat fragmentation that reduced suitable roost sites to less than approximately 67 acres would not be viable roost sites, recommend roost site complexes of 247–2,470 acres (100–1,000 hectare), with an individual site at least 12.3 acres (5 hectares). Roost sites that do not have sufficient size to support greater sandhill cranes due to habitat fragmentation could be abandoned. Habitat fragmentation also reduces the amount of available foraging habitat near roost sites. Pogson (1990) and Ivey and Herziger (2003) observed distances between roosting and foraging

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		sites have averaged from approximately 0.9 mile to 1.7 miles. In addition, habitat fragmentation and longer travel to and from roost sites to foraging areas exacerbate the effects of other potential permanent indirect effects, including increased human activity, altered hydrology, increased wildfire, vehicle collisions, aboveground utilities, altered wildlife communities, and their risk of collisions with man-made structures and vehicles. The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on greater sandhill crane by preserving large habitat blocks and ensuring connectivity throughout the Preserve System. Within the UDA, habitat fragmentation will affect greater sandhill crane because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of GSC AMMs, EDGE AMMs, and UTILITY AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs, UTILITY AMMs, and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System, along with GSC-1, will minimize the effects of habitat fragmentation on greater sandhill crane in the Plan Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Increased wildfire can have similar effects to altered hydrology on foraging habitat for greater sandhill crane. While Cropland and Irrigated Pasture-Grassland are important foraging habitats for greater sandhill crane in the Plan Area and are less prone to wildfire effects, Valley Grassland and Vernal Pool Ecosystems are also a suitable foraging and roosting habitat. Repeated or intense wildfires could affect Valley Grassland and Vernal Pool Ecosystems foraging and roosting habitat by removing vegetation cover and facilitating invasion by non-native exotic plant species. As with hydrologic effects, factors that degrade habitat for

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		important prey and forage would reduce foraging habitat quality for greater sandhill crane. As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Effects of increased wildfire on greater sandhill crane habitat will be minimized through implementation of the Preserve System Monitoring and Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Effects on greater sandhill crane due to vernal pool hydrologic alterations are mainly associated with roosting habitat. Hydrologic alterations could affect patterns of roosting within Vernal Pool Ecosystems. Implementation of AMMs will significantly reduce effects of vernal pool hydrologic alterations on greater sandhill crane roosting habitat.
Chronic Ground Vibration And Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) GSC-1 (Greater Sandhill Crane Surveys) GSC-4 (Greater Sandhill Crane Visual Barrier)	Greater sandhill cranes are very sensitive to human disturbances and vibration and noise could indirectly affect the use of foraging and roosting habitat by greater sandhill crane. Implementation of these AMMs will minimize chronic noise in close proximity to greater sandhill crane roosting and foraging habitat.
Lighting	EDGE-8 (Outdoor Lighting) BMP-6 (Construction Lighting) GSC-1 (Greater Sandhill Crane Surveys) GSC-4 (Greater Sandhill Crane Visual Barrier)	Lighting will mildly affect greater sandhill crane, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally active birds, potentially causing them to abandon roosts and/or become disoriented. Implementation of these AMMs would ensure that Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittees determines lighting is necessary for public safety or security.

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-11 (Speed Limit) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-1 (Avian Collision Avoidance) EDGE-8 (Outdoor Lighting) GSC-1 (Greater Sandhill Crane Surveys) GSC-4 (Greater Sandhill Crane Visual Barrier)	Greater sandhill cranes are very sensitive to human disturbances, including even human presence and passive recreation activities, such as birding, walking, equestrian activities, bicycling, and boating (Ivey and Herziger 2003). Ivey et al. (2015) found that greater sandhill cranes tend to avoid roost sites in the Sacramento-San Joaquin Delta, which is used for waterfowl hunting. Littlefield and Ivey (2000) indicated that only one predawn disruption is usually necessary before cranes abandon a roosting site. Potential effects of increased human activity will be reduced through implementation of these AMMs, including GSC-1 and GSC-4 and Conditions 2 and 5, which will ensure that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect greater sandhill cranes or their habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) GSC-1 (Greater Sandhill Crane Surveys)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community through increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Competition and predation from non-native predators (cats, dogs, coyotes) on greater sandhill crane and their prey species, and invasive plant and animal species that either outcompete or create unsuitable habitat for prey or forage species, could also affect greater sandhill cranes. Implementation of AMMs such as those that require Trail Public Education, Preserve Setbacks, prevention invasive species spread, proper location of road projects, and greater sandhill crane surveys will ensure human activity will have minimal effects to the wildlife community within greater sandhill crane habitat.

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Unmanaged proliferation of non-native plants could affect species composition within greater sandhill crane habitat in the Plan Area. A change in vegetation structure could have an effect on forage habitat and prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described previously in Wildlife Community Alterations, invasion by non-native predators of greater sandhill crane and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.
Mesopredators	None required for this species.	No effect on this species.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	Greater sandhill crane may be vulnerable to disease transmitted from humans and pets, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. In areas where large numbers of greater sandhill cranes are forced to use limited roost areas, epizootic events, such as cholera, avian botulism, aspergillosis, salmonella, and avian tuberculosis, are likely to occur and are known to kill sandhill cranes (Tacha et al. 1992). Avian cholera has resulted in sandhill crane mortality in San Joaquin County (Lindstedt, pers. comm. n.d., as cited in Appendix B, Species Accounts). While these disease factors generally cannot be addressed wholly through specific AMMs, the SSHCP Conservation Strategy of preserving adequate roosting

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		habitat in several locations in the Preserve System will help reduce the risk of epizootic events related to increased contact between individuals. Implementation of these AMMs will also act to minimize the potential for introduction of these diseases into local greater sandhill crane populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) GSC-1 (Greater Sandhill Crane Surveys)	Greater sandhill cranes have been demonstrated to be sensitive to pesticides. Mortality of sandhill cranes has been attributed to anticholinesterase pesticides, which include organophosphorus and carbamate compounds, which may be ingested through contaminated water, seeds, foliage, invertebrates, and vertebrates or by dermal contact and inhalation (Fleischli et al. 2004). Harris and Mirande (2013) report crane deaths from chemicals (primarily pesticides) but do not provide specific information about these deaths. Adverse effects on greater sandhill crane, their prey/forage, or their roosting and foraging habitat from insecticides/pesticides (such as glyphosate) or fertilizers used in new urban developments in or near SSHCP Preserves will be avoided through the implementation of AMMs.
Vehicle and Aircraft Collisions With Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures) GSC-1 (Greater Sandhill Crane Surveys)	Greater sandhill cranes are highly vulnerable to collisions with structures that interfere with flight takeoff (Pogson and Lindstedt 1988). Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by greater sandhill crane near heavily trafficked areas and in urbanized areas. As described for the covered raptors, increased collision risks are inevitable with urbanization and are difficult to predict or control directly because birds fly some distance between roosting locations and preferred foraging areas. However, unlike many raptors, siting roads away from environmentally sensitive locations (ROAD-1) would provide some separation between roosting and foraging habitats and lessen collision risks because it would increase the distance between flight takeoff and landing and the roadways. Still, Covered Activities will increase the frequency of greater sandhill

Table 6-96
Permanent Indirect Effects on Greater Sandhill Crane

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		cranes with vehicle and windshield collisions as the amount of roadways within the Plan Area will be increased from existing conditions. Indirect effects on greater sandhill cranes associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to roosting and foraging habitat. Otherwise, greater sandhill cranes will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7) that will lessen roadway interaction.
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) GSC-1 (Greater Sandhill Crane Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all avian species, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Pogson and Lindstedt (1988) concluded that power line collisions seem to be the largest source of unnatural mortality of greater sandhill cranes in the Central Valley. Implementation of these AMMs will reduce effects of utility-related Covered Activities on greater sandhill cranes by incorporating the most current practices for avoiding avian power line collisions.

Table 6-97
Temporary Effects to Greater Sandhill Crane

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing)	Runoff from construction activities into greater sandhill crane habitat will be fully avoided through the implementation of AMMs.

Table 6-97
Temporary Effects to Greater Sandhill Crane

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation)	
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) GSC-2 (Greater Sandhill Crane Pre-Construction Surveys) GSC-3 (Greater Sandhill Crane Roosting Buffer) GSC-4 (Greater Sandhill Crane Visual Barrier) GSC-5 (Greater Sandhill Crane Roost Buffer Monitoring)	Inadvertent trampling and compaction of vegetation could cause greater sandhill crane and their prey to avoid habitat. Implementation of AMMs ensures that trampling and compaction do not occur.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location) GSC-2 (Greater Sandhill Crane Pre-Construction Surveys) GSC-3 (Greater Sandhill Crane Roosting Buffer) GSC-4 (Greater Sandhill Crane Visual Barrier) GSC-5 (Greater Sandhill Crane Roost Buffer Monitoring)	Loud noise can affect greater sandhill cranes and cause abandonment of roosting sites. Implementation of AMMs will minimize construction noise effects in the vicinity of greater sandhill crane roosting and foraging habitat.
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	BMP-6 (Construction Lighting) GSC-1 (Greater Sandhill Crane Surveys) GSC-2 (Greater Sandhill Crane Pre-Construction Surveys) GSC-3 (Greater Sandhill Crane Roosting Buffer) GSC-4 (Greater Sandhill Crane Visual Barrier) GSC-5 (Greater Sandhill Crane Roost Buffer Monitoring)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid abandonment of roosts and disorienting effects to greater sandhill crane.

Table 6-97
Temporary Effects to Greater Sandhill Crane

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Construction Dust	None required for this species.	No effect on this species.
Increased Human Presence during Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) GSC-1 (Greater Sandhill Crane Surveys) GSC-2 (Greater Sandhill Crane Pre-Construction Surveys) GSC-3 (Greater Sandhill Crane Roosting Buffer) GSC-4 (Greater Sandhill Crane Visual Barrier) GSC-5 (Greater Sandhill Crane Roost Buffer Monitoring)	Effects associated with increased human presence during construction that could affect greater sandhill crane habitat and behavior will be reduced by implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) GSC-3 (Greater Sandhill Crane Roosting Buffer) GSC-4 (Greater Sandhill Crane Visual Barrier) GSC-5 (Greater Sandhill Crane Roost Buffer Monitoring)	Trash and debris would adversely affect greater sandhill crane habitat quality through direct effects, such as attracting nuisance pest species and potential predators (e.g., feral cats). Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.26 Tricolored Blackbird

Permanent Effects

Permanent direct and indirect effects of Covered Activities on tricolored blackbird (*Agelaius tricolor*) will include modification or removal of modeled nesting/foraging habitat, modeled foraging habitat, habitat fragmentation and isolation, noise, lighting, increased human activity (including trash and debris), altered hydrology, altered fire regime, vehicle collisions, electrocution and collisions associated with aboveground transmission lines, wildlife community alterations, disease, and pesticides.

Over the proposed 50-year Permit Term, Covered Activities will directly affect approximately 31,058 of the 212,632 acres of modeled habitat for tricolored blackbird in the Plan Area, including approximately 27,531of the 188,539 acres of modeled nesting/foraging habitat and approximately 3,527 of the 24,093 acres of modeled foraging habitat (Table 6-98). Most of the direct effects for tricolored blackbird, approximately 29,823 acres (96%), will occur inside the UDA, including approximately 26,488 acres of modeled nesting/foraging habitat and 3,335 acres of modeled foraging habitat. Outside of the UDA, a total of approximately 1,235 acres of modeled habitat will be directly affected, including approximately 1,043 acres of modeled nesting/foraging habitat and 192 acres of modeled foraging habitat.

In addition to the direct effects quantified in Table 6-98, Covered Activities will indirectly affect tricolored blackbird modeled nesting and foraging habitat, and will also injure, kill, or harass individuals in the Plan Area (Table 6-99). All indirect effects (both qualitative and quantitative) to tricolored blackbird will be reduced through implementation of the AMMs described in Table 6-99. These potential indirect effects would be expected to generally affect tricolored blackbird in a similar manner to their effects on the other covered avian species, but some of the effects would have relatively greater effects on tricolored blackbird, as discussed in the following text. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on tricolored blackbird is greatest within the UDA because of the closer and more extensive contact between urban development and preserved areas. It is expected that most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA would be along improved roads supporting higher traffic densities and speeds that would increase the risk of vehicle collisions, accidental fire ignitions, and other road-related effects (e.g., traffic noise, road runoff, potential spread of invasive plants).

In addition to the general AMMs (Section 5.4.1), tricolor blackbird-specific measures (Section 5.4.2) will be implemented to avoid permanent direct and indirect effects on tricolor blackbird to Covered Activities. With implementation of the proposed AMMs, the proposed Covered

Activities will result in a small risk of killing or injuring individual tricolor blackbird in the Plan Area due to collisions with fixed structures or vehicles. Additionally, there is a small risk of take in the form of harassment over the duration of the permit (e.g., inhibiting individuals from roosting or foraging in some areas). This incrementally increased risk of take is mitigated through the SSHCP Conservation Strategy (Chapter 7).

Temporary Effects

In addition to the permanent removal of habitat described previously, tricolored blackbird nesting and foraging habitats near proposed ground-disturbing Covered Activities would be adversely affected by several temporary construction-related effects that could result in additional habitat disturbance or additional injury, mortality, or harassment of individual tricolored blackbirds. The various off-site direct effects that would affect tricolored blackbirds are generally described in Section 6.3.2 and include dust; noise and ground vibration; lighting; altered hydrology; chemicals and pollution; general human activity (including trash and debris); and inadvertent grading, clearing, or trampling of habitat.

These potential construction-related environmental stressors were described previously in Section 6.3.2, and their additional effects on tricolored blackbird are qualitatively described in Table 6-100, as are AMMs that would avoid and/or minimize these temporary effects.

Table 6-98
Tricolored Blackbird Permanent Effects

Land Cover Types[1]	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Nesting/Foraging Habitat												
Valley Grassland	135,112	22,014	Qualitative	22,014	30,345	21,345	Qualitative	21,345	104,767	669	Qualitative	669
Cropland	47,905	5,285	Qualitative	5,285	5,481	4,922	Qualitative	4,922	42,424	363	Qualitative	363
Seasonal Wetland	2,600	105	Qualitative	105	162	102	Qualitative	102	2,438	3	Qualitative	3
Freshwater Marsh	2,922	127	Qualitative	127	392	119	Qualitative	119	2,530	8	Qualitative	8
Total Nesting/ Foraging Habitat	*188,539*	*27,531*	*Qualitative*	*27,531*	*36,380*	*26,488*	*Qualitative*	*26,488*	*152,159*	*1,043*	*Qualitative*	*1,043*
Foraging Habitat												
Irrigated Pasture-Grassland	15,991	2,749	Qualitative	2,749	3,218	2,594	Qualitative	2,594	12,773	155	Qualitative	155
Vernal Pool	4,536	389	0	389	935	355	0	355	3,601	34	0	34
Swale	1,222	234	0	234	461	232	0	232	761	2	0	2
Open Water	2,344	155	Qualitative	155	237	154	Qualitative	154	2,107	1	Qualitative	1
Total Foraging Habitat	*24,093*	*3,527*	*0*	*3,527*	*4,851*	*3,335*	*0*	*3,335*	*19,242*	*192*	*0*	*192*
Grand Total	**212,632**	**31,058**	**0**	**31,058**	**41,231**	**29,823**	**0**	**29,823**	**171,401**	**1,235**	**0**	**1,235**

Table 6-99
Permanent Indirect Effects on Tricolored Blackbird

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-2 (Groundwater Recharge) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-2 (Erosion Control) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Pesticide Use) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves)	Long-term hydrologic alterations or reductions in water quality within the Plan Area would substantially affect tricolored blackbird nesting and foraging habitat, both in quantity and in quality. In addition, the colonial nature of this species and the close proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Specific effects of these chemicals and pollutants on tricolored blackbirds may be toxic either directly (e.g., dermal contact) or through ingestion of contaminated food sources (grain and invertebrates), or may reduce prey/forage abundance. Implementation of AMMs such TCB-5 and those that require control of stormwater runoff, restrict pesticide use, and reduce erosion will preserve nesting and foraging habitat from actions that can result in altered hydrology, and ensure pollution will not enter waterways that could degrade tricolored blackbirds nesting and foraging habitat areas and where their primary food sources could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 8, UTILITY-1 (Avian Collision Avoidance) TCB-1 (Tricolored Blackbird Surveys) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves)	Tricolored blackbirds are sensitive to habitat fragmentation and isolation. Habitat fragmentation will reduce relatively undisturbed nesting and foraging habitat patch sizes inside the UDA, increasing the chance that surrounding development will be closer to potential nest colonies and will potentially cause disturbance and possible abandonment of otherwise suitable colony sites. Additionally, habitat fragmentation would reduce available foraging habitat near nest colonies, forcing birds to travel farther and potentially reducing their fitness due to higher energy costs and reduced time at the nest. For example, during the breeding season, tricolored blackbirds do most of their foraging within approximately 3 miles of the nest colony, although they commute up to 8 miles (Beedy

Table 6-99
Permanent Indirect Effects on Tricolored Blackbird

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		2008). Habitat fragmentation would increase and exacerbate the effects of other potential permanent indirect effects to tricolored blackbird including increased human activity, altered hydrology, increased wildfire, vehicle collisions, aboveground utilities, altered wildlife communities, and risk of collisions with man-made structures and vehicles. The Landscape Preserves established outside the UDA will avoid effects of habitat fragmentation on tricolored blackbird by preserving large habitat blocks and ensuring connectivity throughout the Preserve System. Within the UDA, habitat fragmentation will affect tricolored blackbird because all UDA Preserves will be bordered by urban development, which will be reduced through implementation of TCB AMMs, EDGE AMMs, and UTILITY AMMs. The effects of roads fragmenting on some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2), will be reduced through EDGE AMMs, TCB AMMS, UTILITY AMMs, and ROAD AMMs. Overall, the large Core Preserves and connectivity provided by the SSHCP Preserve System, along with TCB-1, will minimize the effects of habitat fragmentation on tricolored blackbird in the Plan Area.
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Increased wildfire can have similar effects to altered hydrology on foraging and nesting habitat for tricolored blackbird. While Cropland and Irrigated Pasture-Grassland are important foraging habitats for tricolored blackbird in the Plan Area and are less prone to wildfire effects, Valley Grassland and Vernal Pool Ecosystems are also a suitable foraging and/or nesting habitat. Repeated or intense wildfires could affect Valley Grassland and Vernal Pool Ecosystems foraging and/or nesting habitat by removing vegetation cover and facilitating invasion by non-native exotic plant species. As with hydrologic effects, factors that degrade habitat for important food sources would reduce foraging habitat quality for

Table 6-99
Permanent Indirect Effects on Tricolored Blackbird

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		tricolored blackbird. As discussed in Section 6.3, outside the UDA, Covered Activities would not affect wildfire frequency, duration, or intensity. Effects of increased wildfire on tricolored blackbird habitat will be minimized through implementation of the Preserve System Monitoring and Management Program, which will include a commitment to develop a memorandum of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) Condition 8, UTILITY-4 (Siting of Entry and Exit Location)	Effects on tricolored blackbird due to Vernal Pool hydrologic alterations are mainly associated with foraging habitat. Hydrologic alterations could affect patterns of foraging (localized forage/prey abundance and quality) within Vernal Pool Ecosystems. Implementation of AMMs will significantly reduce effects of Vernal Pool hydrologic alterations on tricolored blackbird foraging habitat.
Chronic Ground Vibration and Noise	None required for this species.	No effect on this species.
Lighting	EDGE-8 (Outdoor Lighting) BMP-6 (Construction Lighting) TCB-1 (Tricolored Blackbird Surveys)	Lighting will mildly affect tricolored blackbird, depending on several factors, including light intensity, height of lighted structure, and physical shielding and vegetation. Sudden and unexpected onset of lighting (e.g., from vehicles) will also startle normally diurnally active birds, potentially causing them to abandon nests and/or become disoriented. Lighting could also lure prey insects that the tricolored blackbird depend on, reducing their abundance within tricolored blackbird habitat preserves. Implementation of these AMMs would ensure that Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittees determines lighting is necessary for public safety or security. By directing lighting away from preserves, this effect would be reduced but not eliminated.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread)	Tricolored blackbirds are sensitive to human disturbances, and nesting tricolored blackbirds are very sensitive to human disturbances, abandoning colonies with a single disturbance

Table 6-99
Permanent Indirect Effects on Tricolored Blackbird

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 3, BMP-11 (Speed Limit) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 8, UTILITY-1 (Avian Collision Avoidance) EDGE-8 (Outdoor Lighting) TCB-1 (Tricolored Blackbird Surveys) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves)	(Beedy and Hamilton 1999). Potential effects of increased human activity will be reduced through implementation of these AMMs, including TCB-1 and TCB-5 and Conditions 2, 3, 4, and 5, will ensure that increased human activity in and near Preserves is limited, that precautions are taken to minimize anthropogenic effects, and that effects are monitored so that human activity does not substantially affect tricolored blackbirds or their habitat.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education) TCB-1 (Tricolored Blackbird Surveys)	Covered Activities may facilitate wildlife community alterations by changing the structure of the wildlife community by increased human activity (and non-native predators, such as dogs), pesticides, livestock, and invasive species. Known nocturnal predators of tricolored blackbirds that would increase in urbanized and agricultural settings include opossum, skunk, raccoon, American crows, ravens, and cattle egrets (*Bubulcus ibis*) (Mailliard 1914; Meese 2011; Neff 1937), as well as cats (*Felis catus*) (Payne 1969). In the Central Valley, coyotes are also major predator of tricolored blackbird colonies, especially in silage field colonies and cattail colonies when water is withdrawn (Hamilton, pers. comm. n.d., as cited in Appendix B, Species Accounts.) Implementation of AMMs such as those require Trail Public Education and Preserve Setbacks prevent invasive species spread road project location and tricolored blackbird surveys will ensure human activity will have minimal effects to the wildlife community within tricolored blackbird habitat.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks)	Unmanaged proliferation of non-native plants could affect species composition within tricolored blackbird habitat in the Plan Area. A

Table 6-99
Permanent Indirect Effects on Tricolored Blackbird

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	change in vegetation structure could have an effect on forage habitat and prey species use of habitat. Implementation of AMMs will minimize proliferation of non-native plants. Effects of proliferation of non-native plants will be reduced relative to existing unmanaged conditions (see Chapter 7).
Invasive Animals	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, NATURE TRAIL-6 (Nature Trail Public Education)	As described previously in Wildlife Community Alterations, invasion by non-native predators of tricolored blackbird and its prey is avoided through AMMs such as Preserve Setbacks and Monitoring of Trail Impacts.
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 6, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) TCB-1 (Tricolored Blackbird Surveys)	Effects to tricolored blackbird by mesopredators will be minimized by implementing AMMs that reduce interaction between tricolored blackbird and urban wildlife (raccoon, opossum, fox) and pets.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 4, ROAD-3 (Roadside Pesticide Use)	No information on diseases directly affecting tricolored blackbird are available in literature published on the species. However, the West Nile virus has been documented in the closely related red-winged blackbird (*Agelaius phoeniceus*), as well as Brewer's blackbird (*Euphagus cyanocephalus*) and common grackle (*Quiscalus quiscula*) (Bernard et al. 2001; Komar 2003), and the virus has been implicated in the decline of at least one species in Central Valley—loggerhead shrike (Pandolfino 2008). The risk of

Table 6-99
Permanent Indirect Effects on Tricolored Blackbird

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	TCB-1 (Tricolored Blackbird Surveys) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves)	West Nile virus infections will be managed through vector control for public health and safety, such as through spraying with pesticides, but management will need to consider potential adverse effects to native wildlife, as spraying with mosquito abatement oil has resulted in mass mortality of tricolored blackbirds (Beedy and Hamilton 1999). While these disease factors generally cannot be addressed wholly through specific AMMs, the SSHCP Conservation Strategy of preserving adequate nesting and foraging habitat in several locations in the Preserve System will help reduce the risk of epizootic events related to increased contact between colonies. Implementation of these AMMs will also act to minimize the potential for introduction of these diseases into local tricolored blackbird populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use) TCB-1 (Tricolored Blackbird Surveys) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves)	Tricolored blackbirds have been demonstrated to be sensitive to pesticides and herbicides. For example, the application of herbicides and pesticides are known to affect the nesting success of colonies in agricultural areas (Beedy and Hamilton 1999). Various poisons and contaminants have also caused mass mortality, including poisoning by strychnine and selenium and spraying with mosquito abatement oil (McCabe 1932; Beedy and Hayworth 1992; Beedy and Hamilton 1999; Beedy 2008). Pesticides may also reduce the abundance of insect prey that tricolored blackbird depend on. Adverse effects on tricolored blackbird and/or their nesting and foraging habitat from insecticides/pesticides or fertilizers used in new urban developments in or near SSHCP Preserves will be minimized through the implementation of AMMs that will reduce and/or restrict the use of these chemicals in the Plan Area. Specific restrictions on pesticide use in certain preserves may be included in Preserve Management Plans, further minimizing the effects of pesticides on

Table 6-99
Permanent Indirect Effects on Tricolored Blackbird

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		tricolored blackbird nesting habitat and the insect prey of tricolored blackbird.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) ROAD-1 (Road Project Location) ROAD-2 (Wildlife Crossing Structures) TCB-1 (Tricolored Blackbird Surveys)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by tricolored blackbirds near heavily trafficked areas and in urbanized areas. As described for the covered raptors, increased collision risks are inevitable with urbanization and are difficult to predict or control directly because birds fly some distance between nesting locations and preferred foraging areas. Covered Activities will increase the frequency of tricolored blackbird vehicle and windshield collisions as the amount of roadways within the Plan Area will be increased from existing conditions. Indirect effects on tricolored blackbird associated with vehicle collisions and aircraft will be avoided by locating planned road projects in the least environmentally sensitive location relative to nesting and foraging habitat. Otherwise, tricolored blackbird will be preserved from collisions by establishment of large, interconnected Preserves (Chapter 7) that will lessen roadway interaction.
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance) TCB-1 (Tricolored Blackbird Surveys)	Aboveground utilities such as transmission towers, utility poles, and powerlines pose a general risk to all avian species, with mortalities and injuries from collisions (powerlines), entanglements, and electrocutions (Franson et al. 1995; Lehman et al. 2007). Implementation of these AMMs will reduce effects of utility-related Covered Activities on tricolored blackbirds by incorporating the most current practices for avoiding avian power line collisions.

Table 6-100
Temporary Effects to Tricolored Blackbird

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single Loaded Streets) Condition 4, ROAD-1 (Road Project Location) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves)	Runoff from construction activities into tricolored blackbird habitat will be fully avoided through the implementation of AMMs.
Laydown or Trampling of Vegetation	Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-11 (Speed Limit) TCB-1 (Tricolored Blackbird Surveys) TCB-2 (Tricolored Blackbird Pre-Construction Surveys) TCB-3 (Tricolored Blackbird Nest Buffer) TCB-4 (Tricolored Blackbird Nest Buffer Monitoring)	Inadvertent trampling and compaction of vegetation could cause tricolored blackbird to avoid habitat or reduce the quantity or quality of foraging and nesting habitat. Implementation of AMMs ensures that trampling and compaction will not occur.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location) TCB-1 (Tricolored Blackbird Surveys) TCB-2 (Tricolored Blackbird Pre-Construction Surveys) TCB-3 (Tricolored Blackbird Nest Buffer) TCB-4 (Tricolored Blackbird Nest Buffer Monitoring) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural	Loud noise can affect tricolored blackbird and cause abandonment of nesting sites. Implementation of AMMs will minimize construction noise effects in the vicinity of tricolored blackbird nesting and foraging habitat.

Table 6-100
Temporary Effects to Tricolored Blackbird

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	Preserves)	
Construction Ground Vibration	None required for this species.	No effect on this species.
Construction Lighting	BMP-6 (Construction Lighting) TCB-1 (Tricolored Blackbird Surveys) TCB-2 (Tricolored Blackbird Pre-Construction Surveys) TCB-3 (Tricolored Blackbird Nest Buffer) TCB-4 (Tricolored Blackbird Nest Buffer Monitoring) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves)	During construction periods, ground-disturbing Covered Activities will direct all temporary construction lighting away from adjacent natural habitats to avoid abandonment of nests and disorienting effects to tricolored blackbird. Lighting could also lure prey insects that the tricolored blackbird depend on, reducing their abundance within tricolored blackbird habitat preserves. By directing lighting away from preserves, this effect would be reduced but not eliminated.
Construction Dust	None required for this species.	No effect on this species.
Increased Human Presence during Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) TCB-1 (Tricolored Blackbird Surveys) TCB-2 (Tricolored Blackbird Pre-Construction Surveys) TCB-3 (Tricolored Blackbird Nest Buffer) TCB-4 (Tricolored Blackbird Nest Buffer Monitoring) TCB-5 (Timing of Pesticide Use and Harvest Timing on Agricultural Preserves))	Effects associated with increased human presence during construction that could affect greater tricolored blackbird and behavior will be reduced by implementing AMMs.
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program) TCB-1 (Tricolored Blackbird Surveys) TCB-2 (Tricolored Blackbird Pre-Construction Surveys) TCB-3 (Tricolored Blackbird Nest Buffer) TCB-4 (Tricolored Blackbird Nest Buffer Monitoring)	Trash and debris would adversely affect tricolored blackbird habitat quality through direct effects, such as attracting nuisance pest species and potential predators (e.g., feral cats). Implementation of AMMs ensures that construction trash and debris will be controlled.

6.6.27 American Badger

Permanent Effects

Permanent direct and indirect effects of Covered Activities on American badger (*Taxidea taxus*) will include modification or significant degradation of modeled habitat and direct and indirect take of all American badger individuals occupying that modified or degraded habitat. Modeled habitats for American badger are Valley Grassland, Blue Oak Savanna, Vernal Pool, Seasonal Wetland, and Swale.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 22,780 acres of modeled habitat for American badger within the Plan Area (see Table 6-101). Covered Activity impacts on American badger will occur primarily inside the UDA, with approximately 22,036 acres of permanent effects in the UDA and 744 acres of permanent effects outside the UDA.

American badger in the Plan Area will be affected by several permanent indirect effects on habitats, as well as injury, mortality, or harassment of individuals (Table 6-102). Potential permanent indirect effects of the Covered Activities include habitat fragmentation and isolation, noise, lighting, increased human activity (including recreation and trash and debris), altered fire regime, vehicle collisions, wildlife community alterations, disease, and pesticides. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on American badger is greatest within the UDA because of the closer and more extensive contact between urban development and protected areas. It is expected that most of these indirect effects, with the exception of vehicle collisions, will be relatively minor outside the UDA because of the larger Preserves and much lower development densities. Most potential indirect effects outside the UDA will be along improved roads supporting higher traffic densities and speeds that increase the risk of vehicle collisions, accidental fire ignitions, and other road-related effects (e.g., traffic noise, potential spread of invasive plants). The potential permanent indirect effects of Covered Activities are described below, along with AMMs to avoid and minimize these effects.

Table 6-101
American Badger Permanent Effects

Land Cover Types[1]	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Valley Grassland	135,112	22,014	Qualitative	22,014	30,345	21,345	Qualitative	21,345	104,767	669	Qualitative	669
Blue Oak Savanna	5,637	38	Qualitative	38	18	2	Qualitative	2	5,619	36	Qualitative	36
Vernal Pool	4,536	389	0	389	935	355	0	355	3,601	34	0	34
Seasonal Wetland	2600	105	Qualitative	105	163	102	Qualitative	102	2,437	3	Qualitative	3
Swale	1,252	234	0	234	461	232	0	232	791	2	0	2
GRAND TOTAL	**149,137**	**22,780**	**0**	**22,780**	**31,922**	**22,036**	**0**	**22,036**	**117,215**	**744**	**0**	**744**

Temporary Effects

American badgers near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to American badger. Generally, these temporary effects will occur within the project footprint or road right-of-way area (already quantified as permanently affected in the direct effects reported in Table 6-101). These potential construction-related environmental stressors were generally described in Section 6.3.2, and their additional effects on American badger are qualitatively described in Table 6-103.

Table 6-102
Permanent Indirect Effects on American Badger

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 3, BMP-9 (Soil Compaction) Condition 4, ROAD-1 (Road Project Location)	Planned development and roads, both in the UDA and outside the UDA, would be located near American badger habitat. This development will result in hydrologic and water quality effects on this habitat, including urban runoff that alters normal hydroperiods in vernal pools and seasonal wetlands and that contains pollutants and toxins, including fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure pollution will not enter American badger habitat and that water chemistry of aquatic habitat will not be affected.
Habitat Fragmentation	Habitat fragmentation was minimized in the SSHCP Preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	Habitat fragmentation, especially in the UDA, will be the primary indirect effect on American badgers. American badger is a mobile species that often uses large areas within its home range (Lindzey 1978; Long 1973; Messick and Hornocker 1981; Minta 1993; Sargeant and Warner 1972). Minimum patch size is estimated to be approximately 25 acres (Laudenslayer and Parisi 2007). Young also may disperse long distances, with females moving more than 32 miles and males moving more than 63 miles (Messick and Hornocker 1981). These large home ranges and long-distance movements mean that fragmented habitats will expose badgers to various risks, including encounters with humans and dogs and vehicle collisions. Because badgers naturally occur in low population densities, additional effects from habitat fragmentation and isolation can quickly result in local extirpations, which have been observed in the Central Valley possibly more than in any other portion of California (Larsen 1987). Additionally, habitat fragmentation from Covered Activities will reduce habitat patch size and expose American badgers to adverse edge effects such as noise and lighting. Habitat fragmentation will be minimized in the UDA through establishment of large and interconnected Preserves.

Table 6-102
Permanent Indirect Effects on American Badger

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	As discussed in Section 6.3, Covered Activities outside the UDA will not affect wildfire frequency, duration, or intensity. Within the UDA, increased wildfire will cause direct mortality of American badger prey (e.g., ground squirrels, rabbits, other small rodents) and general habitat degradation that reduces prey abundances over time. Other adverse habitat effects could result from wildfire suppression (e.g., fire trucks, retardant, fire breaks). Effects of wildfire suppression on American badge will be minimized through implementation of the Preserve System Management Program, which will include a commitment to develop memorandums of agreement with responsible fire agencies.
Vernal Pool Hydrologic Alterations	None required for this species.	No effect on this species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	Increased vibration and noise levels in American badger habitat will degrade habitat quality for American badger, resulting in avoidance of high-noise areas such as roadways (Iglesias et al. 2012). Effects of noise on badgers will be minimized through EDGE AMMs, including establishment of Preserve Setbacks and design of compatible land uses near Preserves. Noise effects will also be considered in design of wildlife crossings (ROAD-2).
Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 4, ROAD-1 (Road Project Location)	American badger is primarily nocturnal, so lighting will have particularly adverse effects on this species, reducing habitat suitability near urban development and roads. Also, prey such as small rodents may avoid lighted areas, reducing prey resources in these areas. AMMs will minimize light pollution in Preserves in the UDA by requiring that lighting be shielded and directed away from adjacent natural habitats, establishing Preserve Setbacks, and ensuring that compatible land uses are placed adjacent to Preserves as much as possible.

Table 6-102
Permanent Indirect Effects on American Badger

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Increased human activity related to public access in the Preserve System will disrupt essential American badger behaviors such as foraging, reproducing, and dispersing. In addition to effects such as inadvertent or intentional harassment of wildlife and habitat degradation (e.g., off-trail use), specific effects related to increased human activity are increased pets, trash, and debris. American badgers are especially susceptible to harassment by dogs. Potential effects of increased public access in the Preserve System will be addressed through Condition 5 AMMs.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location)	For American badgers, wildlife community alteration effects will occur as a result of changes in prey availability caused by habitat degradation and potentially increased competition for resources by mesopredators. As omnivores, badgers prey on a variety of native prey, including squirrels, rabbits, small rodents, birds (including eggs and nestlings) and snakes, and are sensitive to factors that alter predator/prey relationships. However, their omnivory also makes them resilient to changes in wildlife communities. This resilience, coupled with the minimization provided by the AMMs, will result in minimal effects on American badger.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves)	Invasion and proliferation of invasive plant species related to Covered Activities will adversely affect American badger through changes in rodent prey populations that eat native plant species.

Table 6-102
Permanent Indirect Effects on American Badger

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 6, RE-ESTABLISHMENT/ESTABLISHMENT-2 (Vernal Pool Inocula Bank)	Invasive plants will also adversely affect American badger by changing soil conditions and making it more difficult for badgers to dig burrows. Invasion and proliferation of invasive plant species will be controlled through implementation of AMMs that restrict development near Preserves, establish Preserve Setbacks, and control invasive species spread in Preserves and Preserve Setbacks.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	Because American badgers are mesopredators, an increase in the population of other mesopredators will increase competition for prey and habitat. Increases in mesopredator populations will be limited through AMMs that reduce interaction between badgers on Preserves and pets and urban-adapted wildlife (e.g., raccoon, opossum, fox).
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Urban development near existing and proposed Preserves will increase transmission of disease to American badgers. Quinn et al. (2012) found that American badgers near urban areas had been exposed to several bacterial infectious agents associated with pets and wildlife, and to canine distemper virus. The SSHCP will have little direct control over potential disease transmission from ingested prey such as rodents because active control of these well-established and very common species likely is not feasible. However, potential transmission of diseases from pets will be minimized by through EDGE measures and by restricting public access to Preserves.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside	Pesticides (including rodenticides) will enter American badger habitat through rodent control programs (e.g., ground squirrels), runoff from irrigated landscapes and from storm events, use during windy conditions, and from otherwise incorrect application methods resulting in problems such as drift and overspray into Preserves. Because badgers often prey on ground squirrels, rodent controls

Table 6-102
Permanent Indirect Effects on American Badger

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	that reduce prey abundance and expose badgers to toxic chemicals will adversely affect the species in the Plan Area. Quinn et al. (2012) found badger tissue that contained anticoagulant rodenticides brodifacoum and bromadiolone, commonly used to control rodent pests.
Vehicle and Aircraft Collisions with Wildlife	Habitat fragmentation was minimized in the SSHCP Preserve design, including preserving large habitat blocks and habitat connectivity throughout the Preserve System, as discussed in detail in Chapter 7. Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-7 (Hardpan/Duripan Protection) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures)	Habitat fragmentation associated with Covered Activities, especially in the UDA, will increase the chance of vehicle collisions for badgers attempting to cross improved roads that have higher traffic densities and speeds. It is difficult to predict precise locations where collisions are most likely to occur because there are few known American badger occurrences in the Plan Area, and its spatial movement patterns are unknown. However, Condition 4 road project study requirements, wildlife crossings, and other AMMs to reduce the effects of habitat fragmentation on movement and associated increased collision risks will be implemented. These AMMs, in combination with establishment of large and interconnected Preserves, will help maintain American badger movement in the Plan Area and minimize the chances of death, injury, and harassment of American badger through vehicle collisions.
Aboveground Electrical Utilities Collision and Electrocution	None required for this species.	No effect on this species.

Table 6-103
Temporary Effects to American Badger

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single-Loaded Streets) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location)	Runoff from construction activities into American badger aquatic land cover types will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	None required for this species.	No effect on this species.
Construction Noise	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location)	Construction-related noise will degrade habitat quality for American badger, resulting in avoidance of the construction vicinity. Effects of noise on badgers will be minimized through BMPs and EDGE AMMs, including establishment of Preserve Setbacks and design of compatible land uses near Preserves.
Construction Ground Vibration	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 4, ROAD-1 (Road Project Location)	Construction-related vibration will degrade habitat quality for American badger, resulting in avoidance of the construction vicinity. Generally, non-disturbance setbacks for non-critical den use such as winter dens can be smaller (e.g., at least 50 feet), but need to be larger for maternity dens until young are mobile (e.g., at least 200 feet). Effects of vibration on badgers will be minimized through BMPs and EDGE AMMs, including establishment of Preserve Setbacks and design of compatible land uses near Preserves.
Construction Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-6 (Construction Lighting) Condition 4, ROAD-1 (Road Project Location)	American badgers are primarily nocturnal, so lighting will have particularly adverse effects on this species and reduce habitat suitability near urban development and roads. Also, prey such as small rodents may avoid lighted areas, reducing prey resources in these areas. AMMs will minimize light pollution into Preserves in the

Table 6-103
Temporary Effects to American Badger

Environmental Stressor	Effect Reduced By	Potential Effect on Species
		UDA by requiring that lighting be shielded and directed away from adjacent natural habitats, establishing Preserve Setbacks, and ensuring that compatible land uses are placed adjacent to Preserves as much as possible.
Construction Dust	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-3 (Dust Control)	Dust will affect habitat and prey availability for American badger. Dust effects on vegetation communities will reduce habitat quality for important prey such as small mammals, reptiles, amphibians, and ground nesting birds. An AMM requiring control of construction dust will minimize this effect.
Increased Human Presence during Construction	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas)	Increased human activity in construction areas will disrupt essential American badger behaviors such as foraging, reproduction, and dispersal. In addition to effects such as inadvertent or intentional harassment of wildlife and habitat degradation, specific effects related to increased human activity are increased pets, trash, and debris. Badgers are especially susceptible to harassment by dogs. Potential effects of increased human presence in construction areas will be addressed through staff training.
Construction Trash and Debris	Condition 2, EDGE-3 (Preserve Setbacks) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect American badger habitat quality through direct effects such as attracting nuisance pest species and mesopredators, which could harass American badgers or compete with them for prey. Implementation of AMMs will ensure that construction trash and debris are controlled.

6.6.28 Western Red Bat

Permanent Effects

Permanent direct and indirect effects of Covered Activities on western red bat (*Lasiurus blossevillii*) will include modification or significant degradation of modeled habitat and the direct and indirect take of all roost sites in that modified or degraded habitat. The SSHCP database does not contain any confirmed western red bat roost sites in the Plan Area.

Over the proposed 50-year Permit Term, Covered Activities will permanently affect approximately 23,986 acres of western red bat modeled habitat within the Plan Area (see Table 6-16) consisting of 23,330 acres of foraging habitat and 656 acres of roosting/foraging habitat. Covered Activity impacts on western red bat modeled habitat will occur primarily inside the UDA, with approximately 23,142 acres of permanent effects on modeled habitat in the UDA and 844 acres of permanent effects on modeled habitat outside the UDA (Table 6-104).

Western red bat in the Plan Area will be affected by several permanent indirect effects on roosting/foraging and foraging habitats, and will be affected by injury, mortality, and harassment of individuals (Table 6-105). Western red bat is a tree-roosting species; individuals or small groups of reproductive females roost in the foliage of broadleaf trees such as cottonwoods (*Populus* spp.) and sycamores (*Platanus racemosa*), and also in orchards (often walnut (*Juglans* spp.)). Constantine (1959) reported that human activities in orchards caused bats to fly from the roosts, although they returned the next day. Human talking and walking around roost sites did not appear to substantially disturb bats, but any attempt to handle the bat did. Based on this, human activities associated with Covered Activities will affect roosting and reproduction, especially if pregnant and lactating females are roosting in areas subject to high levels of human activity during construction or operation. Although these indirect effects will occur throughout the Plan Area, their potential to have substantial effects on western red bat is greatest within the UDA because of the closer and more extensive contact between urban development and protected areas. Most of these indirect effects will be relatively minor outside the UDA because of the larger Preserves and much lower development densities, and the potential for human activities near roost sites. Most potential indirect effects outside the UDA would be to potential foraging habitat along improved roads supporting higher traffic densities that increase the risk of accidental fire ignitions and other road-related effects (e.g., traffic noise that will mask acoustic signals, road runoff, potential spread of invasive plants). The permanent indirect effects of Covered Activities on western red bat are described in Table 6-105, along with AMMs to avoid and minimize these effects.

In addition to indirect effects from Covered Activities near or adjoining existing Preserves or planned SSHCP Preserves, certain uses will be allowed inside Preserves and in Preserve

Setbacks that may indirectly affect western red bat. This impact analysis assumes that proper implementation of AMMs on Preserves and Preserve Setbacks over the Permit Term will avoid and minimize "other" indirect impacts.

Temporary Effects

Western red bat occurrences near proposed ground-disturbing Covered Activities will be adversely affected by several temporary construction-related effects (see Section 6.3.2) that will result in additional disturbance to habitat or additional harm to the species. Generally, these temporary effects will occur within the project footprint or road right-of-way area (quantified as permanently impacted in the direct effects reported in Table 6-104). These potential construction-related environmental stressors were described in Section 6.3.2, and their additional effects on western red bat are qualitatively described in Table 6-106.

Table 6-104
Western Red Bat Permanent Effects

Land Cover Types[1]	Total Plan Area (acres)				Inside UDA (acres)				Outside UDA (acres)			
	Total Available	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*	*Total Available*	*Direct Effect*	*Indirect Effect*	*Total Effect*
Foraging Habitat												
Valley Grassland	135,112	22,014	Qualitative	22,014	30,345	21,345	Qualitative	21,345	104,767	669	Qualitative	669
Vernal Pool	4,536	389	0	389	935	355	0	355	3,601	34	0	34
Seasonal Wetlands	2,600	105	Qualitative	105	162	102	Qualitative	102	2,438	3	Qualitative	3
Freshwater Marsh	2,922	127	Qualitative	127	392	119	Qualitative	119	2,530	8	Qualitative	8
Streams/Creeks	2,674	117	Qualitative	117	163	92	Qualitative	92	2,511	25	Qualitative	25
Open Water	2,344	155	Qualitative	155	237	154	Qualitative	154	2,107	1	Qualitative	1
Mixed Riparian Scrub	1,451	189	Qualitative	189	241	186	Qualitative	186	1,210	3	Qualitative	3
Swale	1,252	234	0	234	461	232	0	232	791	2	0	2
Total Foraging Habitat	*152,891*	*23,330*	*0*	*23,330*	*32,936*	*22,585*	*0*	*22,585*	*119,955*	*745*	*0*	*745*
Roosting/Foraging Habitat												
Blue Oak Woodland	9,132	9	Qualitative	9	0	0	Qualitative	0	9,132	9	Qualitative	9
Mixed Riparian Woodland	5,785	184	Qualitative	184	244	146	Qualitative	146	5,541	38	Qualitative	38
Blue Oak Savanna	5,637	38	Qualitative	38	18	2	Qualitative	2	5,619	36	Qualitative	36
Orchards	3,646	207	Qualitative	207	212	191	Qualitative	191	3,434	16	Qualitative	16
Mine Tailing Riparian Woodland	641	218	Qualitative	218	220	218	Qualitative	218	421	0	Qualitative	0
Total Roosting/ Foraging Habitat	*24,841*	*656*	*Qualitative*	*656*	*694*	*557*	*Qualitative*	*557*	*24,147*	*99*	*Qualitative*	*99*
Grand Total	**177,732**	**23,986**	**Qualitative**	**23,986**	**33,630**	**23,142**	**Qualitative**	**23,142**	**144,102**	**844**	**Qualitative**	**844**

Table 6-105
Permanent Indirect Effects on Western Red Bat

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Permanent Alterations to Watershed Hydrographs and Downstream Water Quality Effects	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	The proximity of planned development and roads to aquatic habitat increases the likelihood that hydrologic and water quality effects will occur, including urban runoff that could potentially contain pollutants and toxins such as fertilizers, herbicides, pesticides, fuel, oil, lubricants, paints, and release agents. Implementation of AMMs such as those that require control of stormwater runoff will ensure that pollution will not enter waterways that run through riparian areas and aquatic habitats where western red bat prey could be directly affected.
Habitat Fragmentation	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location)	Although western red bat are mobile and able to fly over unsuitable landscapes, habitat fragmentation will have at least two adverse effects on the species: (1) exposing suitable roosting sites to urban edges, thus increasing the potential for disruptive effects such as noise, lighting, human activities, and urban-related predators, and (2) forcing bats to fly farther to suitable foraging areas, thus increasing energetic demands and time away from the roost. Habitat fragmentation also increases other risks such as collisions with vehicles and human-built structures. The Landscape Preserves and agricultural Preserves established outside the UDA will avoid effects of habitat fragmentation on western red bat. Within the UDA, habitat fragmentation will affect western red bat because all UDA Preserves will be bordered by urban development; this will be reduced through implementation of EDGE AMMs. The effects of roads fragmenting some UDA Preserves, such as Core Preserve 1 in PPU 1 and Core Preserve 2 in PPU 2 (Chapter 7, Section 7.5.2) will be reduced through EDGE AMMs and ROAD AMMs. Overall, the large Preserves and connectivity provided by the SSHCP Preserve System will minimize the effects of habitat fragmentation on western red bat in the Plan Area.

Table 6-105
Permanent Indirect Effects on Western Red Bat

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
Increased Wildfire	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Increased wildfire can have similar effects as altered hydrology on riparian roosting and foraging habitat of western red bat. However, because western red bat depends on larger, mature trees such as Fremont's cottonwood, western sycamore, and valley oak in the Central Valley, it is sensitive to fire effects on mature trees. Implementation of AMMs under Conditions 2 and 5 will help reduce indirect effects to western red bat associated with increased wildfire.
Vernal Pool Hydrologic Alterations	None required for this species.	No effect on this species.
Chronic Ground Vibration and Noise	Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	The sensitivity of western red bats to noise and vibration is not well understood; however, they are likely sensitive to human disturbances, and vibration and noise could indirectly affect the use of foraging and roosting habitat for western red bat. Implementation of these AMMs will minimize chronic noise near western red bat roosting and foraging habitat.
Lighting	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-8 (Outdoor Lighting) Condition 4, ROAD-1 (Road Project Location)	Increased lighting will attract insects, and foraging Western red bats will be attracted to this lighting in urban development areas near Preserves. This effect will not necessarily be adverse, but exposure to urban development could increase lighting spillover onto Preserves. Lighting could also lure prey insects that the western red bat depend on, reducing their abundance within tricolored blackbird habitat preserves. Implementation of these AMMs would ensure that Covered Activities that require lighting in the UDA will minimize light pollution into Preserves, except where a Plan Permittee determines that lighting is necessary for public safety or security. By directing lighting away from preserves, this effect would be reduced but not eliminated.
Increased Human Activity	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-1 (Road Project Location)	Increased human activity related to public access in the Preserve System should have minimal effects on nocturnal foraging species like western red bat, but will potentially disrupt roosting. Potential effects on roosting from public access in the Preserve System will

Table 6-105
Permanent Indirect Effects on Western Red Bat

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
	Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Effects) Condition 5, NATURE TRAIL-6 (Nature Trail Public Education)	be addressed through Conditions 2, 4, and 5.
Wildlife Community Alterations	Condition 1, LID-1 (Stormwater Quality) Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts) Condition 5, NATURE TRAIL-6 (Nature Trail Public Education)	Wildlife community alterations will affect western red bat through changes in prey availability and exposure to urban-related competitors and predators. Roosting western red bats are vulnerable to urban-related predators, including skunks, opossums, cats, rats, and crows, as well as western scrub-jays.
Invasive Plants	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-3 (Roadside Pesticide Use) Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Invasion and proliferation of invasive plants can result in wildlife community alterations that result in reduced insect prey abundance for western red bat. These effects will be limited through implementation of AMMs.
Invasive Animals	None required for this species.	No effect on this species.
Mesopredators	Condition 1, LID-3 (Natural Site Features) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-2 (Wildlife Crossing Structures) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Several mesopredators prey on adult and juvenile western red bats, including Virginia opossum and domestic cats. Exposure of western red bats to these mesopredators will increase with urban development under the SSHCP. Effects to western red bat and its insect prey by mesopredators will be minimized by implementing AMMs that reduce interaction between western red bat and urban

Table 6-105
Permanent Indirect Effects on Western Red Bat

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		wildlife (raccoon, opossum, fox) and pets.
Wildlife Disease	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 4, ROAD-3- Roadside Pesticide Use Condition 5, NATURE TRAIL-1 (Nature Trail Plan) Condition 5, NATURE TRAIL-2 (Nature Trail Protection of Duripan) Condition 5, NATURE TRAIL-3 (Nature Trail Location) Condition 5, NATURE TRAIL-4 (Biological Studies Prior to Nature Trail Design) Condition 5, NATURE TRAIL-5 (Monitoring of Nature Trail Impacts)	Although no diseases have been identified as affecting western red bat, the species has not been well studied. Diseases transmitted from humans and pets could affect western red bat, and the risk of such transmission is expected to increase in the Plan Area with buildout of the UDA. Condition 2 EDGE measures will minimize the interaction of western red bat with humans and pets. Transmission of diseases from humans and pets in Preserves will be minimized by controlling access to Preserves through Condition 2 and Condition 5. Implementation of these AMMs will minimize the potential for introduction of diseases into local western red bat populations.
Pesticides and Fertilizers	Condition 1, LID-1 (Stormwater Quality) Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-4 (Locate Stormwater Control Outside Preserves) Condition 2, EDGE-5 (Stormwater Control in Preserve Setbacks) Condition 2, EDGE-6 (Detention Basins in Linkage Preserves) Condition 2, EDGE-10 (Prevent Invasive Species Spread) Condition 4, ROAD-1 (Road Project Location) Condition 4, ROAD-3 (Roadside Pesticide Use)	Pesticides are of particular concern for western red bats because they roost in orchards. Pierson et al. (2006) expressed concern that pesticide use at occupied orchards could result in injury, mortality, and harassment of western red bats, either through direct poisoning or indirectly through effects on prey abundance, especially if the bats are using the orchards as compensation for the historical loss of native riparian habitats (particularly walnut orchards along the Sacramento River). Adverse effects on western red bat or their habitat from pesticides or fertilizers used in new urban developments and in or near SSHCP Preserves will be minimized by implementation of AMMs. Specific restrictions on pesticide use in certain preserves may be included in Preserve Management Plans, further minimizing the effects of pesticides on the insect prey of western red bat.
Vehicle and Aircraft Collisions with Wildlife	Condition 2, EDGE-1 (Compatible Land Use) Condition 2, EDGE-2 (Single-Loaded Streets) Condition 2, EDGE-3 (Preserve Setbacks) Condition 2, EDGE-9 (Livestock Access to Preserves) Condition 4, ROAD-1 (Road Project Location)	Buildout in the UDA will result in higher traffic densities and speeds on improved roads and more frequent flights by western red bats in heavily trafficked and urbanized areas. Covered Activities will increase the frequency of vehicle and window strikes by western red bats. Indirect effects on western red bat associated with vehicle collisions and aircraft will be avoided by locating road projects in the

Table 6-105
Permanent Indirect Effects on Western Red Bat

Environmental Stressor (Section 6.3)	Indirect Effect Reduced By	Potential Indirect Effect on Species
		least environmentally sensitive location relative to western red bat habitat. Western red bat will be protected from collisions by establishment of large, interconnected Preserves (Chapter 7).
Aboveground Electrical Utilities Collision and Electrocution	Condition 8, UTILITY-1 (Avian Collision Avoidance)	Although UTILITY-1 is designed to avoid collisions with raptors, the same design measures should also reduce the likelihood of collisions with western red bats.

Table 6-106
Temporary Effects to Western Red Bat

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Temporary Alterations to Hydrographs and Construction Water Quality Effects	Condition 2, EDGE-1 (Compatible Land Uses) Condition 2, EDGE-2 (Preserve Setbacks) Condition 2, EDGE-3 (Single-Loaded Streets) Condition 3, BMP-1 (Construction Fencing) Condition 3, BMP-2 (Erosion Control) Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-4 (Erodible Materials) Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) Condition 3, BMP-9 (Soil Compaction) Condition 3, BMP-10 (Revegetation) Condition 4, ROAD-1 (Road Project Location)	Runoff from construction activities into western red bat riparian and aquatic land cover types will be fully avoided through implementation of AMMs.
Laydown or Trampling of Vegetation	None required for this species.	No effect on this species.
Construction Noise	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) BAT-1 (Winter Hibernaculum Surveys) BAT-2 (Winter Hibernaculum Pre-Construction Surveys)	Construction-related noise near winter hibernacula will disrupt colonies, and could lead to roost abandonment (e.g., Constantine 1959). Noise disturbance of these bats will be avoided through implementation of AMMs, including species-specific measures that

Table 6-106
Temporary Effects to Western Red Bat

Environmental Stressor	Effect Reduced By	Potential Effect on Species
	BAT-3 (Winter Hibernaculum Buffer) BAT-4 (Bat Eviction Methods)	require identification and avoidance of any roosts.
Construction Ground Vibration	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) BAT-1 (Winter Hibernaculum Surveys) BAT-2 (Winter Hibernaculum Pre-Construction Surveys) BAT-3 (Winter Hibernaculum Buffer) BAT-4 (Bat Eviction Methods)	Construction-related ground vibration near winter hibernacula will disrupt colonies, and could lead to roost abandonment (e.g., Constantine 1959). Vibration disturbance of these bats will be avoided through implementation of AMMs, including species-specific measures that require identification and avoidance of any roosts.
Construction Lighting	Condition 3, BMP-6 (Construction Lighting) BAT-1 (Winter Hibernaculum Surveys) BAT-2 (Winter Hibernaculum Pre-Construction Surveys) BAT-3 (Winter Hibernaculum Buffer) BAT-4 (Bat Eviction Methods)	Construction-related noise, vibration, and lighting near winter hibernacula will disrupt colonies, including abandonment (e.g., Constantine 1959). Nighttime lighting could disrupt foraging by this nocturnal species, altering behavior by their prey insects and requiring additional energy expenditure by the bats to find food. Lighting could also lure prey insects that the western red bat depend on, reducing their abundance within tricolored blackbird habitat preserves. These effects will be minimized through avoidance of nighttime lighting, and identification and buffering of occupied roosts.
Construction Dust	Condition 3, BMP-7 (Dust Control)	Dust will affect foraging habitat quality for western red bat by decreasing the vigor and productivity of vegetation communities and reducing habitat quality for important insect prey such as moths, beetles, grasshoppers, and crickets. This effect will be minimized by AMMs so that it does not substantially affect the species.
Increased Human Presence during Construction	Condition 3, BMP-3 (Equipment Storage and Fueling) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-2 (No Pets in Construction Areas) BAT-1 (Winter Hibernaculum Surveys) BAT-2 (Winter Hibernaculum Pre-Construction Surveys) BAT-3 (Winter Hibernaculum Buffer) BAT-4 (Bat Eviction Methods)	Increased human presence during construction near a winter hibernaculum will disrupt normal behavior and physiology. Disturbance of these bats will be avoided through implementation of AMMs, including species-specific measures that require identification and avoidance of any roosts.

Table 6-106
Temporary Effects to Western Red Bat

Environmental Stressor	Effect Reduced By	Potential Effect on Species
Construction Trash and Debris	Condition 3, BMP-7 (Biological Monitor) Condition 3, BMP-8 (Training of Construction Staff) SPECIES-1 (Litter Removal Program)	Trash and debris will adversely affect western red bat habitat quality through direct effects such as attracting nuisance pest species or mesopredators, which could prey on juvenile bats. Implementation of AMMs will ensure that construction trash and debris are controlled.

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