Chapter 5
Effects on Covered Species and Natural Communities

5.1 Introduction and General Approach

This chapter presents the analysis of effects of the covered activities on natural communities[1] and covered species. This chapter also presents the cumulative effects of projects other than Yolo HCP/NCCP covered activities in or near the Plan Area and effects on covered species' critical habitat.

The effects analysis relies on application of the best available information regarding implementation of the covered activities (Chapter 3, *Covered Activities*), the distribution and extent of natural communities and covered species and their habitats (Chapter 2, *Existing Ecological Conditions*, and Appendix A, *Covered Species Accounts*), and the natural history and ecological requirements of covered species (Appendix A). Effects are assessed, both qualitatively and quantitatively, on an evaluation of the likely responses of the natural communities and covered species to the effect mechanisms associated with implementing covered activities (Section 5.4, *Effect Mechanisms*). These effect mechanisms are grouped into three categories.

- Natural community and covered species habitat loss and fragmentation.
- Reduction in natural community and covered species habitat function.
- Harassment, injury, or mortality of covered species.

The approach to analyzing effects was programmatic. As described in Chapter 3, *Covered Activities*, the covered activities will occur over a wide geographic area over 50 years. Similarly, the reserve system will be assembled during implementation of the Yolo HCP/NCCP, so its exact location is not yet known. As a result, this effects analysis provides estimates of acres to be lost from covered activities and establishes maximum allowable loss for each natural community and habitat for each covered species. The impact limits for natural community (termed *maximum allowable loss*) and covered species habitat loss (termed *take limits*) presented in this chapter represent the total loss allowable under the Yolo HCP/NCCP. These losses will be offset by the conservation described in Chapter 6, *Conservation Strategy*.

The effects analysis was based on the major categories of covered activities described in Chapter 3, *Covered Activities*, and listed below.

- Urban projects and activities (planning units 19–22; Figure 5-1, *Covered Activities Footprints*).
- Rural projects and activities (planning units 1–18; Figure 5-1).
- Public and private operations and maintenance.
- Conservation strategy implementation.
- Neighboring landowner protection program.

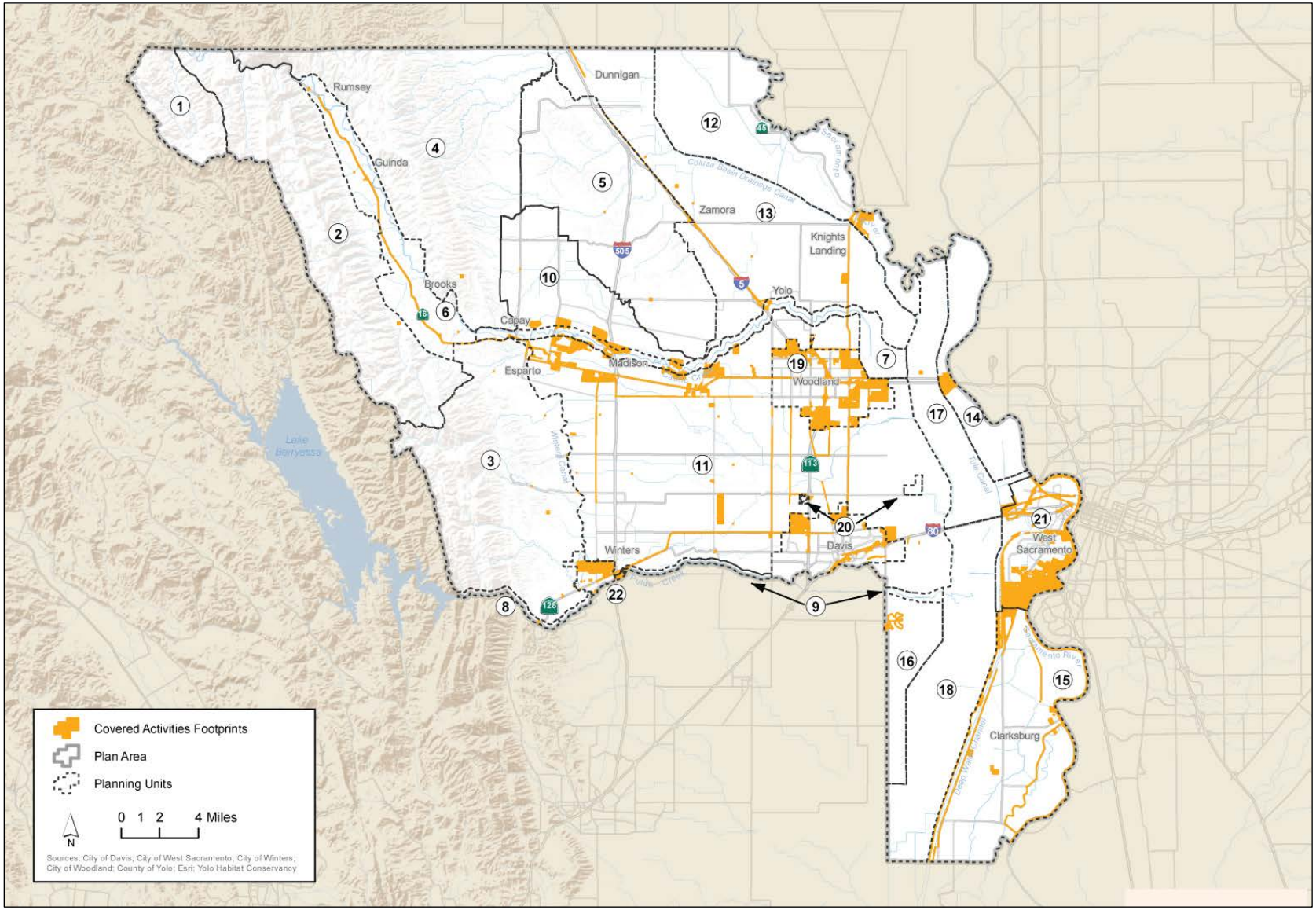
[1] *Natural communities* is used throughout this document to refer generally to both the natural and seminatural (e.g., cultivated) ecological communities conserved under the Yolo HCP/NCCP. *Seminatural communities* is used when referring specifically to this subset of communities.

Over 79 percent of the acreage of covered activities will be concentrated within urban and unincorporated community growth boundaries, and over 90 percent of the Plan Area will remain undeveloped.

The remainder of this chapter is organized as follows.

- Section 5.2, *Regulatory Context*, describes the regulations influencing the framework of the effects analysis and dictating the type of information or findings that must result from the analysis.
- Section 5.3, *Terminology,* defines key terms used in the effects analysis.
- Section 5.4, *Effect Mechanisms,* describes the various mechanisms by which covered activities may adversely affect natural communities and covered species.
- Section 5.5, *Effects Analysis Approach and Methods*, presents methods applied to the effects analysis and the approach by which these effects have been characterized and categorized.
- Section 5.6, *Effects on Natural Communities,* describes the effects of covered activities on each natural community the HCP/NCCP affects, including information necessary for compliance with the Natural Community Conservation Planning Act (NCCPA).
- Section 5.7, *Effects on Covered Species,* describes the effects of covered activities on each covered species, including information necessary for compliance with the NCCPA and the federal Endangered Species Act (FESA).
- Section 5.8, *Cumulative Effects*, is an analysis of cumulative effects as defined under Section 7 of FESA. This analysis is not a requirement for an HCP or NCCP, but is intended to assist the U.S. Fish and Wildlife Service (USFWS) in their mandatory cumulative effects analysis consistent with FESA, Section 7. As described in this section, the definition of cumulative effects under Section 7 of FESA is narrower than that for the National Environmental Policy Act (NEPA) or the California Environmental Quality Act (CESA). The environmental impact statement/environmental impact report (EIS/EIR) prepared for the Yolo HCP/NCCP presents a more thorough analysis of the cumulative effects of all projects (Yolo Habitat Conservancy 2017).
- Section 5.9, *Critical Habitat,* is an analysis of the effects on critical habitat that has been formally designated by USFWS. This analysis is not a requirement for an HCP or NCCP, but is intended to assist the USFWS in their mandatory critical habitat analysis consistent with FESA, Section 7. The only covered species with designated critical habitat in the Plan Area is California tiger salamander. Although the USFWS recently formally designated critical habitat for the western yellow-billed cuckoo, the Plan Area does not contain any designated critical habitat for this species.

Figure 5-1. Covered Activities Footprints



5.2 Regulatory Context

This effects analysis is intended to meet applicable legal and regulatory requirements under the NCCPA and the FESA, as described below. This analysis includes mandatory elements of an HCP and an NCCP, and information necessary for the USFWS and California Department of Fish and Wildlife (CDFW) to make their necessary findings for issuance of permits.

Sections of the NCCPA that are relevant to the effects analysis are as follows.

- Section 2820(a)(6) requires that NCCP conservation measures be based upon the best available information regarding the impacts of permitted activities on covered species.
- Section 2820(b)(9) requires that an NCCP include provisions to ensure that implementation of the mitigation and conservation measures is roughly proportional in time and extent to the impact on habitat or covered species authorized under the plan.
- Sections 2820(f)(1)(B) and (C) state that CDFW's determination of the level of assurances for plan participants shall consider, among other factors, the use of the best available science and adequacy of the analysis of the impact of take on covered species.

Sections of FESA relevant to this effects analysis are as follows.

- Section 10(a)(2)(B)(i) requires that an HCP specify the impacts on covered species that will likely result from the taking.
- Section 10(a)(2)(B)(ii) and (iv) state that the USFWS may only issue an incidental take permit if, among other requirements, the applicant will minimize and mitigate impacts to the maximum extent practicable, and the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

As described in Chapter 1, Section 1.4.1.1.1, *Section* 7, the USFWS will need to consult internally to comply with Section 7 of FESA prior to issuance of permits. As a component of this internal consultation, the USFWS must prepare a written biological opinion describing how the agency's action will affect the listed species and its critical habitat. The USFWS' HCP handbook (U.S. Fish and Wildlife Service and National Marine Fisheries Service 2016) recommends that an HCP include the information necessary for USFWS to complete the internal consultation process under Section 7 of FESA. Section 7 information requirements relevant to the effects analysis are as follows (51 *Federal Register* [FR] 106).

- Section 4012.14(c)(4) requires a description of the manner in which an action may affect any listed species or critical habitat.
- Section 402.202 defines *effects of the action* as the direct and indirect effects of an action on the species or critical habitat, together with the cumulative effects of other activities that are interrelated and interdependent with the action. The definitions of these types of effects are presented in the next section.

5.3 Terminology

The following terminology is applied for the purpose of this effects analysis.

Effect/affect. The term *effect* refers to a change that is the result of a covered activity. This analysis focuses on effects that change the condition of a natural community, a covered species, or its habitat. Effects can be either adverse or beneficial. The verb *affect* is used to mean "to have an effect on."

Impact. The term *impact* is only used when collectively assessing the effects of all take from covered activities on the species as a whole. Impacts are described in Section 5.7, *Effects on Covered Species*, in the sections for each species titled, *Impact of Take on the Species*.

Temporary loss versus permanent loss. For the purpose of this analysis, *temporary loss* is defined as the alteration of land cover for less than one year that allows the disturbed area to recover to pre-project or ecologically improved conditions within one year (e.g., prescribed burning, construction staging areas) of completing construction. *Ecologically improved* means that the site's ability to provide ecological functions is improved compared to its condition prior to disturbance caused by a covered activity or project. Any natural community or species habitat loss associated with a covered activity that has a duration exceeding one year, or that has a duration of less than one year but takes more than one year to recover immediately following construction, is considered a *permanent loss* for the purpose of this analysis.

Direct versus indirect effects. *Direct effects* are defined as those that occur at the same time and place as the action; *indirect effects*[2] are defined as those that occur later in time or farther removed in distance. This analysis considers all effects caused by the action—both direct and indirect—for each effect category.

Take limit versus take maximum allowable loss. The term *take limit* refers to the maximum take allowed for covered species under the HCP/NCCP. For the purpose of this plan, take is quantified in terms of loss of species habitat. Since the term *take* does not apply to natural communities, the maximum acreage of natural communities authorized for removal under the HCP/NCCP is referred to as *maximum allowable loss*.

Cumulative effect. *Cumulative effects* are defined, per the implementing regulations for Section 7 of FESA (50 Code of Federal Regulations [CFR] 402.02), as "the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation." This definition applies only to Section 7 analyses and should not be confused with the broader use of this term in NEPA or other environmental laws.

[2] Implementing regulations under Section 7 of FESA (50 CFR 402.202) define indirect effects as those that are caused by the action *and are later in time.* Federal Council on Environmental Quality regulations (50 CFR Section 1508.8) and California Environmental Quality Act (CEQA) guidelines (Section 15358) define indirect effects as those caused by an action that are later in time *or farther removed in distance*. The second definition of indirect effects includes noise and lighting effects beyond the project boundary that occur during project implementation (such impacts would be treated as direct effects under the definition under FESA Section 7 regulations). For consistency with the EIS/EIR for this HCP/NCCP, the Yolo HCP/NCCP adopts the CEQA guidelines' definition for indirect effects.

5.4 Effect Mechanisms

Chapter 3, *Covered Activities*, describes a wide range of ongoing activities and projects that will be covered by the Yolo HCP/NCCP and permits. These projects and activities have many similarities in terms of their effects on the covered species. These similarities of effects are grouped into three categories of *effect mechanisms*.

- Permanent or temporary removal of natural communities or covered species habitat, and the fragmentation that results from this removal.
- Reduction in function due to natural community degradation or loss of habitat suitability as a result of adjacent covered activities.
- Effects that could result in the injury or killing of covered species individuals, or significant disruption of behavioral patterns, that likely results in injury of individuals (i.e., harm).

Effect mechanisms are categorized in this manner to facilitate a meaningful assessment of the impact of these effects on each of the covered species (Section 5.7, *Effects on Covered Species*).

Each section below describes effect mechanisms related to each of the five main covered activity categories described in Chapter 3, *Covered Activities.* Unlike Chapter 3, which provides details on the activities themselves, this section provides a description of how these groups of covered activities affect natural communities and habitat for covered species. Each of the categories of effect mechanisms is described below. Specific effects on each natural community and covered species are described in Section 5.6, *Effects on Natural Communities,* and Section 5.7, *Effects on Covered Species,* respectively.

5.4.1 Loss and Fragmentation of Natural Communities and Covered Species Habitats

Covered activities will result in the removal of natural community and covered species habitat acreage within the footprint of the activity. Figure 5-1, *Covered Activities Footprints,* shows the locations where development will occur in the Plan Area. The mechanisms through which the covered activities are expected to affect natural communities and covered species are described below by covered activity category. Effects related to the neighboring landowner protection program category are described in Section 5.4.4, *Neighboring Landowner Protection Program.*

5.4.1.1 Urban Projects and Activities

Urban projects and activities, described in Chapter 3, Section 3.5.1, *Urban Projects and Activities*, include all covered development activities within the urban planning units (planning units 19–22: Figure 1-2, *Planning Units*). Urban development will result in loss of an estimated 5,935 acres of natural communities and another 2,899 acres of other land cover types (Table 5-3, *Loss of Natural Communities and Other Land Cover Types:* planning units 19–22). Figure 3-2, *General Plan Build Out within Plan Area,* shows where urban development will occur in the incorporated cities.

The primary effect mechanism of development projects in the urban planning units is conversion of natural communities and covered species habitats to developed land. Development activities that involve construction of structures or placement of impermeable surfaces result in permanent natural community and habitat loss. This analysis assumes that, with the exception of avoidance of

sensitive natural communities, all covered development activities in the urban planning units result in permanent loss of natural communities and species habitat. This assumption likely overstates the actual loss of natural community and species habitat, because some covered development activities will result in only temporary loss of natural communities and covered species habitats (as defined in Section 5.3, *Terminology*) through vegetation clearance for staging and temporary access roads during construction activities.

Loss of natural communities and covered species habitats could result in fragmentation of the remaining lands. Fragmentation effects would be minimal, however, because urban development is limited to contiguous areas within the urban planning units.

5.4.1.2 Rural Projects and Activities

This section examines effects associated with rural projects and activities including general rural development; rural public services, infrastructure, and utilities; and agricultural economic development and open space.

Covered rural projects and activities, described in Chapter 3, Section 3.5.2, *Rural Projects and Activities*, include a number of activities within the rural planning units (planning units 1–18: Figure 1-2, *Planning Units*): general rural development, rural public services, infrastructure, and utilities; and agricultural economic development and open space. This will result in loss of an estimated 5,706 acres of natural communities (Table 5-3, *Loss of Natural Communities and Other Land Cover Types:* planning units 1–18). The locations for these activities are shown in Figure 3-2, *General Plan Build Out within Plan Area*; Figure 3-4, *Planned Public Services, Infrastructure, and Utilities*; Figure 3-5, *Planned Aggregate Mining*; and Figure 3-6, *Publicly Owned Land.*

The effects mechanisms related to development activities in the rural planning units are similar to those described in Section 5.4.1.1, *Urban Projects and Activities*. In general, losses in the rural planning units will consist of smaller acreages distributed within a larger area than in the urban planning units. Yolo County strictly regulates land divisions in rural areas. Minimum lot sizes in agricultural areas ranges from 40 to 320 acres, and the County General Plan prohibits the division of agricultural land for non-agricultural uses. The conversion of agricultural land for non-agricultural uses is strongly regulated. Where agricultural land is planned for conversion, 1:1 mitigation is required under pre-HCP/NCCP conditions. Residential subdivisions are prohibited as are any land use activities incompatible with agriculture.

5.4.1.3 Public and Private Operations and Maintenance

Covered operations and maintenance activities are described in Chapter 3, Section 3.5.3, *Public and Private Operations and Maintenance.* Table 3-2, *Operations and Maintenance, Methods and Assumptions*, describes the methods and assumptions used to estimate acres of effect from operations and maintenance activities. An estimated 506 acres of land cover would be permanently affected by operations and maintenance activities (Table 3-2, *Spatially Undefined Activities, Methods and Assumptions*).

Operations and maintenance activities could result in natural community or covered species habitat loss. Instream activities may require vegetation removal to access project sites (e.g., to reach a gage or bank stabilization site) or for sediment removal. Maintenance of facilities such as buildings and trails in recreation areas also often requires vegetation removal to allow for safe access to facilities. In addition, vegetation removal along road shoulders and utility rights-of-way will likely be needed

to ensure safe road conditions and to provide for the maintenance of utility lines. Maintenance also will involve removing or reducing vegetation to prevent overgrowth and for fire prevention and management.

Effects of operations and maintenance activities could be either permanent or temporary, as many activities involve ongoing, repeated disturbance, while others involve limited disturbance of short duration that is not frequently repeated. For the purpose of the Yolo HCP/NCCP, only those operations and maintenance activities for which vegetation is restored to its prior or better condition within one year of disturbance are considered to result in temporary effects. The effects of operations and maintenance activities are expected to be low because each event is expected to involve small patches of land cover disturbance of short duration (less than one year), and because project proponents will implement *AMM3, Confine and Delineate Work Area; AMM8, Avoid and Minimize Effects of Construction Staging Areas and Temporary Work Areas;* and species-specific avoidance and minimization measures to minimize effects (Chapter 4, Section 4.3.2, *General Construction and Operations and Maintenance* and Section 4.3.4, *Covered Species*).

5.4.1.4 Conservation Strategy Implementation

Most covered conservation activities are not expected to result in loss or fragmentation of natural communities or covered species habitat. Restoration activities, however, will involve conversion of cultivated lands or grassland to riparian, pond, or emergent wetland land cover types, resulting in loss of these natural communities and of habitat for covered species relying on cultivated lands and grassland.

Recreation or management facilities built and maintained within the reserve system could result in a small amount of habitat removal. These facilities will be sited and built to avoid or minimize their effects on covered species, but a small amount of loss may nevertheless occur.

5.4.2 Reduction in Function of Natural Communities and Covered Species Habitats

In addition to removal of natural community and covered species habitat acreage within the footprint of an activity, as described above, many of the covered activities would result in the reduction in function of surrounding natural communities and covered species habitats. These effects could be temporary, during construction, or include indirect effects that persist after the activity is completed. The mechanisms through which these effects would occur are described below by covered activity category. Effects related to the neighboring landowner protection program category are described in Section 5.4.4, *Neighboring Landowner Protection Program.*

5.4.2.1 Urban Projects and Activities

The following effect mechanisms would reduce the function of natural communities and covered species habitats surrounding urban development areas. These effects are limited to the urban interface with natural communities and covered species habitats, which the Yolo Habitat Conservancy (Conservancy) expects will be minimal in urban areas.

Noise, vibrations, and lighting. Urban development activities will involve use of equipment that would temporarily affect wildlife in surrounding areas during construction. Noise and vibrations could render surrounding habitat less suitable for some covered species during construction.

Temporary noise and vibrations during construction could result in temporary abandonment or reduction in use of habitat by covered species in the surrounding affected areas. Sporadic and unpredictable noise events (such as those resulting from construction activities) could be perceived as a threat, causing wildlife to startle and flee affected areas. Urban development will also result in ongoing noise associated with residences and businesses. Continuous noise within the hearing range of wildlife species could interfere with their ability to detect and/or discriminate between important sounds, such as warning or mating calls (Francis and Barber 2013; Dooling and Popper 2007).

Both short- and long-term light exposure could affect wildlife. Short-term exposure to bright lights could temporarily reduce visual capacity in some species, making them vulnerable to predation. Longer-term night lighting could disorient wildlife, alter foraging and reproductive behaviors, increase predation risk, and inhibit movement to and from breeding areas by stimulating light-seeking behavior (Longcore and Rich 2004). The incorporation of urban-habitat interface elements into project design will minimize these effects (Chapter 4, Section 4.3.1, *General Project Design*; *AMM2, Design Developments to Minimize Indirect Effects at Urban-Habitat Interfaces*). In addition, directing construction lighting into project sites and limiting the lighting of natural areas adjacent to construction areas will minimize lighting effects during construction activities (Chapter 4, Section 4.3.2, *General Construction and Operations and Maintenance; AMM7, Control Night-Time Lighting of Project Construction Sites*).

Increased activity of humans and pets. Urban development will directly result in increased human activity associated with human occupancy of developed areas adjacent to natural communities and covered species habitats. Human activities associated with occupancy and use of new developments will result in increased ambient noise levels (e.g., traffic noise, residential development activities) and human activity (e.g., increased traffic, increased intrusion of humans into adjacent habitat areas, night lighting of habitat areas emanating from adjacent structures). These increases in activities are expected to cause covered species to reduce their use of habitat adjacent to new developments, or abandon these areas altogether. Increased numbers of cats and dogs in the vicinity of new development could increase levels of predation on native species and their prey as well as alter foraging and reproductive behaviors. Increased levels of human access into adjacent habitat areas also increase the risk for wildfire that could result in temporary periodic removal of vegetation that supports habitat for covered and other native species.

Invasive species. Removal of native vegetation during construction will increase the opportunities for nonnative, invasive plant species to become established and spread into covered species habitat. These invasive plants compete with native species for space, water, and nutrients, and often displace native species. Covered development activities could also result in ongoing, indirect effects of the spread of invasive species. In extreme cases, spread of invasive species can result in the loss of natural community or covered species habitat acreage, rather than just a reduction in function.

In addition, nonnative aquatic wildlife is known to adversely affect native amphibian populations. Bullfrogs prey upon and compete with California tiger salamanders, for example, and aquarium species released in the wild could introduce new diseases to wild amphibian populations. Ornamental plants and native cultivars could spread to adjacent habitat areas and outcompete and displace native species; they could also hybridize (interbreed) with local native plants, thereby disrupting the genetics of the native population. Such hybridization could cause a number of problems for native plant populations, including poor growth and reproduction.

Runoff, altered hydrology, erosion, and sedimentation. Urban development activities, including construction of structures, roads, and other paved areas, will increase the extent of impermeable surfaces, which could alter local surface runoff patterns (i.e., timing and amount of runoff) that support native vegetation (e.g., wetland and riparian vegetation) and wildlife. Increases in the amount of runoff, especially during storm events, could result in greater levels of scour and/or incision of local creeks, increased sediment loads, alteration of downstream hydrology, and decreased groundwater recharge. Decreased groundwater recharge could result in degradation of riparian and wetland natural communities due to water loss. High runoff temperature would also result in an increase in instream water temperatures when runoff enters local streams affecting habitat conditions for covered and other native aquatic organisms.

In-channel operation of equipment to construct and replace bridges and install and repair flood control and water conservation structures will mobilize sediment from stream beds and banks, causing increased turbidity that would temporarily affect habitat conditions for native aquatic organisms. Construction of in-channel flood control and water conservation structures would have similar effects.

Occupancy of new developments will likely increase the amount of pollutants such as grease, oil, detergents, and lawn pesticides that could be transported from residences during wet weather. Traffic along new roads and higher traffic volumes on widened roads will also increase the amount of petroleum-based pollutants (e.g., oil) that will be transported from road surfaces during wet weather. An increase in the quantity of pollutants reaching local streams through increased runoff could affect the biological and physical characteristics of native aquatic organisms and their habitats.

5.4.2.2 Rural Projects and Activities

This section examines effects associated with rural projects and activities; rural public services, infrastructure, and utilities; and agricultural economic development and open space.

The effect mechanisms that could reduce the function of natural communities and covered species habitat surrounding development in the rural planning units are similar to those described above for urban development. Effect mechanisms that are expected to be substantially different in rural areas than in urban areas are described below.

Planned improvements to roads will result in temporary construction noise and ongoing noise and roadway lighting effects. Noise associated with traffic on new or expanded roads could reduce the use of habitat by covered species in adjacent habitat. Many bird species avoid roadways in proportion to the traffic noise and volume, for reasons such as interference of roadway noise with their ability to communicate (Federal Highway Administration 2004). Aversion to movement through these habitat areas can result in a reduction in genetic flow within and among populations of covered species (Shilling 2013).

Effects from noise and light pollution may also be more significant when introduced into areas where such effects did not previously exist. Noise from vehicle traffic can disrupt nesting birds and the typical movement patterns of terrestrial animals. New sources of light in formerly unpopulated areas can affect the ability of some species—especially birds, bats, and many species of insects—to navigate at night.

Rural development tends to result in an increase in generalist wildlife species commonly found in urban areas (e.g., opossum, skunk, coyote, American crow), and a decrease in specialized or human-sensitive species (Glennon and Kretser 2005; Lenth et al. 2006). Such trends decrease the health of natural communities and could result in harm of covered species. Cumulatively, these rural development projects fragment the landscape and make it more likely that wildlife populations will become segmented and isolated.

Within the Plan Area, water quality effects may arise from horses or other livestock that are kept close to streams. Similarly, new agricultural commercial and industrial facilities, such as commercial stables, equestrian event facilities, feedlots, dairies, poultry projects, and wineries, may produce waste that is rich in nutrients or other potential pollutants. In addition, exposed soils common to equestrian or livestock enclosures are potential sources of erosion and sediment input to streams. Existing Yolo County ordinances, as well as National Pollutant Discharge Elimination System (NPDES) permits overseen by the Regional Water Quality Control Boards (Regional Boards), require many avoidance and minimization measures targeted at protecting water quality in local streams.

5.4.2.3 Public and Private Operations and Maintenance

Equipment used for operations and maintenance activities will generate noise, vibrations and soil compaction. If conducted at night, such activities will result in lighting effects. Noise, vibrations, and lighting could affect natural communities and covered species habitat in adjacent areas as described above for urban development. For operations and maintenance, these effects will be temporary, short in duration, and small in area.

Equipment used during operations and maintenance could carry seeds of invasive species and spread them into new areas. Clearing of land for operations and maintenance activities would increase the opportunities for nonnative, invasive plant species to become established. The potential effects of invasive plant species on natural communities and covered species habitat are as described above for urban development.

Operations and maintenance activities could result in erosion and sedimentation effects as described above for urban development. Erosion and sedimentation associated with maintenance-related disturbance of soils (e.g., grading, resurfacing) could result in temporary reduced function of receiving waters and land surfaces as habitat for covered species (e.g., increased turbidity, reduced dissolved oxygen, silting over vegetation). Project proponents, however, will comply with stormwater management plans that regulate development as part of compliance with regulations under NPDES permit requirements. Covered activities that result in any fill of waters or wetlands will also comply with requirements under Section 404 of the Clean Water Act and State Water Quality Control Board (State Board) and Regional Board regulations.

Removal of woody and other debris from channels or irrigation canals could alter in-channel aquatic habitat structure and hydrodynamics affecting cover for native aquatic organisms, and basking and foraging habitat available for reptile species (e.g., western pond turtle, giant garter snake).

5.4.2.4 Conservation Strategy Implementation

Conservation actions (i.e., restoration, enhancement, and management of the reserve system) are expected to have a net benefit on all covered species; nevertheless, some conservation actions may have temporary or limited permanent adverse effects on covered species. In other cases, activities that are designed to benefit one or more covered species may harm another set of covered species.

The reserve system, however, is designed to be large and diverse enough to ensure that the net effect of all conservation actions is beneficial to all covered species across the system.

Conservation actions could involve use of equipment that generates temporary noise, vibrations, and soil compaction resulting in similar indirect effects as described for urban development. Equipment used during conservation actions could carry seeds of invasive species and spread them into new areas of the reserve system.

Management of some reserve system lands may require establishment and maintenance of new firebreaks. Maintenance of firebreaks (i.e., mowing and disking) is primarily expected to retain the existing land cover (e.g., grassland); however, disking of firebreaks during the dry season could alter vegetation structure. While this would not eliminate natural communities and covered species habitats, it could reduce their function. Land that is regularly disked will not count toward the acre commitment for western burrowing owl and California tiger salamander habitat.

Some habitat enhancement activities may temporarily and adversely affect wildlife habitat. Periodic dredging of ponds to maintain pond capacity and habitat quality may have temporary adverse effects on pond species. The cleared bank conditions that precede establishment of native riparian plants can also trigger rapid establishment of weedy or undesirable aggressive species if these species are not controlled at the site.

Another example of habitat enhancement activities that may temporarily and adversely affect wildlife habitat is road removal. Road removal will only be undertaken if the benefits are determined to outweigh the adverse effects. For example, it may be appropriate to remove a road that is poorly sited such that it is contributing to localized erosion. It may not be appropriate to remove a road that is not causing other adverse effects. In such cases, instead of removal, a road may simply be closed off from access and allowed to naturally re-vegetate.

The Permittees are covered for incidental take of covered species resulting from public use within the permit area, inside or outside of the reserve system, provided that usage is consistent with park management plans and the guidelines of the Yolo HCP/NCCP. Although the permits do not cover incidental take for private individuals, recreational activities allowed on reserves are expected to have some minor effects on covered species. Since wildlife is most active at dawn and dusk or at night, disruptions of wildlife movement are not anticipated to be significant. Trails can fragment otherwise intact landscapes and can also facilitate predator movements and invasion by nonnative animals (e.g., feral cats, dogs, pigs). Trails are also often a source of invasion by nonnative plant species that are transported into the reserve by trail users. As described in Chapter 6, *Conservation Strategy*, recreational uses will be limited to low-intensity activities such as hiking, wildlife observation, horseback-riding and non-motorized bicycling on established, managed trails. Any new trails will be carefully sited and maintained to minimize the disturbance of habitat and wildlife and to avoid disturbance of cultural and archaeological resources within reserves.

In addition to the conservation actions described above, it will also be necessary for the Conservancy to install or replace infrastructure in the reserve system—including signage, fences and gates, field facilities, dirt roads, paved roads, vehicle bridges, and culverts—to ensure that required management and monitoring activities can be conducted. These activities would have effects similar to other covered activities. Temporary construction effects are likely as well. All facilities within the reserve system will be sited on already disturbed areas to the extent possible and in areas that minimize effects on covered species. All activities will comply with the conditions on covered activities (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*).

5.4.3 Harassment, Injury, or Mortality of Individuals

5.4.3.1 Urban Projects and Activities

The operation of equipment and vehicles during construction of urban development projects could result in the injury or mortality of covered species that cannot avoid operating equipment (e.g., crushing or striking of individuals, destruction of nests with eggs or nestlings). These activities also could result in harassment of individuals, particularly bird species, causing them to abandon nests.

New development is expected to result in increased densities of off-leash pets, primarily cats and dogs, in surrounding natural community areas. These pets are expected to cause increased predation (e.g., cats preying on small mammals and nesting birds) and harassment of native wildlife (e.g., dogs chasing wildlife).

Accidental introduction of contaminants in project construction sites associated with construction-related activities (e.g., fuel spills) could result in mortality or inhibit normal behaviors of covered and other native wildlife species that come into contact with these contaminants. The introduction of contaminants associated with maintenance-related activities (e.g., fuel spills) would have similar effects.

Urban development could result in ongoing, indirect effects related to harassment, injury, or mortality of wildlife individuals. New or increased traffic associated with new developments or road construction and improvement adjacent to wildlife habitat areas increases the risk for vehicle-wildlife collisions (e.g., crushing of small mammals, reptiles, and amphibians present on road surfaces; flying birds being hit by moving vehicles).

5.4.3.2 Rural Projects and Activities

Rural development is expected to result in the same types of effects related to species harassment, injury, or mortality as described above for urban development. These effects are expected to be greater in the rural planning units, however, due to the higher likelihood of covered species presence near rural development.

Aggregate material excavation could result in direct mortality if covered species become trapped in excavated areas. Excavation of trenches to install underground utilities (e.g., sewage mains, natural gas pipelines, telecommunications lines) could also cut or trap wildlife species, which could result in injury or mortality of individuals that are unable to escape (e.g., predation, starvation, hypothermia).

5.4.3.3 Public and Private Operations and Maintenance

The use of equipment and vehicles during operations and maintenance activities could result in the injury or mortality of covered species as described above for urban development. During channel maintenance, placement of material dredged from channels along or on channel embankments could bury covered and other native wildlife that are present and cannot avoid operating equipment (e.g., reptiles, amphibians, wildlife in burrows in embankments where dredge material is placed). Trenching activity could injure species occurring in the channel, and vegetation removal could result in habitat loss. Juvenile mammals and ground-nesting birds could be disturbed or injured by mowing equipment during operations and maintenance activities, or rodent burrows used by covered species could be buried by disking of fire breaks. In addition, tree removal could destroy or injure eggs or nestling birds.

5.4.3.4 Conservation Strategy Implementation

Some habitat enhancement activities could result in harassment of covered species. For example, planting emergent vegetation in aquatic California tiger salamander habitat could temporarily disturb amphibians occupying the pond. Tractors and other farming equipment could disturb or injure covered species on cultivated lands in the reserve system.

Monitoring and research activities required by the Yolo HCP/NCCP (Chapter 6, Section 6.5, *Monitoring and Adaptive Management*) could also disturb wildlife. For example, to determine the presence of some covered species (e.g., California tiger salamander larvae), individuals may need to be handled by a qualified biologist. Such handling constitutes harassment—a form of take—under FESA and requires authorization. Translocation activities, which must be coordinated with and approved by CDFW and USFWS, could also cause take through injury or loss of individuals due to capture, handling, transportation, release, and/or the inability of the individual to find new shelter.

5.4.4 Neighboring Landowner Protection Program

The conservation strategy aims to increase populations of covered species through habitat protection, restoration, and enhancement. Certain covered species may disperse from the reserve system, in response to this active management, onto neighboring private lands that are not part of the reserve system. The Yolo HCP/NCCP includes a neighboring landowner protection program to protect landowners in the Plan Area near reserves on agricultural lands from the regulatory consequences of covered species dispersal.

The neighboring landowner protection program only applies to normal agricultural practices described in Appendix M, *Yolo Agricultural Practices.* The neighboring landowner protection program also only provides coverage for species that disperse onto lands after the creation of the neighboring reserve (i.e., only for take authorization above baseline levels on the neighboring land as determined by surveys). Take granted through the neighboring landowner protection program could slightly reduce the beneficial effects of the conservation strategy due to take of individuals that disperse off the reserve lands. There would be no additional take of covered species habitat (or natural communities) as a result of the neighboring landowner protection program. The neighboring landowner protection program is described in detail in Chapter 7, Section 7.7.7.1, *Neighboring Landowner Protection Program*.

The effects associated with the dispersal of covered species from the reserve system onto neighboring lands are anticipated to be very limited and restricted to the species that meet the criteria listed below.

- Covered species that are expected to increase in numbers on the reserves.
- Covered species that are likely to spread from the reserve system onto neighboring lands as their populations increase.
- Covered species for which there is a reasonable likelihood of take from routine, ongoing agricultural activities that would occur on the neighboring lands.

Based on the criteria above, only four of the 12 covered species have the potential to disperse onto adjacent properties and result in take: valley elderberry longhorn beetle, giant garter snake, California tiger salamander, and western pond turtle. Take coverage is therefore only available through this program for these four covered species.

Participation in this program is voluntary. Interested landowners wanting coverage must sign an opt-in agreement with the Conservancy. Owners of private lands that are actively used for agricultural purposes (e.g., crop production) adjacent to reserve system lands will receive take coverage for one or more of these four species under the Yolo HCP/NCCP if they opt in to this program. Take coverage by species is based on the neighboring land's distance from the nearest reserve land. A radius was set for each species over which the program applies based on the species' typical dispersal distance. Although these species are capable of dispersing further than these distances, each radius accounts for the most likely area of effect.

- Valley elderberry longhorn beetle = 0.25 mile.
- Giant garter snake and western pond turtle = 0.5 mile.
- California tiger salamander = 1.0 mile.

Coverage will be provided to agricultural operations only for take beyond the baseline condition that existed prior to the establishment of the neighboring reserves. Furthermore, this coverage will be limited only to ongoing and routine agricultural activities on lands enrolled in the neighboring landowner protection program. Ongoing and routine activities would include normal farming practices. Coverage under the neighboring landowner protection program expires when the Permits expire. See Chapter 7, Section 7.7.7.1, *Neighboring Landowner Protection Program*, for additional details of this program, including the process for landowner notification, request for coverage, and extension of take coverage. The neighboring landowner protection program does not transfer if the property is sold (Section 7.7.7.1, *Neighboring Landowner Protection Program*).

Based on the landowner participation in other counties with approved HCPs and NCCPs (e.g., San Joaquin County, East Contra Costa County, Santa Clara Valley) that have similar programs, it is assumed that up to three percent of eligible lands will enter into neighboring land agreements, for a total of no more than 2,347 acres. Of this, it is assumed that most of the potential effects will occur on land cover types that support farming (agricultural and grassland land cover types), which are used by California tiger salamander and western pond turtle for non-breeding, secondary foraging, or dispersal habitat, and not as breeding or primary habitat. The habitat for the valley elderberry longhorn beetle and western pond turtle on cultivated lands is typically of low value (and non-breeding), so the magnitude of impacts is expected to be low or very low. Giant garter snakes may use wetlands, rice lands, and irrigation channels adjacent to reserves for foraging, cover, or dispersal. Although rice lands and irrigation ditches can provide high-value habitat for the giant garter snake, ongoing agricultural practices are not expected to adversely affect populations of this species, as giant garter snakes commonly persist in cultivated landscapes, particularly rice lands.

Adverse effects from allowable agricultural activities on giant garter snake, and western pond turtle could result from rodent control (rodenticide use is not a covered activity in the Yolo HCP/NCCP), active farming practices, vehicle and machinery travel, runoff from fields, or disturbance to adjacent streams or wetlands.

The amount of take to be authorized for giant garter snake, western pond turtle, California tiger salamander, and valley elderberry longhorn beetle through this program includes up to all individuals (or elderberry shrubs, in the case of valley elderberry longhorn beetle) that are above baseline conditions within no more than 2,347 acres enrolled in the neighboring landowner protection program. The amount of take to be authorized for giant garter snake individuals are those above baseline up to the take total included for all covered activities as listed in Table 5-2(b).

5.5 Effects Analysis Approach and Methods

This section describes the organization and approach of the effects analysis for each natural community (Section 5.6, *Effects on Natural Communities*) and covered species (Section 5.7, *Effects on Covered Species*). It also describes the quantitative and qualitative methods for assessing effects.

The effects analysis for each natural community (Section 5.6, *Effects on Natural Communities*) and covered species (Section 5.7, *Effects on Covered Species*) begins with a summary of the geographic information system (GIS) model used to assess effects, and a summary of the distribution of modeled natural community or covered species habitat in the Plan Area. For covered species, each species section also summarizes the known distribution of the species in the Plan Area. This information is intended to provide the reader with context for the evaluation of effects of the covered activities on natural communities and covered species.

Each effects analysis includes an assessment of the adverse effects of covered activities, the beneficial effects of the conservation strategy, and the net effects of the Yolo HCP/NCCP on each natural community and covered species. The covered species analyses (Section 5.7, *Effects on Covered Species*) are more rigorous than the analyses for natural communities, to meet incidental take issuance criteria under FESA and the NCCPA. Section 5.6, *Effects on Natural Communities*, includes a section that describes effects common among natural communities (Section 5.6.1, *Effects of Covered Activities Common to All Natural Communities*), and the subsequent analyses refer back to this section as appropriate for each natural community. The approach used for each of the three categories of effects (adverse, beneficial, and net effects) is described below.

5.5.1 Adverse Effects

Adverse effects include any effects of the covered activities that reduce the amount or quality of a natural community or covered species habitat. For covered species, adverse effects may reduce the number, range, reproductive success, or survival of the covered species. Adverse effects may also affect species behavior in ways that adversely affect reproduction or survival. The approaches to evaluating adverse effects are described for each natural community or covered species in terms of the following:

- Loss and fragmentation of natural community or covered species habitat (for maximum acres of loss, see Table 5-1, *Maximum Allowable Permanent Loss, Natural Communities*).
- Reduction in function of natural community or covered species habitat (for maximum acres of loss, equivalent to take, see Tables 5-2[a], *Habitat-Based Take Limits, Covered Species* and 5-2[b], *Forms of Take and Take Limits, Covered Species*).
- Harassment, injury, or mortality of covered species (Table 5-2[b], *Forms of Take and Take Limits, Covered Species*).
- Impact of take on covered species.

5.5.1.1 Loss and Fragmentation of Natural Community or Covered Species Habitat

Maximum allowable natural community or covered species habitat loss is expressed as an amount (acres) and as a percentage of the total in the Plan Area. This percentage is relevant because most of the Plan Area is expected to remain undeveloped, and only a small percentage of the total land in the

Plan Area will be affected by covered activities. The analysis quantifies both permanent and temporary loss, but assumes that most loss is permanent, with only a very small acreage of loss associated with bridge replacements considered temporary.

This section also describes the locations of substantial spatially defined acreage losses in relation to important habitat areas (e.g., if habitat loss is expected to occur in known population centers for the species). To estimate natural community and covered species habitat loss resulting from covered activities over the course of the permit term, it was first necessary to identify the baseline conditions on which the effects are assumed to occur (i.e., the anticipated composition and distribution of land cover at the time of Yolo HCP/NCCP implementation). Establishing a baseline helps to ensure that the estimated amount of permanent loss is appropriately scaled (i.e., to ensure effects are not under- or overestimated). The baseline for natural communities was established through the land cover mapping described in Chapter 2, *Existing Ecological Conditions*. Covered species habitat models (described in Appendix A, *Covered Species Accounts*) use the same land cover mapping, so the same baseline is used for covered species habitat.

5.5.1.1.1 Spatially Defined Covered Activities

The areal extent of loss for each natural community and covered species habitat type was assessed for both spatially defined and spatially undefined covered activities. *Spatially defined* covered activities are those for which the GIS data developed for this HCP/NCCP spatially depicts the activities' locations. The direct effects of spatially defined covered activities were estimated by overlapping the GIS data for covered activities footprints (Figure 5-1, *Covered Activities Footprints*) over GIS baseline data (layers of geographic data for each of the natural communities and covered species habitat models) (Section 2.6.3, *Covered Species Habitat Models*, and Appendix A describe how habitat models were developed). Approximately 91 percent of all natural community and covered species habitat loss was based on the analysis of spatially defined covered activities. All covered activities except operations and maintenance were spatially defined. The intersection between the covered activities layer and the natural community or covered species habitat model layer provided the estimated maximum allowable permanent loss of 12,649 acres and temporary loss of 66 acres (Table 5-1). Table 3-1, *Spatially Defined Urban and Rural Development, Methods and Assumptions,* describes how existing information was used to develop the covered activities layer of 17,551 acres.. The covered activities layer overlaps with all land cover types, including land cover types that make up natural communities and covered species habitat, and land cover types such as orchards and vineyards that do not make up natural communities or covered species habitat models.

Table 5-1. Maximum Allowable Loss, Natural Communities

Natural Community	Existing Acreage	Maximum Allowable Loss (Permanent)	Maximum Allowable Loss (Temporary)	Percent Lost[a]
Rice	35,724	87	0	less than 1%
Cultivated Lands (non-rice)	214,939	9,910	203	less than 1%
Grassland	80,911	1,734	28	2%
Serpentine	247	0	0	0%
Chamise Chaparral	30,187	0	0	0%
Mixed Chaparral	14,518	0	0	0%
Oak and Foothill Pine	43,772	0	0	0%
Blue Oak Woodland	35,891	3	0	less than 1%

Natural Community	Existing Acreage	Maximum Allowable Loss (Permanent)	Maximum Allowable Loss (Temporary)	Percent Lost[a]
Closed-Cone Pine-Cypress	212	0	0	0%
Montane Hardwood	3,087	0	0	0%
Valley Oak Woodland	181	0	0	0%
Alkali Prairie	312	4	0	1%
Vernal pool complex[b]	299	0	0	0%
Fresh Emergent Wetland	26,309	88	0	less than 1%
Valley Foothill Riparian	12,565	588	0	4%
Lacustrine and Riverine	13,493	236	31	2%
TOTAL NATURAL COMMUNITIES	**512,646**	**12,649**	**266**	**2%**

Note
[a] Rounded to nearest percent.
[b] This includes depressional seasonal wetlands that potentially support federally listed vernal pool crustaceans.

The Conservancy excluded from the covered activities layer projects known to have required discretionary approvals for development but not yet constructed. These activities are expected to develop prior to approval of the Yolo HCP/NCCP, would have no additional discretionary approvals, and therefore would not be subject to the requirements of this HCP/NCCP unless they seek coverage as a SPE.[3] Assumptions used to define the covered activities layer are made only to estimate an accurate overall level of take proposed for coverage under this HCP/NCCP; these assumptions will not influence the amount of take authorization provided to each covered activity. During implementation, it is expected that some activities will have more loss of natural communities or loss of covered species habitat (i.e., take or loss authorized) than what is assumed in this effects analysis, while others will have less. The total limits of natural community loss or covered species take allocated to the HCP/NCCP as a whole, however, cannot be exceeded. The GIS intersection of the covered activities layer with natural communities or modeled species habitat layers assumed the maximum loss without the application of any avoidance or minimization measures. The covered activities layer included both permanent and temporary effect categories.

Effects on special habitat features within covered species habitat were also assessed. Swainson's hawk nest trees and ponds providing habitat for California tiger salamander were also assessed by overlapping GIS data for nest trees and ponds with the covered activities GIS layer.

5.5.1.1.2 Spatially Undefined Covered Activities

Spatially undefined activities are those activities for which specific locations are unknown. Spatially undefined activities included operations and maintenance for roadways, levee operations and maintenance, reclamation district operations and maintenance, Cache Creek Resources Management Plan implementation, and other conservation strategy implementation. Footprint effects from these activities were estimated based on the assumptions provided in Table 3-2, *Spatially Undefined*

[3] Proponents of approved projects assumed to develop prior to HCP/NCCP adoption could seek coverage under the Yolo HCP/NCCP if the activity is covered, take coverage is available, and the proponent follows the SPE application requirements described in Chapter 4, *Application Process and Conditions on Covered Activities*. Such coverage will be tracked and counted against allowable natural community and covered species habitat losses.

Activities, Methods and Assumptions. These assumptions were also used to establish limits for natural community and covered species habitat loss, so effects would not exceed those analyzed under this HCP/NCCP.

5.5.1.1.3 Fragmentation

A qualitative approach was used to assess fragmentation effects, including wildlife connectivity. Fragmentation effects were assessed based on the known locations of covered activities relative to the distribution of natural communities and covered species habitat, and relevant scientific information related to population distribution and dispersal or local movement patterns of covered species.

5.5.1.2 Reduction in Function of Natural Community or Covered Species Habitat

The section on *Reduction in Function* in the effects analysis for each natural community or covered species describes the diminished function for each natural community and covered species that could result from covered activities, consistent with the effect mechanisms described in Section 5.4.2, *Reduction in Function of Natural Communities and Covered Species Habitats.* This analysis is qualitative, and based on the best available information for each natural community and covered species regarding vulnerability to each effect mechanism.

5.5.1.3 Harassment, Injury, or Mortality

The section on *Harassment, Injury, or Mortality* for each covered species describes the potential for harassment, injury, or mortality to covered species that could result from covered activities, consistent with the effects mechanisms described in Section 5.4.3, *Harassment, Injury, or Mortality of Individuals.* This section describes the potential for effects such as crushing (injury, mortality) of covered species by construction equipment and harassment by pets introduced by occupancy of new developments. Harassment, injury, or mortality of covered species is assessed qualitatively by evaluating how the effect mechanisms described in Section 5.4.3 would affect each covered species.

5.5.1.4 Impact of Take on the Species

HCPs are required (Section 10(a)(2)(A)(i) of FESA) to describe the impact of take on each covered species. The impact of take is defined as the effect of covered activities on the long-term survival and recovery of the species. For each covered species, the section on *Impact of Take on the Species* describes the combined effects of covered activities on the long-term survival and recovery (or conservation[4]) of the species, in the context of the species' range and abundance, and the best available information regarding stressors on the species.

[4] For non-listed species, conservation refers to maintaining or enhancing the condition of a species so that state listing is no longer necessary (NCCPA Section 4805(d)).

Table 5-2 (a). Habitat-Based Take Limits, by Covered Species

Species	Existing Modeled Habitat in Plan Area (acres)[a]	Take Limit, Permanent	Take Limit, Temporary	Percent Remaining[b]
Valley elderberry longhorn beetle				
Riparian habitat	9,447	523	0	95%
Non-riparian habitat	3,932	61	1	98%
Total	**13,379**	**584**	**1**	**96%**
California tiger salamander				
Aquatic breeding habitat	1,004	12	1	99%
Upland habitat	86,505	398	1	100%
Total	**87,509**	**410**	**2**	**100%**
Western pond turtle				
Aquatic habitat	53,907	369	31	99%
Nesting and overwintering habitat	137,185	3,133	112	98%
Total	**191,092**	**3,502**	**143**	**99%**
Giant garter snake				
Rice habitat	31,168	87	0	100%
Aquatic habitat	6,596	109	1	98%
Freshwater emergent habitat	25,897	76	0	100%
Active season upland movement	6,612	441	3	93%
Overwintering habitat	6,783	1,235	5	82%
Total	**77,056**	**1,966**	**9**	**97%**
Swainson's hawk				
Nesting habitat	15,673	651	0	94%
Natural foraging habitat	79,336	1,407	22	98%
Cultivated lands foraging habitat	214,078	9,399	202	96%
Total	**309,087**	**11,457**	**224**	**96%**
White-tailed kite				
Nesting habitat	31,732	661	0	98%
Primary foraging habitat	101,758	2,609	29	97%
Secondary foraging habitat	134,740	7,969	205	94%
Total	**268,230**	**11,239**	**234**	**96%**
Western yellow-billed cuckoo				
Nesting/foraging habitat	**3,868**	59	0	98%
Western burrowing owl				
Primary habitat	37,694	861	1	98%
Other habitat	66,160	2,311	218	97%
Total	**103,854**	**3,172**	**219**	**97%**
Least Bell's vireo				
Nesting/foraging habitat	**4,719**	**39**	0	99%
Bank swallow				
Nesting habitat	**962**	**37**	**0**	**96%[c]**

Species	Existing Modeled Habitat in Plan Area (acres)[a]	Take Limit, Permanent	Take Limit, Temporary	Percent Remaining[b]
Tricolored blackbird				
Nesting habitat	4,680	86	0	98%
Foraging habitat	261,133	8,942	230	97%
Total	**265,813**	**9,028**	**230**	**97%**
Palmate-bracted bird's beak				
Habitat	**312**	**4**	0	99%

a. Take limits are established based on modeled habitat for each covered species. In implementation, take limits of covered species will be measured based on field conditions as described in Section 7.5.11, *Compliance Tracking.*

b. Rounded to nearest percent.

c. Actual nests will be avoided. Up to 37 acres of barren floodplain may be permanently affected by bank stabilization activities along Cache Creek undertaken through the CCRMP as needed to protect property or valuable resources. The natural, dynamic fluvial processes along Cache Creek are expected to create additional barren floodplain during the 50-year permit term.

d. The effects analysis, based on the covered activities footprint and operations and maintenance assumptions, predicts 37 nest trees may be removed. However, the Swainson's hawk nest tree take limit is set at 20 to account for the implementation of avoidance and minimization measures. The number of nest trees per planning unit will not exceed those provided in Table 5-5 and the total will not exceed 20 nest trees.

Table 5-2(b). Forms of Take and Take Limits, by Covered Species[5]

Species	Harm[a]	Injury or Mortality[b]	Harassment[c]
Palmate-bracted bird's beak	4 acres of permanent habitat loss	No injury or mortality, except as part of management and enhancement where needed for the benefit of the population (e.g., damage to seeds in seed bank during ground disturbance related to management and enhancement).	Not applicable.
Valley elderberry longhorn beetle	Harm resulting from permanent loss of 523 acres of riparian habitat and 61 acres of non-riparian habitat, and temporary disturbance of one acre of non-riparian habitat.	Potential injury or mortality of individuals associated with the 523 acres of riparian habitat and 61 acres of non-riparian habitat	Potential harassment of individuals associated with the 523 acres of riparian habitat and 61 acres of non-riparian habitat (includes elderberry shrubs within 100 feet of disturbance, and shrubs that would be transplanted)

[5] Take in the form of harm or harassment applies only to the federal ESA. Take in the form of injury or mortality applies to the federal ESA and CESA definitions of take.

Species	Harm[a]	Injury or Mortality[b]	Harassment[c]
California tiger salamander	Harm resulting from permanent loss of 12 acres of aquatic habitat and 398 acres of upland habitat. Also, potential harm to individuals within 55 acres of upland habitat, resulting from removing aquatic habitat within a 1.2-mile radius (i.e., the 55 acres will no longer have aquatic habitat within 1.3 miles). Also, temporary disturbance of one acre of aquatic and one acre of upland habitat.	Potential injury or mortality of individuals associated with 12 acres of aquatic habitat and 398 acres of upland habitat.	Potential harassment of individuals associated with 12 acres of aquatic habitat and 398 acres of upland habitat.
Western pond turtle	Harm resulting from permanent loss of 369 acres of aquatic habitat and 3,133 acres of upland habitat. Also, potential harm to individuals within 569 acres of upland habitat, resulting from removing aquatic habitat within a 1,640-foot radius (i.e., 569 acres of uplands will no longer have aquatic habitat within 1,640 feet). Also, temporary disturbance of 31 acres of aquatic habitat and 112 acres of upland habitat.	Potential injury or mortality of individuals associated with 369 acres of aquatic habitat and 3,133 acres of upland habitat.	Potential harassment of individuals associated with 369 acres of aquatic habitat and 3,133 acres of upland habitat.

Species	Harm[a]	Injury or Mortality[b]	Harassment[c]
Giant garter snake	Harm resulting from permanent loss of 87 acres of rice, 109 acres of aquatic habitat, 76 acres of fresh emergent wetland habitat, 441 acres of upland within 200 feet of aquatic, and 1,123 acres of upland between 200 and 820 feet from aquatic. Also, potential harm resulting from removing aquatic habitat from 69 acres of upland habitat within 200 feet of aquatic, and temporary disturbance of 9 acres of upland habitat.	Potential injury or mortality of individuals associated with 87 acres of rice, 109 acres of aquatic habitat, 76 acres of fresh emergent wetland habitat, 441 acres of upland within 200 feet of aquatic, and 1,123 acres of upland beyond 200 feet. Injury, mortality, or harassment of up to an estimated 815 individuals associated with this habitat (Appendix P).	Potential harassment of individuals associated with 87 acres of rice, 109 acres of aquatic habitat, 76 acres of fresh emergent wetland habitat, 441 acres of upland within 200 feet of aquatic, and 1,123 acres of upland beyond 200 feet. Injury, mortality, or harassment of up to an estimated 815 individuals associated with this habitat (Appendix P).
Swainson's hawk	Harm resulting from permanent loss of 651 acres of nesting habitat, 1,407 acres of natural foraging habitat, and 9,399 acres of cultivated lands foraging habitat. Also, loss of up to 20 nest trees (removed while inactive) and temporary loss of 224 acres of foraging habitat.	No injury or morality of individuals, with application of the HCP/NCCP avoidance and minimization measures.	No harassment of individuals, with application of the HCP/NCCP avoidance and minimization measures.

Species	Harm[a]	Injury or Mortality[b]	Harassment[c]
White-tailed kite	Harm resulting from the permanent loss of 661 acres of nesting habitat and 10,578 acres of foraging habitat. Also, loss of up to 1 nest tree[6] (removed while inactive), and temporary disturbance of 234 acres of foraging habitat (29 acres primary and 205 acres secondary foraging habitat).	No injury or morality of individuals, with application of the HCP/NCCP avoidance and minimization measures.	No harassment of individuals, with the avoidance and minimization measures in place.
Western yellow-billed cuckoo	Harm resulting from the permanent loss of 59 acres of habitat.	No injury or morality of individuals, with application of the HCP/NCCP avoidance and minimization measures.	No harassment of individuals, with the avoidance and minimization measures in place.
Western burrowing owl	Harm resulting from permanent loss of 861 acres of primary habitat, and 2,311 acres of other habitat, including up to 4 occupied sites.[d] Also, temporary disturbance of 1 acre of primarily habitat and 218 acres of other (cultivated lands) habitat.	No injury or morality of individuals, with application of the HCP/NCCP avoidance and minimization measures.	Harassment of individuals associated with up to 4 occupied sites, through relocation of birds consistent with Section 4.3.4, *AMM18, Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl* (between 4 and 8 birds).
Least Bell's vireo	Harm resulting from the permanent loss of 39 acres of habitat.	No injury or morality of individuals, with the avoidance and minimization measures in place.	No harassment of individuals, with the avoidance and minimization measures in place.
Bank swallow	Harm resulting from permanent loss of 37 acres of barren floodplain potential nesting habitat.	No injury or mortality of individuals, with the avoidance and minimization measures in place.	No harassment of individuals, with the avoidance and minimization measures in place.

[6]Counted as a nest tree if occupied by active nest within the last five years.

Species	Harm[a]	Injury or Mortality[b]	Harassment[c]
Tricolored blackbird	Harm resulting from permanent loss of 86 acres of nesting habitat and 8,942 acres of foraging habitat. Also, temporary disturbance of 230 acres of foraging habitat.	No injury or mortality with the avoidance and minimization measures in place.	No harassment of individuals with the avoidance and minimization measures in place.
Palmate-bracted bird's-beak	Harm resulting from the loss of four acres of habitat.	No removal of occurrences except as needed during enhancement or restoration for the purpose of benefitting the population.	Not applicable

a. Harm is defined as, "An act which actually kills or injures wildlife. Such acts may include significant habitat modification or degradation when it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering." (50 CFR 17.3) Habitat modification or degradation includes effects resulting from fragmentation (e.g., if upland habitat for California tiger salamander becomes unsuitable as a result of removing nearby aquatic habitat).

b. Injury or mortality includes actions that directly kill wildlife, such as bulldozers or other construction equipment crushing individuals. In addition to the take described in this column, there is potential for take of valley elderberry longhorn beetle, California tiger salamander, giant garter snake, and western pond turtle within up to 2,347 acres of lands that may be enrolled in the Neighboring Landowner Protection program. This take would be in the form of injury or mortality of any individuals that establish adjacent to the reserve system beyond baseline conditions within the enrolled areas. This also may include harm to valley elderberry longhorn beetle resulting from loss of elderberry shrubs that establish adjacent to the reserve system beyond baseline conditions within the enrolled areas (Neighboring Landowner Protections).

c. Harassment is defined as, "an intentional or negligent act which creates the likelihood of injury of an endangered species by annoying the species to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering."(50 CFR 17.3)

d. An "occupied site" is defined as a breeding or wintering burrow or burrow complex occupied by a single breeding pair or nonbreeding individual.

5.5.2 Beneficial Effects

For each natural community and covered species, the effects analysis includes an assessment of the beneficial effects of the conservation strategy. The *Beneficial Effects* section for each natural community and covered species summarizes relevant biological goals and objectives, and the conservation measures that will be implemented to achieve them for the benefit of each natural community and covered species.

5.5.3 Net Effects

For each natural community and covered species, the effects analysis includes an assessment of the net effects of the Yolo HCP/NCCP implementation, including the adverse effects of covered activities and the beneficial effects of the conservation strategy. For each natural community and covered species, the *Net Effects* section expresses the net change in natural community or habitat acreage, considering both loss resulting from covered activities and gain resulting from restoration. It also

describes the gain in amount of protected lands for each natural community and covered species, in terms of acreage and percentage increase. This section also factors in the beneficial effects of enhancement and management. Considering both adverse and beneficial effects, the net effects assessment concludes how the Yolo HCP/NCCP will adequately minimize and mitigate effects on each species and conserve the species in the Plan Area consistent with FESA and NCCPA standards.

5.6 Effects on Natural Communities

The approach and methods for analyzing the effects on natural communities are described in Section 5.5, *Effects Analysis Approach and Methods*. To minimize redundancy, this section begins by describing effects of covered activities that are common to all natural communities (Section 5.6.1, *Effects of Covered Activities Common to all Natural Communities*). It then describes effects specific to each natural community (Sections 5.6.2 through 5.6.8). For each natural community, adverse, beneficial, and net effects are described. The beneficial effects discussions refer to the biological goals and objectives described in Chapter 6, Section 6.3, *Biological Goals and Objectives.* Only those natural communities affected by Yolo HCP/NCCP covered activities are addressed in this section.[7] For more details on the direct and indirect effects of the covered activities on non-covered special-status species, see the Biological Resources section of the EIS/EIR for this HCP/NCCP (Yolo Habitat Conservancy 2017).

Table 5-3, *Loss of Natural Communities and Other Land Cover Types*, provides the amount of natural community loss by planning unit and summaries for permanent and temporary loss of each natural community type. Table 5-4, *Natural Community Benefits and Net Effects*, provides the amount of each natural community loss in relation to the amount of conservation for each natural community.

5.6.1 Effects of Covered Activities Common to All Natural Communities

5.6.1.1 Loss and Fragmentation

Covered activities will convert natural communities to developed land, thereby reducing the extent of each natural community and resulting in loss of habitat for native species. Habitat loss is the single greatest threat to biodiversity in the United States (Wilcove et al. 1998). The extent of loss, and types of activities resulting in loss, are described for each natural community in Sections 5.6.2 through 5.6.8.

Covered activities could also result in fragmentation of the remaining natural communities, contributing to loss of the ecological integrity of large natural community blocks, ecosystem function, biological diversity, and habitat connectivity for native species. Over 50 percent of the covered activities will be concentrated within urban planning units that support approximately two percent of the natural community acres in the Plan Area (10,490/512,646 acres). Over 90 percent of the Plan Area will remain undeveloped, as shown in Table 5-3, *Loss of Natural Communities and Other Land Cover Types.*

[7] The following natural communities will not be affected by HCP/NCCP covered activities so are not discussed in this chapter: serpentine grassland, chamise chaparral, mixed chaparral, oak and foothill pine, closed-cone pine-cypress, montane hardwood, valley oak woodland, and vernal pool complex.

New roads will be limited to urban growth areas; road projects in unincorporated communities are limited to upgrading and widening existing roads. Upgrading roads (e.g., increasing lanes, improving road surfaces, straightening road alignments) could reduce the ability of wildlife to cross, due to increased width and higher traffic volume and velocity, thus diminishing connectivity between natural community areas. In Yolo County, however, effects on covered species associated with road upgrades or other covered activities are expected to be far less than in counties with more extensive and less compact rural development. Yolo County restricts development in rural areas to existing communities and does not allow any new rural residential communities or new roads to fragment the rural countryside.

5.6.1.2 Reduction in Function

In addition to removing and fragmenting natural communities, described above, covered activities could reduce the function of natural communities in the vicinity of covered activities.

Construction activities, operations and maintenance activities, and habitat restoration and management could temporarily affect natural communities in the vicinity of the covered activities. These activities will generate noise, human activity, and other disturbances (e.g., ground vibrations) associated with operating equipment and other related activities, which could cause native wildlife to reduce their use of affected areas during the activities. Other temporary direct effects of construction (altered runoff, dust) could result in localized degradation of ecosystem functions (e.g., erosion, dust accumulation on or burying of herbaceous vegetation).

Permanent effects of new developments on adjacent natural communities include ongoing visual effects (e.g., operation of vehicles, lighting, human activity), noise (e.g., operation of vehicles and other equipment), effects of human activity (e.g., trampling of vegetation), pet-related disturbance (e.g., pets harassing or harming wildlife), and other disturbances associated with human occupancy following construction. These disturbances could affect use by native wildlife species associated with the natural communities that are adjacent to new developments, and could damage native vegetation. For example, lighting could cause native wildlife species that are active nocturnally to avoid habitat around permanent development. In addition, uncontrolled pets could prey on individuals and nests of covered and other bird species or alter their reproductive behavior, as well as prey on reptile and amphibian species. Project proponents will minimize these effects on natural communities through establishment of buffers around sensitive natural communities, as described in *AMM9, Establish Buffers around Sensitive Natural Communities* and *AMM10, Avoid and Minimize Effects on Wetlands and Waters* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*).

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Table 5-3. Loss of Natural Communities and Other Land Cover Types

		Estimated Permanent Loss from Covered Activities by Planning Unit (acres)[a]																										
Natural Community	**Existing Acreage**	**Little Blue Ridge 1**	**North Blue Ridge 2**	**South Blue Ridge 3**	**Capay Hills 4**	**Dunnigan Hills 5[b]**	**Upper Cache Creek 6**	**Lower Cache Creek 7**	**Upper Putah Creek 8**	**Lowr Putah Creek 9**	**Hungry Hollow Basin 10**	**Willow Slough Basin 11**	**Colusa Basin 12**	**Colusa Basin Plains 13[b]**	**North Yolo Basin 14**	**South Yolo Basin 15**	**Yolo Basin Plains 16**	**North Yolo Bypass 17**	**Woodland 18**	**Davis 19**	**West Sacramento 20**	**Winters 21**	**Valley Landscape Unit 22**	**Total Perm. Loss in PUs**	**Perm. Loss from O&M (Unk PU)**	**Loss from Restoration[d]**	**Total Perm Loss**	**Total Temp. Loss**
Natural Communities																												
Rice	35,724	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	0	0	0	68	19	0	**87**	**0**
Cultivated Lands (non-rice)	214,939	0	0	6	0	1,398	25	398	0	0	450	1,905	175	25	256	304	0	34	0	1,406	583	1,812	361	9,138	69	702	**9,910**	**203**
Grassland	80,911	0	11	10	10	143	3	8	0	0	7	82	0	25	0	27	5	10	0	723	56	215	155	1,490	35	210	**1,734**	**28**
Serpentine	247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Chamise Chaparral	30,187	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Mixed Chaparral	14,518	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Oak and Foothill Pine	43,772	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Blue Oak Woodland	35,891	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**3**	**0**
Closed-Cone Pine-Cypress	212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Montane hardwood	3,087	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Valley Oak Woodland	181	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Alkali Prairie	312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	**4**	**4**
Vernal pool complex	299	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Fresh Emergent Wetland	26,309	0	0	0	0	7	0	0	0	0	0	7	0	10	0	17	0	1	0	0	0	42	0	84	4	0	**88**	**0**
Valley Foothill Riparian	12,565	0	0	0	0	0	10	11	0	0	0	11	7	0[e]	17	119	0	0	0	0	18	329	5	529	59	0	**588**	**0[b]**
Lacustrine and Riverine[c]	13,493	0	0	0	0	0	0	0	0	0	4	15	0	0	8	14	0	0	0	37	5	112	5	201	34	0	**236**	**31**
Total Natural Communities	**512,646**	**0**	**11**	**16**	**10**	**1,548**	**38**	**417**	**0**	**0**	**461**	**2,020**	**182**	**60**	**281**	**481**	**5**	**45**	**0**	**2,237**	**662**	**2,510**	**526**	**11,510**	**222**	**912**	**12,649**	**266**
Other Land Cover Types																												
Other Agriculture	62,164	0	0	1	0	713	17	79	2	54	84	156	11	12	0	23	0	0	0	128	237	12	80	1,609	20	0	1,628	2
Semiagriculture, Incidental to Ag	30,510	0	0	8	0	129	61	51	1	7	40	376	55	15	33	31	0	9	0	128	129	49	57	1,179	115	0	1,294	9
Eucalyptus	369	0	0	0	0	0	0	0	0	0	0	0	0	94	0	0	0	0	0	0	0	0	46	141	0	0	141	0
Barren and Developed	47,806	0	1	8	0	207	59	47	1	3	44	240	1	145	66	198	0	1	0	829	245	946	13	3,055	148	44	3,172	37
Total Other Land Cover Types	**140,848**	**0**	**1**	**17**	**0**	**1,050**	**137**	**177**	**4**	**64**	**167**	**772**	**67**	**267**	**99**	**252**	**0**	**10**	**0**	**1,085**	**611**	**1,007**	**196**	**5,843**	**283**	**44**	**6,177**	**48**

Notes:

[a]Columns headings correspond to planning unit numbers.

[b] The Public Draft HCP/NCCP included the projected impacts of the Dunnigan Specific Plan within Planning Units 5 and 13. Since then, Yolo County has removed the Dunnigan Specific Plan from the County General Plan to allow for more incremental development of the Plan Area. While the Dunnigan Specific Plan is no longer a covered activity, the area remains a possible location for future development in Yolo County within the 50-year permit term because of its proximity to I-5 and the existing Dunnigan community, and its location outside of the floodplain, among other reasons. The Final HCP/NCCP maintains the location and amount of impact in the analysis in the event similar development is approved in the future.

[c] Assumed avoidance in Planning Units 1–9

[d] Assumed 75% of restoration in cultivated lands and 25% in grassland.

[e]Assumed avoidance of riparian in Planning Unit 13. Perm. = permanent; Temp. = temporary; PUs = planning units; O&M = operations and maintenance; Ag = agriculture

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Table 5-4. Natural Community Benefits and Net Effects

Natural Community	(A) Existing Acres in Plan Area	(B) Baseline PEL[a] Category 1	(C) Baseline PEL Category 2	(D) Outside Baseline PEL 1–2	(E) Estimated and Allowable Loss	(F) Estimated Loss (% of Total)	(G) Remaining Outside Baseline PEL 1–2	(H) Protection Requirements for Compensation and Conservation	Minimum Open Space Protection: HCP/NCCP Protection Requirements and Category 1 Baseline PEL		Minimum Open Space Protection: HCP/NCCP Protection Requirements and Category 1 and 2 Baseline PEL	
									(I) Area (acres)	(J) % of Plan Area	(K) Area (acres)	(L) % of Plan Area
Cultivated Lands – Rice	35,724	3,475	1,728	30,521	87	less than 1%	30,433	2,800	6,275	18%	8,003	22%
Cultivated Lands – Non-rice	214,939	6,394	3,552	204,897	9,910	5%	194,874	14,362	20,756	10%	24,308	11%
Grassland	80,911	4,609	3,456	72,832	1,734	2%	71,090	4,430	9,039	11%	12,495	16%
Serpentine	247	0	162	85	0	0%	85	0	0	0%	162	66%
Chamise	30,187	1,040	13,784	15,313	0	0%	15,313	0	1,040	3%	14,824	49%
Mixed Chaparral	14,518	444	3,490	10,559	0	0%	10,559	0	444	3%	3,934	27%
Oak and Foothill Pine	43,772	5,175	10,683	27,906	0	0%	27,906	0	5,175	12%	15,858	36%
Blue Oak Woodland	35,891	6,118	3,490	26,283	3	less than 1%	26,280	10	6,128	17%	9,618	27%
Closed-Cone Pine-Cypress	212	0	209	3	0	0%	3	0	0	0%	209	99%
Montane hardwood	3,087	232	821	2,011	0	0%	2,011	0	232	8%	1,053	34%
Valley Oak Woodland	181	20	0	161	0	0%	161	20	40	22%	40	22%
Alkali Prairie	312	141	0	146	4	1%	143	34	174	57%	174	57%

									Minimum Open Space Protection			
									HCP/NCCP Protection Requirements and Category 1 Baseline PEL		HCP/NCCP Protection Requirements and Category 1 and 2 Baseline PEL	
Natural Community	**(A) Existing Acres in Plan Area**	**(B) Baseline PEL[a] Category 1**	**(C) Baseline PEL Category 2**	**(D) Outside Baseline PEL 1–2**	**(E) Estimated and Allowable Loss**	**(F) Estimated Loss (% of Total)**	**(G) Remaining Outside Baseline PEL 1–2**	**(H) Protection Requirements for Compensation and Conservation**	**(I) Area (acres)**	**(J) % of Plan Area**	**(K) Area (acres)**	**(L) % of Plan Area**
Vernal pool complex	299	1	285	13	0	0%	13	0	1	0%	286	96%
Fresh Emergent Wetland	26,309	5,402	9,559	11,347	88	less than 1%	11,258	500	5,902	23%	15,461	59%
Valley foothill Riparian	12,565	611	1,421	10,412	588	4%	9,864	1,600	2,211	18%	3,632	30%
Lacustrine and Riverine	13,493	621	926	11,662	236	2%	11,442	600	1,221	9%	2,147	16%
Total Natural Communities	**512,646**	**34,282**	**53,730**	424,009	**12,650**	2%	411,435	**24,356** [b]	58,577	12%	112,143	22%

a. PEL = Public and easement lands. See Chapter 6, Table 6-1(a), *Baseline Public and Easement Lands,* for descriptions of each of the categories of baseline public and easement lands.

b. This does not include 50 acres of bank swallow habitat consisting of floodplain that does not fall into any of the above categories.

5.6.2 Cultivated Lands Seminatural Community

The cultivated lands seminatural community consists of nonrangeland agricultural crops that provide habitat for covered species (Figure 5-2, *Cultivated Lands Seminatural Community and Covered Activities Footprints*).[8] Crop types that do not provide covered species habitat are not included in the cultivated lands natural community (Chapter 2, Section 2.5, *Other Land Cover Types*). This seminatural community accounts for 250,663 acres (49 percent) of the natural communities in the Plan Area including rice; it is most prevalent in the eastern portion of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, provides a detailed account of land cover types and acres in the Plan Area).

This analysis considers the cultivated lands seminatural community in two parts—rice and non-rice lands—because rice generally supports a different assemblage of species that require wetland conditions.

5.6.2.1 Adverse Effects

Covered activities will remove up to 9,997 acres (four percent) of cultivated lands seminatural community of in the Plan Area: up to 87 acres (less than one percent) of rice lands and 9,910 acres (four percent) of non-rice lands (Tables 5-1, *Maximum Allowable Loss, Natural Communities,* and 5-3, *Loss of Natural Communities and Other Land Cover Types*).

All the development-related loss (68 acres) of the rice lands is expected to result from urban development in the Woodland planning unit (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*).[9] The remaining estimated 22 percent (19 acres) of permanent loss of rice lands is expected to result from operations and maintenance activities (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*).

An estimated 42 percent (4,162 acres) of the non-rice cultivated lands permanent loss will occur in the urban planning units (19–22), while the remainder of spatially defined non-rice cultivated loss is concentrated primarily in the Dunnigan Hills and Willow Slough Basin planning units (5 and 11), with small loss in planning units 6, 7, 10, 12, 13, 14, 15, and 17 (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*). An estimated 702 acres of permanent loss is expected to result from restoration, and another 69 acres of permanent loss is expected to result from operations and maintenance activities. Construction activities will also result in an estimated 203 acres of temporary loss of this seminatural community. Each temporary disturbance is expected to be small, likely no greater than approximately ten acres (and often much less). Disturbance of small areas of cultivated lands during the 50-year permit term, with each disturbance to last for no more than one year, will remove minor amounts of foraging habitat but is unlikely to adversely affect Swainson's hawk foraging behavior. Cultivated lands regularly experience temporary disturbances and continue to provide habitat for Swainson's hawk when the disturbance is completed.

[8] Rangelands are lands grazed by livestock and typically include grassland, oak woodland, and other natural communities that are not cultivated.

[9] The accounting of loss of natural communities by covered activity types is based on estimates of development throughout the permit term. Actual impacts by covered activity type are likely to vary from these estimates. Loss of natural community types are limited by the Permits to the total amounts listed in Table 5-1, not by covered activity type.

Fragmentation effects are expected to be minimal because most of the development will be in consolidated blocks within or adjacent to existing urban areas of Davis and Woodland. Most of the county will remain as a large, interconnected cultivated lands seminatural community.

Section 5.6.1.2, *Reduction in Function*, qualitatively describes other effects on this seminatural community that are common to all of the natural communities.

5.6.2.2 Beneficial Effects

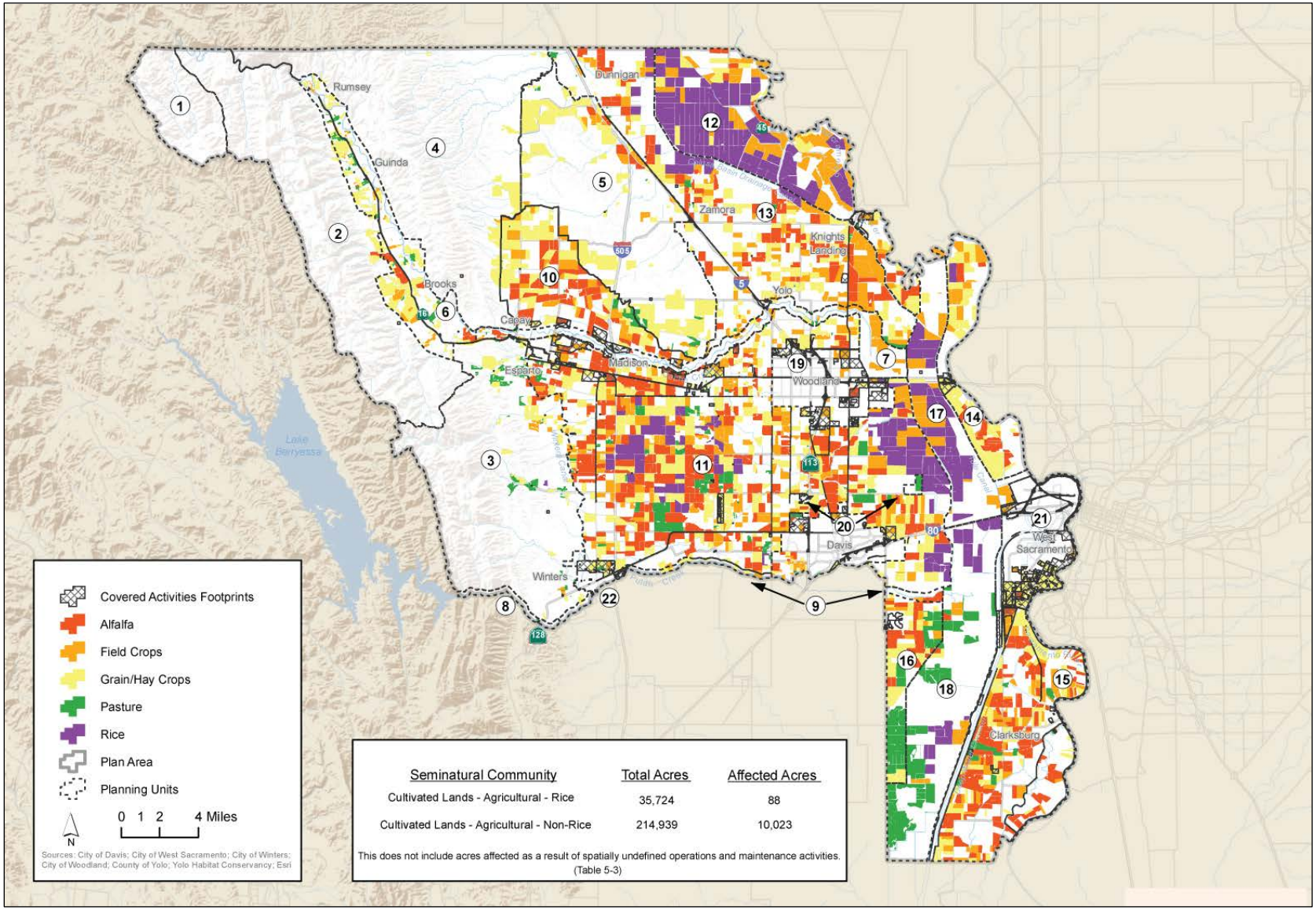
The Yolo HCP/NCCP will protect at least 14,362 acres of unprotected non-rice cultivated lands seminatural community (Objective NC-CL1.1) and 2,800 acres of unprotected rice lands seminatural community (Objective NC-CL1.2) through implementation of CM1 (Table 5-4, *Natural Communities Benefits and Net Effects*). The entire protected cultivated lands seminatural community will be managed and enhanced, particularly through planting hedgerows to provide cover and suitable conditions for prey, thereby enhancing food base, and through planting trees to provide raptor nesting and perching sites (Objective NC-CL1.3; CM1).

Conservation of the cultivated lands seminatural community will provide many ecosystem benefits in the Plan Area. Although the historic conversion of natural vegetation to cultivated lands has eliminated large areas of native species habitat, many agricultural systems continue to support abundant wildlife and provide important breeding, foraging, and roosting habitat for many resident and migratory wildlife species. Covered species that use cultivated lands include Swainson's hawk, giant garter snake, and tricolored blackbird. These species have come to rely on the habitat value of certain cultivated lands, farming practices, and crop types. Swainson's hawks in the Central Valley rely on cultivated lands for foraging, given the lack of grassland foraging habitat remaining in California (Hartman and Kyle 2010). Orchards and vineyards develop a dense overstory canopy that generally precludes access to ground-dwelling prey by foraging Swainson's hawks, white-tailed kites, western burrowing owls, and other covered species associated with cultivated lands. The cultivated lands in the reserve system will be protected from development and conversion to orchards and vineyards.

Protection and management of cultivated lands consistent with the Yolo HCP/NCCP conservation strategy will ensure these lands continue to provide habitat for covered and other native species, and are not converted to orchards or vineyards, which have very low habitat value for wildlife. Irrigated pastures, alfalfa, and annually cultivated irrigated cropland provide foraging habitat for covered species, including the Swainson's hawk, white-tailed kite, western burrowing owl, and tricolored blackbird. Grain, corn, and rice fields provide foraging habitats for waterfowl, wading birds, and shorebirds. Additionally, the 2,800 acres of rice lands will provide aquatic habitat for the giant garter snake and western pond turtle.

Small patches of important wildlife habitats associated with cultivated lands, such as isolated oaks, trees and shrubs along field borders and roadsides, remnant groves, riparian corridors, water conveyance channels, grassland, ponds, and wetlands will also be protected (Conservation Measure 1, Section 6.4.1.4.1, *Reserve System Design Criteria*). Maintenance of these small but important wildlife habitats will benefit covered wildlife species as well as a diversity of non-covered native wildlife. Cultivated lands are used primarily for foraging by several species that nest in riparian areas, roadside trees, or isolated trees and groves. Wetlands, streams, ponds, hedgerows, groves, and other remnant natural or created habitats will be maintained to provide the full range of habitat elements necessary to support covered species in cultivated lands.

Figure 5-2. Cultivated Lands Seminatural Community and Covered Activities Footprints



5.6.2.3 Net Effects

Implementation of the Yolo HCP/NCCP will result in less than a one percent net decrease (-87 acres) of the rice component of the cultivated lands seminatural community and an estimated five percent net decrease (-9,910 acres) of the non-rice component in the Plan Area (Table 5-4, *Natural Community Benefits and Net Effects*). The Yolo HCP/NCCP will protect 17,162 acres of unprotected cultivated lands seminatural community, increasing the total protected acres (Category 1 public and easements lands) of this seminatural community in the Plan Area to 22 percent for rice lands and 11 percent for non-rice cultivated lands. With full implementation of the Yolo HCP/NCCP, 18 percent (6,275 acres) of the rice lands component and 10 percent (20,756) of the non-rice cultivated lands seminatural community in the Plan Area will be in category 1 public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). All lands in the reserve system supporting the cultivated lands seminatural community will be enhanced and managed to improve and sustain values for covered and other native wildlife species in the Plan Area.

5.6.3 Grassland Natural Community

The grassland natural community is composed of five vegetation types that support grasses and associated annual and perennial forbs, as described in Chapter 2, *Existing Ecological Conditions*. In many cases, grassland is dominated by native and exotic forbs in certain seasons or during different periods within a season (D'Antonio et al. 2007). Many of the species that occupy this natural community also occur as understory plants in other natural communities such as blue oak woodland (California Department of Fish and Game 1999; Allen-Diaz et al. 2007). The grassland natural community accounts for 80,911 acres (16 percent) of the Plan Area (Table 5-1, *Maximum Allowable Loss, Natural Communities*). The largest expanses of grassland natural community in the Plan Area are in the South Blue Ridge planning unit, Capay Hill planning unit, and the Dunnigan Hills planning unit (planning units 3 through 5 in Figure 5-3, *Grassland and Covered Activities Footprints*).

5.6.3.1 Adverse Effects

Covered activities will permanently remove up to 1,734 acres (2 percent) of grassland natural community in the Plan Area (Tables 5-1, *Maximum Allowable Permanent Loss, Natural Communities* and 5-4, *Loss of Natural Communities and Other Land Cover Types*). Of this, 66 percent (1,149 acres) will result from development in the urban planning units (19–22). Another five percent (82 acres) will occur in the Willow Slough Basin planning unit (planning unit 11) primarily as a result of expansion of the Yolo County Central Landfill, and eight percent (143 acres) will occur in planning unit 1. An estimated 10 percent (210 acres) of the permanent grassland natural community loss is expected to occur as a result of wetland or riparian natural community restoration (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*). Covered activities are expected to result in temporary loss of up to 28 acres of the grassland natural community, primarily resulting from stream enhancement activities associated with the Cache Creek Resources Management Plan (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*).

Fragmentation effects are expected to be minimal because the covered activities potentially affecting habitat are primarily at the edges of blocks of grassland natural community.

Section 5.6.1.2, *Reduction in Function*, qualitatively describes other effects on this natural community that are common to all of the natural communities.

5.6.3.2 Beneficial Effects

The Yolo HCP/NCCP will protect at least 4,430 acres of unprotected grassland natural community, including a large, interconnected block in the Dunnigan Hills planning unit (planning unit 5) (Objective NC-G1.1; CM1) (Table 5-4, *Natural Community Benefits and Net Effects*). This natural community will be managed and enhanced in the reserve system (Objective NC-G1.2; CM1). Grassland will be protected in large contiguous landscapes encompassing the range of vegetation, hydrologic, and soil conditions that characterize this community. Grassland in the Dunnigan Hills planning unit will provide upland habitat for California tiger salamander. Additional patches of grassland associated with wetland land cover types will be protected to provide upland habitat for giant garter snake, western pond turtle, and other native aquatic species requiring adjacent uplands.

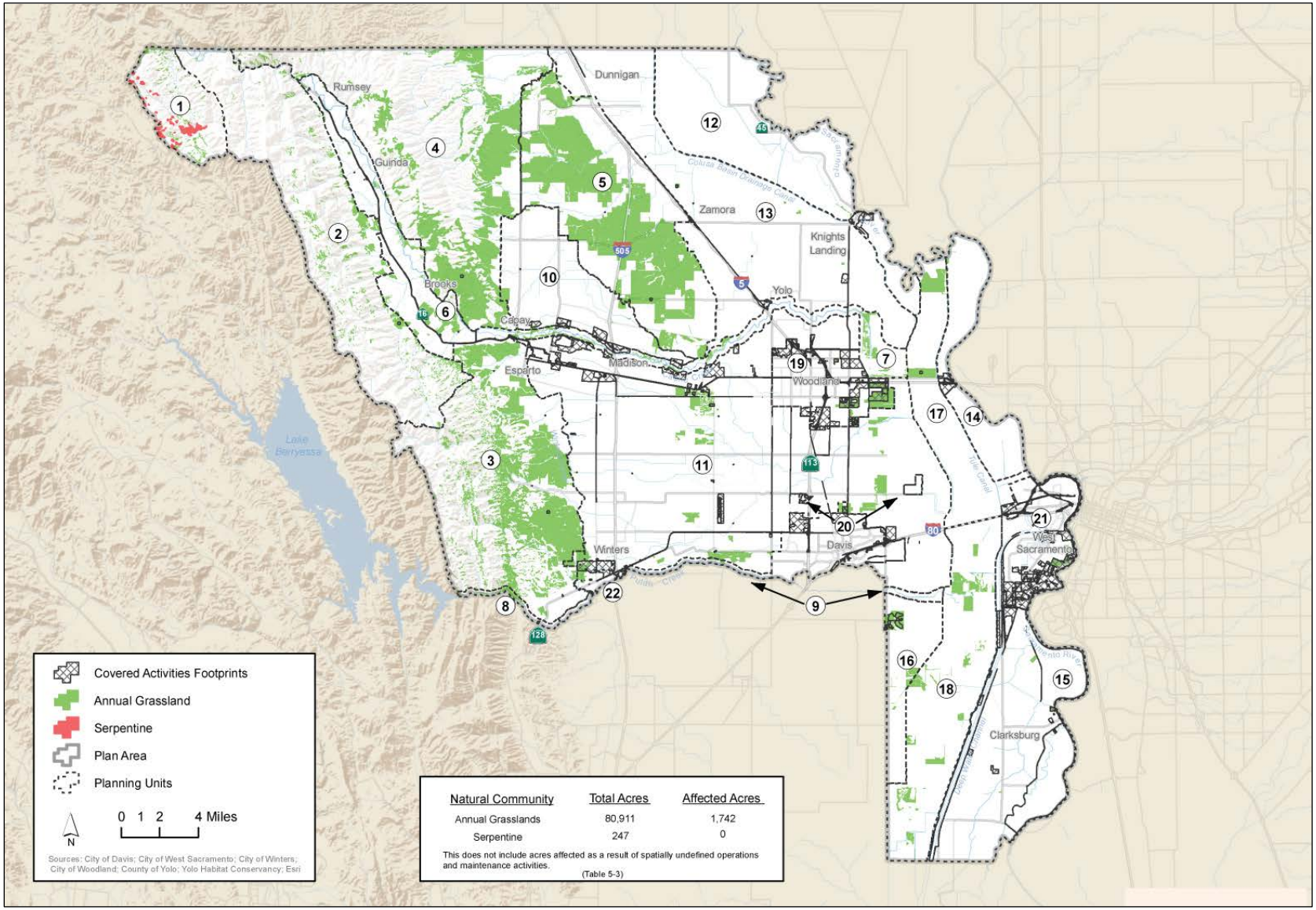
Grassland in the reserve system will be managed to sustain or increase native biodiversity and wildlife habitat values, through measures such as livestock grazing, exotic plant control, erosion control along drainages, and prescribed burning where feasible. They will be managed to sustain a mosaic of grassland vegetation alliances and increase the extent, distribution, and density of native perennial grasses intermingled with other native species, including annual grasses, geophytes, and other forbs. They will also be managed to increase opportunities for movement by broad-ranging animals through grassland, increase burrow availability for burrow-dependent species, and increase prey, especially small mammals and insects, for grassland-foraging species.

Conservation of the grassland natural community will have many ecosystem benefits. Although native grassland species have been reduced in abundance or distribution, through anthropogenic influences, native plant species remain rich in number, persisting and coexisting with nonnative plants in traditional locations with remaining grassland. Some animal species have also adjusted well to nonnative grassland. Thus, the current grassland community offers highly valuable habitats to many grassland dependent species. The protected grassland will provide habitat for numerous native wildlife species, including rare and endangered species such as Swainson's hawk, golden eagle, prairie falcon, short-eared owl, white-tailed kite, western burrowing owl, grasshopper sparrow, and American badger.

5.6.3.3 Net Effects

The Yolo HCP/NCCP will result in an estimated two percent decrease (-1,734 acres) of the grassland natural community in the Plan Area (Table 5-4, *Natural Community Benefits and Net Effects*). With full implementation of the Yolo HCP/NCCP, 16 percent (12,495 acres) of the grassland natural community in the Plan Area will be conserved in Category 1 and 2 public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). The protected, managed, and enhanced grasslands will be of high value, consisting primarily of large, contiguous expanses in areas with high concentrations of covered grassland associated species in the Dunnigan Hills planning unit and other portions of the Conservation Reserve Area. Therefore, the Yolo HCP/NCCP will result in a net benefit to the grassland natural community.

Figure 5-3. Grasslands and Covered Activities Footprints



5.6.4 Valley Foothill Riparian Natural Community

The valley foothill riparian natural community consists of a multilayered woodland plant community with a tree overstory and diverse shrub layer. This natural community is composed of 13 vegetation types (Table 2-1, *Natural Communities and Other Land Cover Types*), reflecting the diversity of riparian conditions. The valley foothill riparian natural community occurs most extensively along Cache Creek, Putah Creek, Willow Slough, Union School Slough, Dry Slough, Chickahominy Slough, the Colusa Basin Drain, and the Sacramento River. Many other streams, sloughs, and canals, and some lowland areas with shallow groundwater away from watercourses, support less developed riparian vegetation. This natural community accounts for 12,565 acres (two percent) of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*; Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). A more detailed description of the valley foothill riparian natural community is provided in Chapter 2, Section 2.4.5.4, *Valley Foothill Riparian Natural Community*.

5.6.4.1 Adverse Effects

Covered activities will remove up to 588 acres (five percent) of valley foothill riparian natural community in the Plan Area (Table 5-1, *Maximum Allowable Loss, Natural Communities*; Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). An estimated 64 percent (352 acres) of the loss is expected to result from development in the urban planning units (19–22), and the remainder is distributed among planning units 5–7 and 10–15 (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*; Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). Operations and maintenance activities will result in the removal of an estimated 60 acres of this natural community: this loss is considered to be permanent even if the disturbed area is planted with riparian vegetation because the natural community will take more than one year to restore.

Fragmentation effects are expected to be minimal except in the urban planning units. Patches of valley foothill riparian natural community that are avoided within urban growth areas could become isolated by surrounding urban development. Project proponents will establish setbacks consistent with *AMM10, Avoid and Minimize Effects on Wetlands and Waters* and *AMM9, Establish Buffers around Sensitive Natural Communities* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*) to minimize this effect.

Section 5.6.1.2, *Reduction in Function*, qualitatively describes other effects on this natural community that are common to all of the natural communities.

5.6.4.2 Beneficial Effects

The Yolo HCP/NCCP will protect at least 1,600 acres of unprotected valley foothill riparian natural community distributed primarily in the Cache Creek and Putah Creek planning units (Objective NC-VFR1.1; CM1) (Table 5-4, *Natural Community Benefits and Net Effects*). The HCP/NCCP will also restore valley foothill riparian natural community to yield no net loss as a result of covered activities, and will restore another 20 acres independent of effect (Objective NC-VFR1.2; CM2). The protected and restored valley foothill riparian natural community will be managed and enhanced in the reserve system by reducing the relative extent of nonnative plants that degrade habitat function and by improving native plant diversity and vegetation structure. The Conservancy will manage

invasive species in the riparian natural community (Objective L-2.1) and allow for natural fluvial processes to promote riparian succession and diversity (Objective L-2.3).

Additionally riparian natural community outside the reserve system (i.e., not included in conservation easements) along Cache Creek in planning unit 7 will be managed and enhanced consistent with the Cache Creek Resources Management Plan, as described in Chapter 6, Section 6.5.8.1.1, and riparian natural community outside the reserve system along Putah Creek in planning unit 9 will be monitored and enhanced consistent with direction from the Lower Putah Creek Coordinating Committee, as described in Section 6.5.8.1.2.

Conservation of the valley foothill riparian natural community will have numerous ecological benefits. More than 225 species of birds, mammals, reptiles, and amphibians use riparian areas in California for forage, water, thermal and escape cover, nesting and breeding, and migration and dispersal (Riparian Habitat Joint Venture 2004). Riparian communities are critical for the conservation of resident and migratory land birds in California (Gains 1980). Remnant valley/foothill riparian communities in the Plan Area, while highly degraded relative to their historical state, provide habitat for covered species, including Swainson's hawk, white-tailed kite, and valley elderberry longhorn beetle. Riparian areas also serve an important function as movement corridors for mammals and other wildlife if they provide suitable connections between larger blocks of habitat (Fischer et al. 2000). Additionally, riparian vegetation adjacent to streams moderates water temperature for fish and other aquatic wildlife, produces invertebrates that serve as a vital food source for fish and other wildlife, and is a source of coarse woody and other organic material that provides habitat and substrate and food for the aquatic foodweb for macroinvertebrates and fish (Pusey and Arthington 2003).

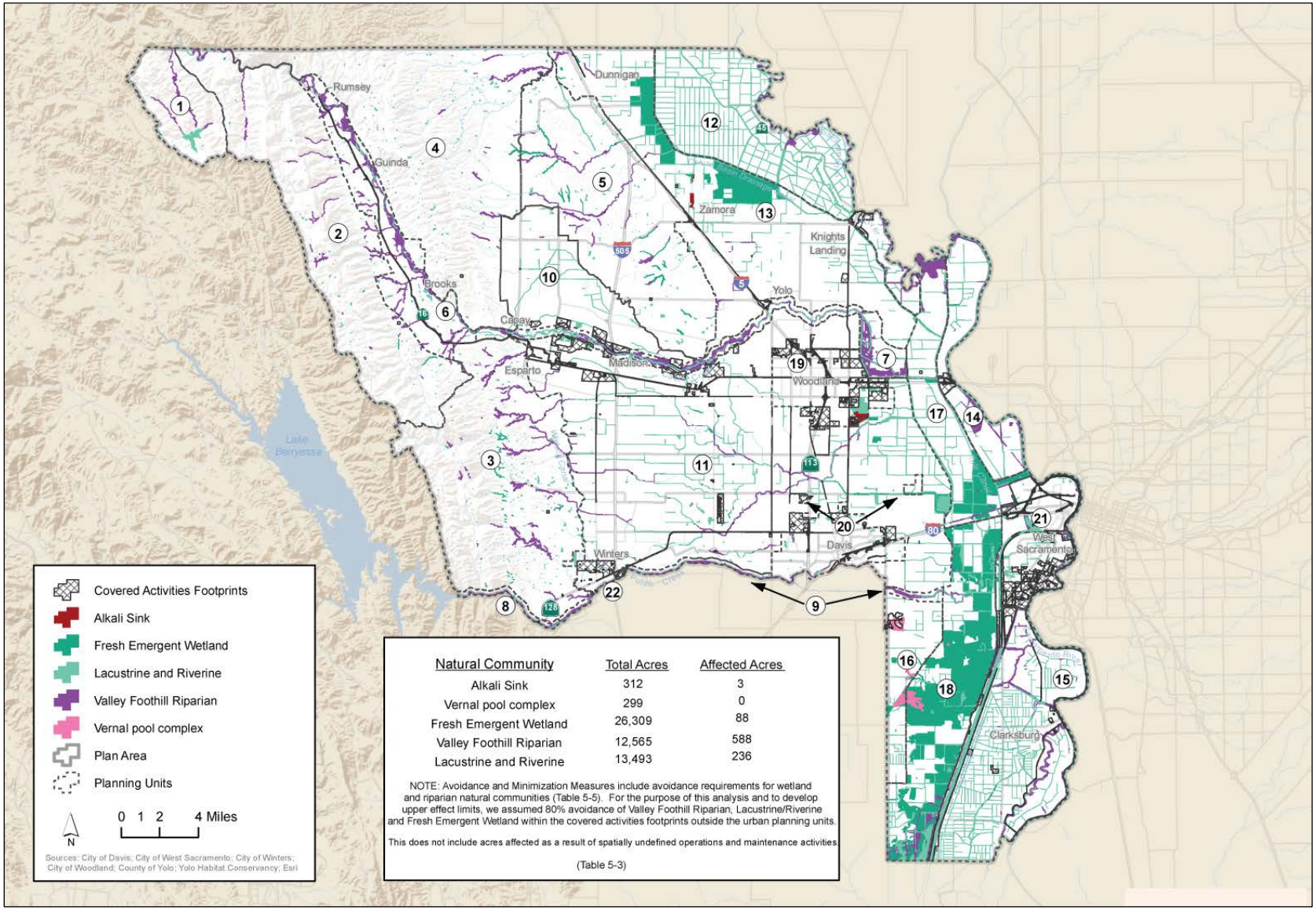
5.6.4.3 Net Effects

The Yolo HCP/NCCP will result in a net gain of the valley foothill riparian natural community in the Plan Area, restoring up to 598 acres to offset the maximum of 588 acres of loss, and restoring at least an additional 20 acres independent of effect. With full HCP/NCCP implementation, 30 percent (3,632 acres) of the riparian natural community in the Plan Area will be conserved in public and easement lands Categories 1 and 2. These lands will be monitored and adaptively managed in the reserve system to sustain the ecological value of this natural community for covered species. The Yolo HCP/NCCP will result in a net benefit to the valley foothill riparian natural community.

5.6.5 Alkali Prairie Natural Community

The alkali prairie natural community hydrology is determined by a mixture of rainfall, runoff, and flooding from adjacent drainages that vary annually depending on both local and upper watershed precipitation patterns. The soils are composed of saline-alkaline clay with salts that include sodium, magnesium, and boron. The alkali prairie natural community accounts for 312 acres, or 0.06% of the Plan Area, most of which is southeast of the city of Woodland (Table 5-1, *Maximum Allowable Loss, Natural* Communities; Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). A more detailed description of the alkali prairie natural community is provided in Chapter 2, Section 2.4.5.1, *Alkali Prairie Natural Community.*

Figure 5-4. Riparian and Wetlands and Covered Activities Footprints



Natural Community	Total Acres	Affected Acres
Alkali Sink	312	3
Vernal pool complex	299	0
Fresh Emergent Wetland	26,309	88
Valley Foothill Riparian	12,565	588
Lacustrine and Riverine	13,493	236

NOTE: Avoidance and Minimization Measures include avoidance requirements for wetland and riparian natural communities (Table 5-5). For the purpose of this analysis and to develop upper effect limits, we assumed 80% avoidance of Valley Foothill Riparian, Lacustrine/Riverine and Fresh Emergent Wetland within the covered activities footprints outside the urban planning units.

This does not include acres affected as a result of spatially undefined operations and maintenance activities.

(Table 5-3)

5.6.5.1 Adverse Effects

Covered activities will remove up to 4 acres (1%) of the alkali prairie natural community in the Plan Area (Table 5-1, *Maximum Allowable Loss, Natural Communities*: Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). This loss will result from future widening of Road 102 and Road 25, and infrastructure installation and maintenance at the Woodland Regional Park. The infrastructure installation and maintenance include installation of a stormwater conveyance and pre-treatment system, maintenance and/or future upgrade of a well on the property, and construction of access to monitoring wells. In addition, road widening and infrastructure installation would add to the habitat fragmentation by increasing the existing spatial separation between areas supporting alkali prairie natural community. Implementation of *AMM9, Establish Buffers around Sensitive Natural Communities,* will minimize adverse effects on this natural community.

5.6.5.2 Beneficial Effects

The Yolo HCP/NCCP will place a conservation easement on 164 acres of open space supporting 33.7 acres of alkali prairie natural community at the Woodland Regional Park and incorporate this land into the reserve system. The Conservancy will prepare and implement a management and monitoring plan for this site. The framework will guide enhancement activities for alkali prairie natural community. It will focus specifically on controlling Italian ryegrass and other invasive species, implementing measures to restore hydrological functions of alkali prairie habitat, and maintaining adjacent habitat for pollinators. The Conservancy will monitor the enhanced sites to assess the effectiveness of these actions toward improving and expanding habitat for palmate-bracted bird's beak.

5.6.5.3 Net Effects

The Yolo HCP/NCCP will result in net loss of 1% (4 acres) of the alkali prairie natural community in the Plan Area (Table 5-4, *Natural Community Benefits and Net Effects*). With full HCP/NCCP implementation, 57% (174 acres) of the remaining alkali prairie natural community in the Plan Area will be protected with conservation easements on category 1 public and easement lands. These will be monitored and adaptively managed in the reserve system to sustain the ecological value of this natural community for covered species. The Yolo HCP/NCCP will result in a net benefit to the alkali prairie natural community. Fresh Emergent Wetlands Natural Community

The fresh emergent wetlands natural community accounts for 26,309 acres (five percent) of the Plan Area (Table 5-1, *Maximum Allowable Loss, Natural Communities*, Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). This natural community is most commonly found on level to gently rolling landscapes along rivers, lakes, and creeks, but can be found anywhere the topography allows perennial or seasonal soil saturation or flooding by fresh water. Perennially flooded areas are typically dominated by cattails, tule, and California bulrush that can reach up to 12 feet in height. Seasonally saturated or inundated areas contain much shorter vegetation and are more variable in their plant species composition. Dominant species in many lower elevation seasonal wetlands include Baltic rush, iris-leaved rush, and spikerushes. Additional detail on this natural community is provided in Chapter 2, Section 2.4.5.3, *Fresh Emergent Wetland Natural Community*.

Freshwater emergent wetlands east of the Dunnigan Hills and the Cache/Putah Basin are predominately found in managed waterfowl habitat that is flooded during the winter and dry during

the summer. A much smaller extent with the same winter-flooded hydrologic regime is associated with sewage treatment plants, the lower Willow Slough Bypass, and abandoned agricultural land in the lower Yolo Bypass. This natural community also includes small areas of unmanaged vegetation and areas that are inundated during the summer. Sedges and rushes dominate the emergent wetlands within the drainages located between the Blue Ridge and State Route 16, between Rocky Ridge and Interstate 5, and in the Dunnigan Hills. There are bulrush and cattail emergent wetlands in the Willow Slough Bypass just east of Davis, and alkali bulrush emergent wetlands in the lowlands just west of the Sacramento River Deep Water Ship Channel in southeast Yolo County.

5.6.5.4 Adverse Effects

Covered activities will permanently remove up to 88 acres (less than one percent) of fresh emergent wetlands natural community in the Plan Area (Table 5-1, *Maximum Allowable Loss, Natural Communities*; Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). Of this, 47 percent (42 acres) is expected to result from urban development in the West Sacramento planning unit (planning unit 21); the remaining development-related loss will likely be distributed among planning units 5, 11, 13, 15, and 17 (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*). Operations and maintenance activities will result in permanent loss of an estimated five acres of fresh emergent wetland (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*).

Fragmentation effects are expected to be minimal because the covered activities potentially affecting habitat are primarily at the edges of blocks of fresh emergent wetlands natural community.

Section 5.6.1.2, *Reduction in Function*, qualitatively describes other effects on this natural community that are common to all of the natural communities.

5.6.5.5 Beneficial Effects

The Yolo HCP/NCCP will protect 500 acres of unprotected fresh emergent wetland (Objective NC-FEW1.1; CM1) and restore up to 88 acres to result in no net loss of this natural community (Objective NC-FEW1.2; CM2) of fresh emergent wetland (Table 5-4, *Natural Community Benefits and Net Effects*). An additional 714 acres of fresh emergent wetlands on pre-permit reserve lands will be enrolled into the reserve system (Table 6-2(b); Appendix D, *Glossary of Terms*, provides a definition of pre-permit reserve lands). This natural community will be managed and enhanced in the reserve system (Objective NC-FEW1.3; CM3) to sustain and improve ecosystem values.

Conservation of the fresh emergent wetland natural community will provide numerous ecosystem benefits, including providing habitat for giant garter snake, tricolored blackbird, western pond turtle, and other native species dependent upon this natural community. A variety of native and nonnative freshwater invertebrates and resident fish species, waterfowl, pisciverous (fish-eating) birds, semi-aquatic mammals, and insectivorous birds inhabit or forage in the fresh emergent wetland natural community. Invertebrates and organic material produced in the fresh emergent wetland natural community supports the aquatic foodweb and production of food for native aquatic organisms. A wide variety of waterfowl and other birds migrating along the Pacific Flyway use the fresh emergent wetland natural community. Abundant and diverse plant and invertebrate populations in these wetlands provide important food resources for migrating waterfowl and many other wildlife species that forage in and over these wetlands.

5.6.5.6 Net Effects

Implementation of the Yolo HCP/NCCP will result in no net loss of the fresh emergent wetland natural community in the Plan Area as a result of covered activities, and will protect 500 acres of unprotected fresh emergent wetland (Table 5-4, *Natural Community Benefits and Net Effects*). With full implementation of the Yolo HCP/NCCP, 59 percent of the fresh emergent wetland natural community in the Plan Area will be conserved in Category 1 and 2 public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*), including baseline and newly protected lands. At least 1,250 acres of this natural community will be included in the Yolo HCP/NCCP reserve system (500 acres newly protected lands and 750 acres pre-permit reserve lands), and will be monitored and adaptively managed to sustain or improve values for covered and other native species. The Yolo HCP/NCCP will result in a net benefit to this natural community.

5.6.6 Lacustrine and Riverine Natural Community

The lacustrine and riverine natural community includes a variety of lakes, reservoirs, and ponds (lacustrine); rivers and streams (riverine); and other open-water land cover types such as stock ponds, stormwater detention ponds, and wastewater treatment ponds. The lacustrine and riverine natural community is designated as open water in the land cover database (Table 2-1, *Natural Communities and Other Land Cover Types*) and accounts for 13,493 acres in the Plan Area.

5.6.6.1 Adverse Effects

Covered activities will remove up to up to 236 acres (two percent) of lacustrine and riverine natural community in the Plan Area (Table 5-1, *Maximum Allowable Loss, Natural Communities*; Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). An estimated 72 percent (159 acres) of the lacustrine and riverine natural community loss will result from development in the urban planning units (planning units 19–22) (Figure 5-4, *Riparian and Wetlands, and Covered Activities Footprints*). Additional loss is expected to be distributed though planning units 3, 5, 7, 10, 11, and 13 through 15. Operations and maintenance activities are expected to result in permanent loss of an estimated 34 acres of lacustrine and riverine natural community (Table 5-3, *Loss of Natural Communities and Other Land Cover Types*).

Fragmentation effects are expected to be minimal because project proponents will implement avoidance measures and setbacks described in *AMM9, Establish Buffers around Sensitive Natural Communities* and *AMM10, Avoid and Minimize Effects on Wetlands and Waters* to protect wetlands and continuous stream corridors (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*).

Section 5.6.1.2, *Reduction in Function*, qualitatively describes other effects on this natural community that are common to all of the natural communities.

5.6.6.2 Beneficial Effects

The Yolo HCP/NCCP will protect at least 600 acres of unprotected lacustrine and riverine natural community (Objective NC-LR1.1; CM1), and will restore additional acres to result in no net loss of this natural community (Objective NC-LR1.2; CM2). The Yolo HCP/NCCP will restore at least 36 acres of aquatic habitat for California tiger salamander. Within the 600 acres of protected lacustrine and riverine natural community, the Conservancy will protect at least 36 acres of aquatic habitat for California tiger salamander. The remainder will provide habitat for western pond turtle, and

portions are expected to provide aquatic habitat for giant garter snake. This natural community will be managed and enhanced in the reserve system (Objective NC-LR1.3; CM3) to sustain its value for covered and other native species.

5.6.6.3 Net Effects

Implementation of the Yolo HCP/NCCP will result in no net loss of lacustrine and riverine natural community in the Plan Area (Table 5-4, *Natural Community Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will protect 600 acres of this natural community. With full implementation of the Yolo HCP/NCCP, an estimated 2,147 acres, comprising 16 percent of the lacustrine and riverine natural community in the Plan Area, will be conserved on Category 1 and 2 public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*), including baseline and newly protected lands. The Yolo HCP/NCCP will result in a net benefit to this natural community.

5.6.7 Other Land Cover Types

Covered activities will convert 6,087 acres of land cover types such as orchards and vineyards, eucalyptus, and barren and developed areas that do not fall within any of the natural community or seminatural community categories. Although the conservation strategy will not focus on these lands, many of them do have conservation value by providing open space for connectivity and buffers around development. Eucalyptus provides nesting opportunities for Swainson's hawk and white-tailed kite. The conservation strategy will protect, restore, manage, and enhance lands that provide greater habitat value than these other land cover types.

5.6.8 Natural Communities Not Affected by Covered Activities

Covered activities will not affect any of the following natural community types occurring in the Plan Area.

5.6.8.1 Serpentine

The Plan Area includes 247 acres of serpentine natural community, of which 162 acres (66 percent) are in Category 2 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). The 162 acres of open space include lands on UC Davis McLaughlin Reserve, and the Bureau of Land Management's (BLM) Cache Creek Natural Area within the Little Blue Ridge planning unit in the far northwestern corner of the Plan Area (Figure 5-3, *Grassland and Covered Activities Footprints*). This natural community is well represented on conserved lands in the Plan Area.

5.6.8.2 Chamise

The Plan Area includes 30,187 acres of chamise natural community, of which 1,040 acres are in Category 1 open space and 13,784 are in Category 2 baseline public and easement lands, for a total of 49 percent of this natural community occurring on Categories 1 and 2 public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). Chamise is a very common natural community type in California. The baseline public and easement lands supporting this natural community in the Plan Area consist mostly of the BLM's Cache Creek Natural Area, CDFW's Knoxville Wildlife Area, and Yolo County's Otis Ranch Open Space Park in the western and northwestern

portions of the Plan Area (Figure 2-7, *Distribution of Shrubland and Scrub Natural Communities in the Plan Area*). This natural community is well represented on conserved lands in the Plan Area.

5.6.8.2.1 Mixed Chaparral

The Plan Area includes 14,518 acres of mixed chaparral, of which 444 acres are in Category 1 baseline public and easement lands and 3,490 acres are in Category 2 baseline public and easement lands, for a total of 27 percent of this natural community type in Category 1 and 2 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). Mixed chaparral is a common natural community type in California. The open space lands supporting this natural community in the Plan Area consist mostly of the BLM's Cache Creek Natural Area and CDFW's Knoxville Wildlife Area (Figure 2-7, *Distribution of Shrubland and Scrub Natural Communities in the Plan Area*). This natural community is well represented on conserved lands in the Plan Area.

5.6.8.2.2 Oak and Foothill Pine Woodland

The Plan Area includes 43,772 acres of oak and foothill pine woodland natural community, of which 5,175 acres are in Category 1 baseline public and easement lands and 10,683 acres are in Category 2 baseline public and easement lands, for a total of 36 percent of this natural community in Category 1 and 2 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). Most of the open space supporting this natural community is on the Oak Ranch Property (protected through a conservation easement held by Rangeland Trust), BLM's Cache Creek Natural Area, and Audubon's Bobcat Ranch. This natural community is well represented on conserved lands in the Plan Area.

5.6.8.2.3 Blue Oak Woodland

The Plan Area includes 35,891 acres of blue oak woodland natural community, of which 6,118 acres are in Category 1 baseline public and easement lands and 3,490 acres are in Category 2 baseline public and easement lands, for a total of 27 percent of this natural community in Category 1 and 2 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). Most of the open space supporting this natural community is on the Oak Ranch Property (protected through a conservation easement held by Rangeland Trust), BLM's Cache Creek Natural Area, and Audubon's Bobcat Ranch. This natural community is well represented on conserved lands in the Plan Area.

5.6.8.2.4 Closed-Cone Pine-Cypress

The Plan Area includes 212 acres of closed-cone pine-cypress natural community, of which 209 acres (99 percent) are in Category 2 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*), primarily on BLM's Cache Creek Natural Area and on Audubon's Bobcat Ranch. This natural community is well represented on conserved lands in the Plan Area.

5.6.8.2.5 Montane Hardwood

The Plan Area includes 3,087 acres of montane hardwood natural community, of which 232 acres are in Category 1 baseline public and easement lands and 821 acres are in Category 2 baseline public and easement lands, for a total of 34 percent of this natural community in Category 1 and 2 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). The protected area are scattered among patches of oak woodland on BLM lands along the western edge of the Plan Area. This natural community is well represented on conserved lands in the Plan Area.

5.6.8.2.6 Valley Oak Woodland

The Plan Area includes 181 acres of valley oak woodland natural community, of which 20 acres (11 percent) are in Category 1 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). The Yolo HCP/NCCP will newly protect an additional 20 acres of this natural community type, for a total of 22 percent of this natural community being protected countywide (Table 5-4). With this additional protection, this natural community will be well represented on conserved lands in the Plan Area.

5.6.8.2.7 Vernal Pool Complex

The Plan Area includes 299 acres of vernal pool complex natural community, of which one acre is in Category 1 open space and 285 acres are in Category 2 open space, for a total of 96 percent of this natural community in Category 1 and 2 baseline public and easement lands (Table 5-4, *Natural Community Benefits and Net Effects*). These open space acres are within Yolo Bypass Wildlife Area, Davis Communications Facility, and the Yolo County Grasslands Regional Park Burrowing Owl Preserve. This natural community is well represented on conserved lands in the Plan Area.

5.7 Effects on Covered Species

Table 5-5, *Covered Species Habitat Loss*, provides the amount of habitat loss for each covered species, by habitat type and planning unit, and for both permanent and temporary loss. Table 5-6, *Covered Species Benefits and Net Effects*, provides the amount of habitat lost in relation to the amount of conservation for each species, in the context of total habitat and habitat in baseline public and easement lands. The sections below describe adverse, beneficial, and net effects of the Yolo HCP/NCCP on each covered species.

5.7.1 Palmate-Bracted Bird's Beak

The palmate-bracted bird's-beak habitat model is based on GIS digitization of the alkali prairie natural community in the Plan Area (Appendix A, *Covered Species Account*). This natural community was identified from current and historical soils maps, aerial imagery from 1933 and 1952, and current Google Earth imagery. Additional habitat was mapped in planning unit 13 using polygons supplied by CDFW. The total extent of palmate-bracted bird's-beak modeled habitat in the Plan Area is 312 acres (Table 5-2, *Habitat-Based Take Limits, Covered Species*).

Modeled habitat for palmate-bracted bird's-beak is located in two areas, one in the Colusa Basin Plains planning unit and a second that overlaps the Woodland and Willow Slough Basin planning units. Palmate-bracted bird's-beak has not been documented within the Colusa Basin Plains planning unit; however, the Woodland and Willow Slough Basin planning units support two known occurrences of palmate-bracted bird's-beak. One occurrence (California Natural Diversity Database [CNDDB] Element Occurrence #1) was originally documented in 1963 and has been surveyed on multiple occasions between 1981 and 2012 (CNDDB 2014). This occurrence is on protected land managed by the Center for Natural Lands Management for the benefit of palmate-bracted bird's-beak and other rare plants. The second occurrence (CNDDB Element Occurrence #27), located in Woodland Regional Park, was documented in 1996 (CNDDB 2014) and observed again in 2009 (UC

Davis Center for Plant Diversity 2009) and in 2015.[10] More specific detail on the habitat and ecology of palmate-bracted bird's-beak is provided in Appendix A, *Covered Species Accounts*.

5.7.1.1 Adverse Effects

5.7.1.1.1 Habitat Loss and Fragmentation

Habitat loss has been the primary cause of the range-wide decline of palmate-bracted bird's-beak (U.S. Fish and Wildlife Service 2009). Implementation of the covered activities will result in the removal of four acres of modeled habitat for palmate-bracted bird's-beak in the Yolo HCP/NCCP Plan Area (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Populations or individuals of the species within this habitat, however, will be avoided.

5.7.1.1.2 Reduction in Habitat Function

Habitat loss from spatially defined activities will result in a small, unquantified reduction of habitat function in the remaining habitat. Temporary ground disturbances and permanent long-term activities could result in a reduction in habitat function. The reduction in function could take the following forms.

Road Construction. Habitat disturbance associated with road construction and pipeline excavation activities would promote the spread of invasive plant species that compete with palmate-bracted bird's-beak and its host plants.

Runoff. The increased area of paved surfaces and installation of infrastructure promote changes in runoff patterns and provide opportunities for erosion and sedimentation into the habitat.

Recreation. The City of Woodland will build a new parking lot and staging area for trail access, create up to 3.1 miles of new foot trails accessible to hikers and mountain bikers, and potentially build a new education center on the Woodland Regional Park site. Recreational use on the site could result in trampling of palmate-bracted bird's beak. Equestrians will not be able to use the trail, however, due to the sensitive nature of habitat on the site and the potential for horses to stray from trails and harm rare plants.

The City of Woodland will closely monitor allowable recreational uses on the site to ensure compliance with the terms of the conservation easement and the protection of the conservation values of the site, including palmate-bracted bird's-beak populations. If there is evidence that recreational users stray from trails and may be disturbing rare plant populations, the City of Woodland will work with the Conservancy to design and implement recreational use restrictions or controls that will eliminate that disturbance. If despite these controls these disturbances continue, the City of Woodland may need to close or partially close recreational use on the site to ensure the maintenance of the site's conservation values, and to restore degraded areas. With these measures in place, the City of Woodland will protect palmate-bracted bird's-beak from recreation-related disturbances.

These disturbances reduce the amount of habitat suitable for use by palmate-bracted bird's-beak and reduce the resources available for the growth and reproduction of the species. Moreover,

[10] Zippin, D. B and P. Marchand. Personal observation during site visit to Woodland Regional Park, Woodland, CA, July 16, 2015. No plants were observed during a visit during the blooming season in 2016.

habitat fragmentation greatly reduces habitat function because it prevents the natural ebb and flow of the population into different parts of the habitat, which limits the amount of suitable habitat that is actually occupied by the species.

5.7.1.1.3 Harassment, Injury, or Mortality

Even if no palmate-bracted bird's-beak plants are currently present in a specific location, seeds may be present in the soil and could be lost when the habitat is removed. The covered activities will, however, avoid known locations of the plant, therefore minimizing the risk of affecting this species.

5.7.1.1.4 Impact of Take on the Species

On a species-wide basis, the amount of habitat lost will be quite small (<0.1 percent). Loss of this habitat is not expected to result in the direct loss of individual plants as populations and individual plants will be avoided, although undetected seeds present in the soil may be affected as described above. The avoidance of populations or individuals is important because only two population groups throughout the species' range (Delevan National Wildlife Refuge and Colusa National Wildlife Refuge) are large and relatively stable, both being protected and managed on federal lands (U.S. Fish and Wildlife Service 2009; California Department of Fish and Wildlife 2014). One group (at Sacramento National Wildlife Refuge) consists of three small populations, all of which were established via translocated seeds, and another group (at Mendota Wildlife Area/Alkali Sink Ecological Reserve) consists of two small populations, one of which was established via translocated seeds. Another group on private lands in western Madera County consisted of a few widely scattered individuals; the habitat at that location has been disked, and the population may no longer be present (California Department of Fish and Wildlife 2014). Habitat for the population located in Livermore is partially preserved, but no management activities have been implemented to maintain the population.

5.7.1.2 Beneficial Effects

The Yolo HCP/NCCP will benefit palmate-bracted bird's-beak by expanding the protected amount of palmate-bracted bird's-beak habitat in the Plan Area (alkali prairie), by enhancing the function of the protected habitat, and by maintaining the occupied habitat. Management and enhancement actions will increase the population of palmate-bracted bird's-beak at Woodland Regional Park. Overall, protecting 33 acres of alkali prairie will protect approximately 11 percent of the remaining habitat for palmate-bracted bird's-beak in the Plan Area.

5.7.1.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in a net one percent (four acres) loss of palmate-bracted bird's beak habitat in the Plan Area. The Yolo HCP/NCCP will place a conservation easement on 33 acres of habitat on Woodland Regional Park. With full implementation of the Yolo HCP/NCCP, 56 percent of the palmate-bracted bird's-beak habitat in the Plan Area will be protected on category 1 public and easement lands, and 100 percent of all occupied habitat in the Plan Area will be protected. Woodland Regional Park will be monitored and adaptively managed to improve values for palmate-bracted bird's-beak. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on palmate-bracted bird's-beak, to the maximum extent practicable, and will provide for the conservation of this species in the Plan Area.

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Table 5-5. Covered Species Habitat Loss[c]

		Permanent Loss from Covered Activities with a Spatially Defined Footprint by Planning Unit (acres)[f]																											
Covered Species	**Existing Acreage**	**Little Blue Ridge 1**	**North Blue Ridge 2**	**South Blue Ridge 3**	**Capay Hills 4**	**Dunnigan Hills 5[f]**	**Upper Cache Creek 6**	**Lower Cache Creek 7**	**Upper Putah Creek 8**	**Lowr Putah Creek 9**	**Hungry Hollow Basin 10**	**Willow Slough Basin 11**	**Colusa Basin 12**	**Colusa Basin Plains 13[f]**	**North Yolo Basin 14**	**South Yolo Basin 15**	**Yolo Basin Plains 16**	**North Yolo Bypass 17**	**Woodland 18**	**Davis 19**	**West Sacramento 20**	**Winters 21**	**Valley Landscape Unit 22**	**Total Perm. Loss in PUs**	**O&M Perm. Loss**	**Restoration**	**Total Perm. Loss**	**% Remaining**	**Total Temp. Loss**
Valley elderberry longhorn beetle																													
Riparian habitat	9,447	0	0	1	0	0	10	11	0	0	0	0	7	0	17	119	0	1	0	0	0	329	5	501	13	0	523	95%	0
Non-riparian habitat	3,932	0	0	0	0	0	0	6	0	0	0	0	0	0	0	21	0	0	0	0	0	32	2	60	1	0	61	98%	1
Total	**13,379**	**0**	**0**	**1**	**0**	**0**	**10**	**17**	**0**	**0**	**0**	**0**	**7**	**0**	**17**	**140**	**0**	**1**	**0**	**0**	**0**	**361**	**7**	**561**	**14**	**0**	**584**	**96%**	**1**
California tiger salamander																													
Aquatic breeding habitat	1,004	0	0	0	0	1	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	12	0	0	12	99%	1
Upland habitat	86,505	0	0	0	10	310	0	0	0	0	0	0	0	26	0	0	5	0	0	0	0	0	0	349	13	36	398	100%	1
Total	**87,509**	**0**	**0**	**0**	**10**	**311**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**36**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**361**	**13**	**36**	**410**	**100%**	**2**
Ponds - seasonal in aquatic breeding habitat (no. of ponds)	434	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0		3	99%	0
Western pond turtle																													
Aquatic habitat	53,907	0	0	1	0	3	1	0	0	0	4	16	0	1	8	31	0	1	0	105	7	145	5	329	40	0	369	99%	31
Nesting and overwintering habitat	137,185	0	10	11	10	105	7	19	0	0	7	73	7	64	17	146	0	11	0	694	69	545	199	1,994	35	1,104	3,133	99%	112[c]
Total	**191,092**	**0**	**11**	**11**	**10**	**108**	**7**	**19**	**0**	**0**	**11**	**79**	**8**	**65**	**25**	**177**	**0**	**12**	**0**	**815**	**76**	**690**	**204**	**2,323**	**74**	**1,104**	**3,502**	**99%**	143
Ponds - perennial in aquatic habitat (no. of ponds)	1,003	0	1	1	1	1	0	0	0	0	0	2	0	0	0	2	0	0	0	2	0	8	1	19	0	0	19	98%	1
Ponds - perennial in nesting and overwintering habitat (no. of ponds)	149	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	5	0	0	5	97%	0
Total (no. of perennial ponds)	***1,152***	***0***	***1***	***1***	***1***	***1***	***0***	***0***	***0***	***0***	***0***	***2***	***0***	***1***	***0***	***2***	***0***	***0***	***0***	***2***	***0***	***12***	***1***	***24***	***0***	***0***	***24***	*98%*	*1*
Giant garter snake																													
Rice habitat	31,168	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	0	0	0	68	19	0	87	100%	0
Aquatic habitat	6,596	0	0	0	0	0	0	0	0	0	0	2	0	1	8	13	0	0	0	10	0	69	0	103	6	0	109	98%	1
Freshwater emergent habitat	25,897	0	0	0	0	1	0	0	0	0	0	0	0	10	0	17	0	1	0	0	0	42	0	71	4	0	76	100%	0
Active season upland movement	6,612	0	0	0	0	13	0	0	0	0	0	0	6	3	23	73	0	1	0	105	0	210	0	433	7	0	441	93%	3
Overwintering habitat	6,783	0	0	0	0	20	0	0	0	0	0	0	0	13	22	219	0	3	0	329	0	298	0	905	5	343	1,235	87%	5
Total	**77,056**	**0**	**0**	**0**	**0**	**34**	**0**	**0**	**0**	**0**	**0**	**2**	**6**	**27**	**52**	**322**	**0**	**6**	**0**	**511**	**0**	**610**	**0**	**1,584**	**42**	**343**	**1,966**	**98%**	**9**
Drainage miles	1,083																							20	37	0	57	95%	0
Swainson's hawk																													
Nesting habitat	15,673	0	0	0	0	4	2	6	0	0	1	12	5	23	7	24	0	0	0	36	32	361	66	580	71	0	651	94%	0
Natural foraging habitat	79,336	0	0	10	0	144	3	7	0	0	7	89	0	31	0	27	5	10	0	52	53	0	152	589	15	803	1,407	99%	22
Cultivated lands foraging habitat	214,078	0	0	6	0	1,396	25	391	0	0	447	1,893	173	24	255	304	0	34	0	1,400	582	1,810	358	9,099	65	236	9,399	96%	202
Total	**309,087**	**0**	**0**	**16**	**0**	**1,561**	**36**	**428**	**0**	**1**	**461**	**2,043**	**197**	**169**	**292**	**451**	**5**	**45**	**0**	**1,488**	**667**	**2,171**	**576**	**10,268**	**151**	**1,039**	**11,457**	**97%**	**224**
Nest trees	534	0	0	0	0	1	0	1	0	0	0	7	0	1	2	0	0	0	0	4	5	13	0	34[a]	3	37[a]	37[a]	93%	0

		Permanent Loss from Covered Activities with a Spatially Defined Footprint by Planning Unit (acres)[f]																											
Covered Species	**Existing Acreage**	**Little Blue Ridge 1**	**North Blue Ridge 2**	**South Blue Ridge 3**	**Capay Hills 4**	**Dunnigan Hills 5[f]**	**Upper Cache Creek 6**	**Lower Cache Creek 7**	**Upper Putah Creek 8**	**Lowr Putah Creek 9**	**Hungry Hollow Basin 10**	**Willow Slough Basin 11**	**Colusa Basin 12**	**Colusa Basin Plains 13[f]**	**North Yolo Basin 14**	**South Yolo Basin 15**	**Yolo Basin Plains 16**	**North Yolo Bypass 17**	**Woodland 18**	**Davis 19**	**West Sacramento 20**	**Winters 21**	**Valley Landscape Unit 22**	**Total Perm. Loss in PUs**	**O&M Perm. Loss**	**Restoration**	**Total Perm. Loss**	**% Remaining**	**Total Temp. Loss**
White-tailed kite																													
Nesting habitat	31,732	0	0	0	0	4	2	6	0	0	1	12	5	23	7	24	0	0	0	36	36	361	66	585	76	0	661	98%	0
Primary foraging habitat	101,758	0	11	10	0	221	10	89	0	0	80	492	40	28	0	197	5	10	0	481	179	279	216	2,347	26	236	2,609	98%	29
Secondary foraging habitat	134,740	0	0	6	0	843	18	316	0	0	378	1,480	135	32	256	135	0	34	0	1,209	400	1,584	300	7,125	41	803	7,969	95%	205
Total	**268,230**	**0**	**11**	**16**	**0**	**1,068**	**30**	**411**	**0**	**0**	**459**	**1,984**	**180**	**83**	**263**	**356**	**5**	**44**	**0**	**1,726**	**615**	**2,224**	**582**	**10,057**	**103**	**1,039**	**11,239**	**96%**	**234**
Western yellow-billed cuckoo																													
Nesting/foraging habitat	3,868	0	0	0	0	0	0	7	0	0	0	3	0	0	13	33	0	0	0	0	0	0	0	56	4	0	59	98%	0
Western burrowing owl																													
Primary habitat	37,694	0	0	0	0	147	0	13	0	0	8	158	0	26	0	28	5	10	0	52	55	0	110	612	13	236	861	98%	1
Other habitat	66,160	0	0	0	0	175	0	91	0	0	80	488	47	6	0	177	0	0	0	139	131	65	69	1,467	41	803	2,311	98%	218
Total	**103,854**	**0**	**0**	**0**	**0**	**322**	**0**	**104**	**0**	**0**	**88**	**646**	**47**	**32**	**0**	**205**	**5**	**10**	**0**	**192**	**186**	**65**	**178**	**2,079**	**54**	**1,039**	**3,172**	**98%**	**219**
Least Bell's vireo																													
Nesting/foraging habitat	4,719	0	0	0	0	0	0	11	0	0	0	0	7	0	17	0	0	1	0	0	0	0	0	36	3	0	39	98%	0
Bank swallow																													
Nesting habitat	962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	0	37	100%	0
Tricolored blackbird																													
Nesting habitat	4,680	0	0	0	0	1	0	0	0	0	0	0	0	0	0	35	0	1	0	0	0	48	0	84	2	0	86	98%	0
Foraging habitat	261,133	0	11	16	10	1,219	24	154	0	0	193	1,385	41	46	212	255	5	29	0	1,391	408	1,996	439	7,832	80	1,030	8,942	97%	230
Total	**265,813**	**0**	**11**	**16**	**10**	**1,220**	**24**	**154**	**0**	**0**	**193**	**1,385**	**41**	**46**	**212**	**290**	**5**	**30**	**0**	**1,391**	**408**	**2,044**	**39**	**7,917**	**81**	**1,030**	**9,028**	**98%**	**230**
Palmate-bracted bird's beak																													
Habitat	312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	4	98%	0

Note

[a] Although the covered activities footprint overlaps with 37 Swainson's hawk nest trees, only 20 may be taken under the Permits. No more than the amount of nest trees specified herein for each Planning Unit may be taken, with the total not to exceed 20 nest trees.

[b] The Public Draft HCP/NCCP included the projected impacts of the Dunnigan Specific Plan within Planning Units 5 and 13. Since then, Yolo County has removed the Dunnigan Specific Plan from the County General Plan to allow for more incremental development of the Plan Area. While the Dunnigan Specific Plan is no longer a covered activity, the area remains a possible location for future development in Yolo County within the 50-year permit term because of its proximity to I-5 and the existing Dunnigan community, and its location outside of the floodplain, among other reasons. The Final HCP/NCCP maintains the location and amount of impact in the analysis in the event similar development is approved in the future.

[c] This table quantifies habitat directly removed as a result of covered activities, and does not include indirect effects such as habitat fragmentation, or other forms of take. Table 5-2(b) quantifies all take authorized under the Yolo HCP/NCCP, including habitat fragmentation (55 acres of upland habitat for California tiger salamander, 569 acres of upland habitat for western pond turtle, and 69 acres of upland habitat for giant garter snake).

[d] Nine acres of temporary effects on riparian habitat are treated as permanent.

[f] Discrepancies in totals for all planning units are due to rounding differences in the data.

Table 5-6. Covered Species Benefits and Net Effects[f]

Covered Species	Existing Condition				Effect of HCP/NCCP Implementation				Outcome for Plan Area with HCP/NCCP Implementation			
	(A) Total Extent in Plan Area (acres)	(B) Existing Category 1 Public and Easement Lands (Protected Lands: acres)	(C) Existing Protected Category 2 Public and Easement Lands (acres)	(D) Total Existing Category 1 and 2 Public and Easement Lands (acres) B+C	(E) Permanent Loss (acres)	(F) Newly[f] Protected (acres)	(G) Restored (acres – assuming max. allowable loss)	(H) Pre-permit Reserve Lands (acres)[a]	(I) % Net Change (G-E)/A	(J) Total Category 1 and 2 Public and Easement Lands in Plan Area (acres, including restored) D+F+G	(K) Percent of Plan Area in Category 1 and 2 Public and Easement Lands J/(A-E)	(L) Total Reserve System (acres, HCP/NCCP monitored and adaptively managed) F+G+H
Valley elderberry longhorn beetle												
Riparian habitat	9,447	423	1,165	1,588	523	1,600	576	10	Less than 1%	3,764	42%	2,186
Non-riparian habitat	3,932	284	208	492	61	0	0	120	-2%	492	13%	120
Total	**13,379**	**707**	**1,373**	**2,080**	**584**	**1,600**	**576**	**130**	**Less than 1%**	**4,256**	**33%**	**2,306**
California tiger salamander												
Aquatic breeding habitat	1,004	26	543	569	12	36	36	27	+2%	640	66%	99
Upland habitat	86,505	4,214	3,682	7,896	398	2,000	0	340	Less than 1%	9,896	11%	2,340
Total	**87,509**	**4,240**	**4,225**	**8,465**	**410**	**2,036**	**36**	**367**	**Less than 1%**	**10,536**	**12%**	**2,439**
Ponds - seasonal in aquatic breeding habitat (no. of ponds)	434	16	120	136	3	36	36	unknown	Less than 1%	208	48%	72+[b]
Western pond turtle												
Aquatic habitat	53,907	4,837	3,957	8,794	369	2,400	369	2,098	0%	11,543	22%	4,867
Nesting and overwintering habitat	137,185	14,460	20,691	35,151	3,133	3,475	0	978	-2%	38,626	29%	4,453
Total	**191,092**	**19,297**	**24,648**	**43,945**	**3,502**	**5,875**	**369**	**3,076**	**-2%**	**50,189**	**27%**	**9,320**
Giant garter snake												
Rice habitat	31,168	3,475	1,728	5,203	87	2,800	0	1,775	Less than 1%	8,003	26%	4,575
Aquatic habitat	6,596	574	551	1,125	109	420	109	140	0.0	1,654	25%	669
Freshwater emergent habitat	25,897	5,359	9,541	14,900	76	500	76	750	0.0	15,497	60%	1,326
Active season upland movement	6,612	628	1,285	1,913	441	1,160	0	130	-7%	3,073	50%	1,290
Overwintering habitat	6,783	409	1,524	1,933	1,235	2,315	0	115	-18%	4,248	77%	2,430
Total	**77,056**	**10,445**	**14,629**	**25,074**	**1,966**	**7,195**	**185**	**2,910**	**-2%**	**32,454**	**43%**	**10,290**
Swainson's hawk												
Nesting habitat	15,673	600	1,366	1,966	651	1,600	651	215	0%	4,217	28%	2,766
Natural foraging habitat	79,336	7,071	7,830	14,901	1,407	4,430	0	980	-2%	19,331	25%	5,365
Cultivated lands foraging habitat	214,078	6,387	1,821	8,208	9,399	14,362	0	3,600	-4%	22,570	11%	17,962
Total	**309,087**	**14,058**	**11,017**	**25,075**	**11,457**	**20,392**	**651**	**4,795**	**-3%**	**46,311**	**16%**	**26,031**
Nest trees	534	12	26	38	20	20		unknown	-4%	72	14%	20+
White-tailed kite												
Nesting habitat	31,732	3,214	1,449	4,663	661	1,600[c]	965	215	0%	7,228	23%	2,780
Foraging Habitat	236,498	9,848	5,581	15,429	10,578	18,792	0	3,330	-4%	34,221	15%	22,122
Total	**268,230**	**13,062**	**7,030**	**20,092**	**11,239**	**20,392**	**965**	**3,545**	**-4%**	**41,449**	**16%**	**23,902**
Western yellow-billed cuckoo												
Nesting/foraging habitat	3,868	350	812	1,162	59	500	60	135	0%	1,722	45%	695

Covered Species	Existing Condition				Effect of HCP/NCCP Implementation				Outcome for Plan Area with HCP/NCCP Implementation			
	(A) Total Extent in Plan Area (acres)	(B) Existing Category 1 Public and Easement Lands (Protected Lands: acres)	(C) Existing Protected Category 2 Public and Easement Lands (acres)	(D) Total Existing Category 1 and 2 Public and Easement Lands (acres) B+C	(E) Permanent Loss (acres)	(F) Newly[f] Protected (acres)	(G) Restored (acres – assuming max. allowable loss)	(H) Pre-permit Reserve Lands (acres)[a]	(I) % Net Change (G-E)/A	(J) Total Category 1 and 2 Public and Easement Lands in Plan Area (acres, including restored) D+F+G	(K) Percent of Plan Area in Category 1 and 2 Public and Easement Lands J/(A-E)	(L) Total Reserve System (acres, HCP/NCCP monitored and adaptively managed) F+G+H
Western burrowing owl												
Primary habitat	37,694	818	2,490	3,308	861	3,000	0	330	-2%	6,308	17%	3,330
Other habitat	66,160	1,351	1,546	2,897	2,311	2,500	0	770	-3%	5,397	8%	2,270
Total	**103,854**	**2,169**	**4,036**	**6,205**	**3,172[d]**	**5,500[d]**	**0**	**1,100[d]**	**-3%[d]**	**11,705**	**12%**	**6,600**
Least Bell's vireo												
Nesting/foraging habitat	4,719	359	925	1,284	39	600	608	110	+12%	2,492	53%	1,318
Bank swallow												
Nesting habitat	962	0	6	6	37	50	0	0	-4%	55	6%	50
Tricolored blackbird												
Nesting habitat	4,680	730	1,244	1,964	86	200	86	150	Less than 1%	2,260	49%	436
Foraging habitat	261,133	11,616	6,303	17,919	8,942	16,610	0.0	4,000	-3%	34,529	14%	20,610
Total	**265,813**	**12,346**	**7,547**	**19,893**	**9,028**	**16,810**	**86**	**4,150**	**-3%**	**36,789**	**14%**	**21,046**
Palmate-bracted bird's beak												
Habitat	312	141	0	141	4	33	0	141	1%	174	56%	174

[a] These acreages are estimated based on modeled habitat on baseline public and easement lands the Conservancy is most likely to enroll as pre-permit reserve lands.

[b] Number of ponds in pre-permit reserve lands are not currently known. There will be an estimated 28 ponds in the reserve system excluding pre-permit reserve lands, and there are expected to be more ponds include pre-permit reserve lands.

[c] To include at least two protected white-tailed kite nest trees.

[d] Within the affected western burrowing owl habitat, covered activities will displace no more than four occupied sites. Within the protected burrowing owl habitat, the Conservancy will protect at least two active burrowing owl nest sites, and will additionally protect two active nest sites for each nesting pair displaced, and one active nesting site or single owl site for each non-breeding single owl displaced by covered activities. See Section 6.3.4.9, *Western Burrowing Owl*, for more detail.

[e] The 112 acres of temporary effects on western pond turtle upland habitat include 40 acres of riparian natural community and 37 acres of barren that are not included in Table 5-1, *Maximum Allowable Loss, Natural Communities.* This is because the barren land cover type is not considered a natural community, and because temporary impacts to the riparian natural community are treated as permanent impacts on the natural community (due to the time it takes for riparian vegetation to recover). Components necessary to provide western pond turtle uplands would recover within one year, therefore the impact is treated as temporary for western pond turtle.

[f] This table addresses habitat protection and restoration, and does not address additional protection of covered species nest sites, breeding colonies, and other occupied areas as identified in Chapter 6, Table 6-2(c), Covered Species Occupancy Commitments.

5.7.2 Valley Elderberry Longhorn Beetle

The Plan Area includes 13,379 acres of modeled habitat for valley elderberry longhorn beetle, with 9,447 acres of riparian and 3,932 acres of nonriparian habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). The habitat model for valley elderberry longhorn beetle includes all land cover types in the valley foothill riparian natural community (riparian habitat) and all potentially suitable areas (described in Appendix A, *Covered Species Accounts*) within 250 feet of modeled riparian habitat (nonriparian habitat). Historically, valley elderberry longhorn beetle habitat included valley oak woodland which were more widespread than riparian habitat, but the current habitat distribution consists of these riparian corridors and adjacent lands. The model overestimates the actual amount of potentially occupied valley elderberry longhorn beetle habitat in the Plan Area, because only those riparian areas supporting elderberry shrubs are capable of supporting the species, and beetles are only expected to occupy a small proportion of those shrubs at any given time.

Occupied valley elderberry longhorn beetle habitat has been documented in numerous locations throughout the Sacramento River corridor (Eya 1976; Jones & Stokes 1985, 1986, 1987a, 1987b; U.S. Fish and Wildlife Service 1984; Barr 1991; Collinge et al. 2001) as well as along Putah Creek from Monticello Dam east to Davis (Eya 1976; U.S. Fish and Wildlife Service 1984; Barr 1991; Collinge et al. 2001) and along Cache Creek (Barr 1991). The population size and locations of this species in the Plan Area are not fully known, however, because the few surveys for the species in Yolo County have not been comprehensive; known occurrences throughout the species' range are based mostly on incidental observations (e.g., CNDDB). The distribution of elderberry shrubs in modeled habitat in the Plan Area cannot be determined at this time but will be determined during planning-level surveys (Table 4-1, *Avoidance and Minimization Measures for Sensitive Natural Communities and Covered Species*).

5.7.2.1 Adverse Effects

5.7.2.1.1 Habitat Loss and Fragmentation

Habitat loss is one of the greatest threats to valley elderberry longhorn beetle (Talley et al. 2006). Covered activities will remove up to 523 acres (five percent) of valley elderberry longhorn beetle riparian habitat in the Plan Area and up to 61 acres (two percent) of valley elderberry longhorn beetle nonriparian habitat in the Plan Area (Table 5-2, *Habitat-Based Take Limits, by Covered Species*).[11] Bridge construction activities will result in temporary loss of up to one acre of non-riparian valley elderberry longhorn beetle habitat (Table 5-5, *Covered Species Habitat Loss*).

This section reports riparian and nonriparian habitat loss separately, because riparian habitat likely has higher value for the valley elderberry longhorn beetle, even though historically the species' habitat was widespread in valley oak woodlands extending far beyond riparian areas. The greatest expected habitat losses resulting from covered activities are in the West Sacramento planning unit and South Yolo Basin planning unit (planning units 21 and 15). Approximately 64 percent of the riparian (329 acres) and 52 percent of the nonriparian (32acres) habitat loss is expected to occur in

[11] The accounting of loss of modeled species habitat is based on estimates of development throughout the permit term. Actual loss by habitat type is likely to vary from these estimates. Loss of species habitat is limited by the Permits to the total amounts listed in Table 5-2(a), not by covered activity type.

the West Sacramento planning unit as a result of urban development and levee improvements. Approximately 23 percent of riparian (119 acres) and 34 percent of nonriparian (21 acres) habitat loss is expected to occur in the South Yolo Basin planning unit, much of which will result from development within the unincorporated community of Clarksburg. Operations and maintenance are expected to permanently remove an estimated 13 acres of riparian habitat and one acre of nonriparian habitat.

Although the distribution of valley elderberry longhorn beetle in modeled habitat in the Plan Area is not well known, numerous occurrences of this species have been recorded in the Lower Cache Creek and West Sacramento planning units (Eya 1976; Jones & Stokes 1985, 1986, 1987a, 1987b; U.S. Fish and Wildlife Service 1984; Barr 1991; Collinge et al. 2001; California Department of Fish and Game 2000), where a majority of the habitat loss will occur. Projects will be designed to avoid elderberry shrubs, if feasible. Unavoidable elderberry shrubs will be transplanted consistent with USFWS guidelines (Table 4-1, *Avoidance and Minimization Measures for Sensitive Natural Communities and Covered Species*).

Conservation actions will be designed to avoid removal of elderberry shrubs. Therefore, no removal of any elderberry shrubs is expected from conservation actions.

Habitat fragmentation is a known threat to valley elderberry longhorn beetle. Colonization of isolated sites or drainages is constrained by the limited ability of the species to disperse to these areas from occupied sites (Collinge et al. 2001). Development activities in the West Sacramento planning unit could fragment habitat where valley elderberry longhorn beetle is known to occur. Cache Creek Resources Management Plan activities are not expected to fragment valley elderberry longhorn beetle habitat, because the riparian corridors will remain intact, and the Cache Creek Resources Management Plan has restored and enhanced and will continue to restore and enhance riparian areas to provide continuous stretches of this natural community. Avoidance requirements for valley foothill riparian natural community and elderberry shrubs (Table 4-1, *Avoidance and Minimization Measures for Sensitive Natural Communities and Covered Species*) are expected to minimize the potential for valley elderberry longhorn beetle habitat fragmentation.

5.7.2.1.2 Reduction in Habitat Function

Covered activities could result in reduction in valley elderberry longhorn beetle habitat function in the following ways.

Dust. Temporary ground disturbances and permanent long-term activities (e.g., use of dirt trails in reserves and parks covered in the HCP/NCCP) could generate dust that could adversely affect adjacent valley elderberry longhorn beetle habitat. Dust is listed in the valley elderberry longhorn beetle recovery plan as a threat to the species (U.S. Fish and Wildlife Service 1984); however, one study indicates that dust deposition was not correlated with valley elderberry longhorn beetle presence (Talley et al. 2006), although dust was weakly correlated with elderberry stress symptoms (water stress, dead stems, smaller leaves). During times of drought, when elderberry shrubs are under stress, dust deposition could further stress the shrubs, potentially leading to their death. This loss of shrubs would adversely affect valley elderberry longhorn beetle (Talley and Hollyoak 2009).

Exhaust. Exhaust from construction and maintenance vehicles associated with covered activities may result in increases in particulates, heavy metals, and mineral nutrients that could influence the quality and quantity of elderberry shrubs and thereby affect beetle presence and abundance. The

results of a study by Talley and Hollyoak (2009) showed no relationship, however, between the distance of the shrubs from highways and the presence and abundance of the beetle.

Noise, Vibrations, and Lighting. Temporary noise, vibrations, and lighting from construction, operations and maintenance activities, and restoration and enhancement activities, and permanent noise, vibrations, and lighting from urban and rural development could adversely affect valley elderberry longhorn beetle. The effects of lighting on valley elderberry longhorn beetle are unknown, although insects are known to be subject to heavy predation when they are attracted to night lighting (Rich and Longcore 2006).

Argentine Ant. Permanent urban and rural development could result in introduction of the invasive Argentine ant (*Linepithema humile*) and spread into nearby valley elderberry longhorn beetle habitat. These ants spread rapidly in urbanized areas because of the increased availability of water in landscaped yards, and they spread from urbanized areas into nearby riparian vegetation. The Argentine ant poses a significant threat to valley elderberry longhorn beetle (Huxel et al. 2003; Talley et al. 2006). The ant enters the exit hole that the beetle makes prior to pupation and preys on the larva (Huxel et al. 2003). The invasion of riparian systems by the Argentine ant has continued to spread, and the species has affected valley elderberry longhorn beetle populations along Putah Creek in Yolo County (Huxel 2000).

Project proponents will minimize effects related to reduction in habitat function in areas surrounding covered activities through establishment of 100-foot buffers around shrubs (Table 4-1, *Avoidance and Minimization Measures for Sensitive Natural Communities and Covered Species*).

These effects may also occur as a result of ongoing agricultural practices on reserve system lands. Farmers will not remove elderberry shrubs from reserve system lands unless shrubs establish in areas where they will interfere with the economic use of the property, and they will maintain a 100-foot buffer around elderberry shrubs on these lands where possible, as described in Section 4.3.5.1, *Valley Elderberry Longhorn Beetle.* There may be cases, however, where maintaining such a buffer would interfere with agricultural practices (e.g., if existing access road or existing cultivated lands are within 100 feet of a shrub). This would be an ongoing effect and would not be expected to reduce habitat value below baseline conditions.

5.7.2.1.3 Harassment, Injury, or Mortality

Operation of equipment and vehicles to implement covered activities (e.g., construction of urban and rural development, operations and maintenance activities, and conservation actions) could result in removal of elderberry shrubs and mortality of valley elderberry longhorn beetle. Individual shrubs and beetles could be removed or crushed by moving construction-related equipment or suffer mortality from the accidental discharge of contaminants associated with equipment operation near shrubs. These effects will be minimized through implementation of measures to identify and avoid habitat for the valley elderberry longhorn beetle, and to transplant elderberry shrubs, consistent with the HCP/NCCP avoidance and minimization measures (*AMM12, Minimize Take and Adverse Effects on Habitat of Valley Elderberry Longhorn Beetle*; Table 4-1, *Avoidance and Minimization Measures for Sensitive Natural Communities and Covered Species*).

5.7.2.1.4 Impact of Take on the Species

The valley elderberry longhorn beetle occurs throughout the Central Valley. There are 201 extant CNDDB occurrences of valley elderberry longhorn beetle in California, 18 of which (nine percent range-wide) are in the Plan Area (Appendix A, *Covered Species Accounts*).

The Plan Area supports an estimated 13,379 acres of modeled valley elderberry longhorn beetle habitat (habitat that has potential to support the species' host plant), including 9,447 acres of riparian habitat and 3,932 acres of nonriparian habitat. Of this, covered activities will permanently remove up to 576 acres (four percent) of habitat, including 523 acres (four percent) of riparian habitat and 61 acres (less than one percent) of nonriparian habitat. Since modeled habitat does not necessarily support the species' host plant, which is required for occupancy, the loss of modeled habitat as described above overestimates the actual extent of habitat loss for this species. As the habitat model for this species overestimates the area that is actually suitable for this species habitat loss is also overestimated. Valley elderberry longhorn beetle populations are known to be present in the Lower Cache Creek and West Sacramento planning units, however, where most of the habitat loss is expected to occur. Take resulting from habitat loss and other adverse effects, described above, is not expected to result in an adverse impact on the long-term survival and recovery of the valley elderberry longhorn beetle for the following reasons.

- The Plan Area represents approximately 10 percent of the species' range-wide distribution.
- Most (65 percent) of the habitat loss is nonriparian habitat, which has lower value for valley elderberry longhorn beetle than riparian habitat.
- The amount of modeled riparian habitat that will be lost is a small fraction (three percent) of the total modeled riparian habitat in the Plan Area.
- Yolo County's implementation of the Cache Creek Resources Management Plan has resulted in the establishment of thousands of valley elderberry shrubs along the Cache Creek corridor: the Yolo HCP/NCCP will build off of this effort to provide large, contiguous patches of valley elderberry longhorn beetle habitat in this area.
- Lower Putah Creek Coordinating Committee efforts have resulted the increase of thousands of elderberry shrubs along the Putah Creek corridor. They grow elderberry plants at their nursery and establish them along the creek corridor using safe harbor agreements with USFWS. Yolo HCP/NCCP will build off of this effort to provide large, contiguous patches of valley elderberry longhorn beetle habitat in this area.
- Projects will be designed to avoid effects on elderberry shrubs, where feasible, and to transplant unavoidable shrubs to riparian areas in the reserve system and restore habitat within the reserve system.

5.7.2.2 Beneficial Effects

The Yolo HCP/NCCP will protect, restore, and enhance corridors of valley elderberry longhorn beetle riparian habitat that are spatially distributed to provide landscape-level connectivity among protected habitats (Objectives L1.3, L1.5, L1.6, NC-VFR1.1, NC-VFR1.2, NC-VFR1.3). Habitat connectivity is a critical factor for the valley elderberry longhorn beetle due to the species' poor dispersal abilities (Collinge et al. 2001). The Yolo HCP/NCCP will protect at least 1,600 acres and restore up to 576 acres of valley foothill riparian natural community in the Plan Area (Objectives NC-VFR1.1 and NC-VFR1.3; Table 5-6, *Covered Species Benefits and Net Effects*). Most of this

protection and restoration will occur in the areas with the highest concentrations of valley elderberry longhorn beetle occurrences in the Plan Area: the Lower Cache Creek planning unit and Lower Putah Creek planning unit (planning units 7 and 9).

When siting valley foothill riparian natural community protection, the Yolo HCP/NCCP will prioritize areas that support elderberry shrubs and that are connected to occupied or potentially occupied habitat (Objective VELB1.1). This will provide habitat to accommodate potential future expansion of the valley elderberry longhorn beetle population.

In addition, valley foothill riparian natural community restoration will expand the availability of suitable habitat by establishing elderberry shrubs consistent with USFWS 1999 guidelines (Objective VELB1.2). As described in the USFWS guidelines, the number of elderberry shrubs to be planted will depend on the number of elderberry stems one inch in diameter or greater removed by covered activities, and whether or not the stems removed show signs of occupancy by valley elderberry longhorn beetle (occupied stems have a higher replacement ratio than unoccupied stems). The Yolo HCP/NCCP will protect valley elderberry longhorn beetle habitat within a larger connected system of reserves to accommodate potential future shifts in its distribution in response to changed environmental conditions (e.g., effects of climate change on the future distribution of valley elderberry longhorn beetle habitat).

5.7.2.3 Net Effects

Implementation of the Yolo HCP/NCCP will result in an estimated net increase of 53 acres (576 acres restored and 523 acres lost, or less than one percent increase) of valley elderberry longhorn beetle riparian habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full HCP/NCCP implementation, 42 percent of the valley elderberry longhorn beetle habitat in the Plan Area will be conserved on Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. At least 1,600 acres of these Category 1 and 2 public and easement lands will be newly protected and incorporated into the reserve system. The Conservancy will monitor and adaptively manage all reserve system lands to sustain populations of valley elderberry longhorn beetle and their habitat (Table 5-6, *Covered Species Benefits and Net Effects*).

The habitat that will be lost as a result of covered activities is widely distributed throughout the Plan Area, and only a small fraction of it supports elderberry shrubs. While some proportion of the affected habitat likely does not support elderberry shrubs, the habitat to be restored will include elderberry shrubs and is therefore much more likely to support valley elderberry longhorn beetle than the habitat lost. Moreover, these shrubs will be planted near sites the species is known to occupy. Restoring suitable habitat near occupied areas is necessary to expand populations of valley elderberry longhorn beetle because of the species' poor dispersal ability. Additionally, shrubs that are removed will be transplanted to restoration sites, many of which will continue to provide suitable habitat for the species despite being counted as lost habitat. Therefore, although there is only a small net gain in habitat amount (53 acres), the net gain to the population is expected to be substantial because transplanting will minimize losses, and restoration will provide the highest-value habitat most likely to be colonized by the species. These measures are expected to offset any population effects resulting from covered activities and to facilitate expansion of valley elderberry longhorn beetle populations in the Plan Area.

Overall, the Yolo HCP/NCCP will provide a substantial net benefit to the valley elderberry longhorn beetle through the increase in available habitat adjacent to known occupied habitat. These restored areas will be protected, and will be managed and monitored to support the species. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on valley elderberry longhorn beetle, to the maximum extent practicable, and will provide for the conservation of this species in the Plan Area.

5.7.3 California Tiger Salamander

The Plan Area includes 87,509 acres of modeled habitat for California tiger salamander, with 1,004 acres of aquatic breeding habitat and 86,505 acres of upland habitat (Table 5-2*, Habitat-Based Take Limits, by Covered Species*). The modeled aquatic breeding habitat consists of all mapped vernal pools, alkali prairies, and ponds (except those known to be perennial[12]) that occur below an elevation of 1,509 feet. The modeled upland habitat consists of all potentially suitable upland land cover types such as grassland and oak woodland (Appendix A, *Covered Species Accounts*) within 1.3 miles of modeled aquatic habitat and below an elevation of 1,509 feet. The North Yolo Basin, South Yolo Basin, and West Sacramento planning units (planning units 14, 15, and 21) were excluded from the model because they are isolated from occupied habitat and unlikely to be occupied in the future due to limited available suitable habitat and substantial movement barriers. Upland habitat in the Yolo Bypass is suitable dispersal habitat but is considered to be generally unsuitable as aestivation habitat because of frequent flooding.

Known occurrences of California tiger salamander in the Plan Area include one occurrence near the southern end of the Capay Hills planning unit (planning unit 4), one occurrence at the western edge of the Colusa Basin Plains planning unit (planning unit 13), and four occurrences at the northern end of the Dunnigan Hills planning unit (planning unit 5).

5.7.3.1 Adverse Effects

5.7.3.1.1 Habitat Loss and Fragmentation

Habitat loss and fragmentation are considered the most significant threat to California tiger salamander throughout its range (Twitty 1941; Hansen and Tremper 1993; Shaffer et al. 1993; Jenning and Hayes 1994; Fisher and Shaffer 1996; Launer and Fee 1996; Loredo et al. 1996; Davidson et al. 2002). Covered activities will permanently remove up to 12 acres (one percent) of California tiger salamander aquatic breeding habitat and up to 398 acres (less than one percent) of the California tiger salamander upland habitat in the Plan Area (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Operations and maintenance activities may result in additional temporary loss of up to one acre of aquatic habitat and one acre of upland habitat for California tiger salamander.

The greatest loss of habitat is expected to occur in the Dunnigan Hills area. Unincorporated community development in the Dunnigan Hills and Colusa Basin Plains planning units (planning units 5 and 13) within the Dunnigan growth boundary will result in an estimated 11 acres of aquatic habitat loss and 336 acres of upland habitat loss. These amounts make up approximately 92 percent of the total aquatic habitat loss and 96 percent of the total upland habitat loss anticipated to occur due to covered activities. The majority of California tiger salamander occurrences in the Plan Area

[12] Perennial ponds are not included as habitat as they may harbor invasive species that exclude California tiger salamander.

(five out of six) were recorded in these planning units. While covered activities will not remove any of these current occurrences, rural development within the Dunnigan growth boundary will occur in the location of an extirpated occurrence. There is also a known occurrence in the vicinity of the Capay Hills planning unit (planning unit 4), where an estimated five percent (10 acres) of the upland habitat loss will occur.

Conservation actions could result in the conversion of up to 10 acres of California tiger salamander upland habitat (e.g., grassland) to aquatic habitat to meet no net loss of aquatic California tiger salamander aquatic habitat in the Plan Area.

Ascent Environmental assessed the effects of fragmentation that would potentially result from California tiger salamander breeding habitat being removed from surrounding upland habitat (Appendix O, *Fragmentation Effects*). They identified upland habitat within 1.2 miles of the 12 acres of aquatic habitat that will be removed. They deducted the upland habitat acreage that would be directly removed by covered activities. Of the habitat that would remain after loss resulting from covered activities, they identified areas that would remain within 1.2 miles of another source of aquatic habitat. They estimated that with the removal of 12 acres of aquatic habitat, there would no longer be aquatic habitat within 1.2 miles of approximately 55 acres of upland habitat.

5.7.3.1.2 Reduction in Habitat Function

Covered activities in the vicinity of California tiger salamander habitat may reduce the function of the habitat for this species. Construction and operations and maintenance activities will have a temporary effect, while the ongoing disturbance resulting from occupation of developed areas will have a permanent effect. The following factors may reduce California tiger salamander habitat functions.

Noise, human activity, and vibrations. Noise, human activity, and vibrations associated with construction and maintenance-related operation of equipment and with ongoing occupation of developed areas could cause California tiger salamander to avoid the affected habitat thereby reducing the function of the habitat. Additionally, lighting could affect the nocturnal activity patterns of California tiger salamander. These effects are not cited as stressors on the species, however, and the effects of these mechanisms on California tiger salamander are unknown.

Introduction of nonnative wildlife. One of the primary threats to California tiger salamander is the introduction of nonnative wildlife into its habitat (Fisher and Shaffer 1996). The increase in human populations in development near California tiger salamander habitat will increase opportunities for introduction of these nonnative species. Mosquitofish (*Gambusia affinis*) are often introduced into ponds by vector control agencies to eliminate mosquitos near areas populated by humans. There is evidence that mosquitofish prey directly on California tiger salamander larvae (Leyse and Lawler 2001). Fish that are introduced inadvertently or for recreational fishing, such as bass, green sunfish, carp, fathead minnow, and bullhead, may compete with California tiger salamanders for food, and prey on the larvae (Shaffer et al. 1993). Introduced bullfrogs are a known stressor that in some cases eliminates California tiger salamanders from ponds; bullfrogs also compete for food and prey on the larvae (Shaffer et al. 1993).

Domestic dogs and cats. Domestic dogs and cats that accompany unincorporated community development in the rural community growth boundaries may reduce the function of California tiger salamander habitat (Cook and Northen 2001 in Center for Biological Diversity 2001). Dogs can dig

up rodent burrows being used by aestivating California tiger salamanders. Both dogs and cats hunt rodents that create burrows for California tiger salamanders.

Pesticides and herbicides. Pesticides and herbicides may enter California tiger salamander habitat from adjacent covered operations and maintenance activities, or from nearby urban or rural development. Pesticides and herbicides may adversely affect California tiger salamander habitat (U.S. Fish and Wildlife Service 2000b). Pesticide and herbicide use, however, is not a covered activity under the Yolo HCP/NCCP.

Hydrologic alterations. The increase in impermeable surfaces and other hydrologic alteration resulting from urban and rural development could cause increased runoff into nearby habitat areas and sedimentation. Increased sedimentation can degrade California tiger salamander habitat by filling pools and reducing the salamanders' ability to detect aquatic food items (U.S. Fish and Wildlife Service 2000b).

Urban runoff. Occupancy of new developments could increase the amount of pollutants such as grease, oil, detergents, and lawn pesticides transported from residences into aquatic habitat during wet weather. Traffic along new roads and higher traffic volumes on widened roads could also increase the amount of petroleum-based pollutants (e.g., oil) transported from road surfaces to aquatic habitats during wet weather. These pollutants can affect California tiger salamander prey populations. Pollutants that potentially injure or kill California tiger salamanders are described in Section 5.7.3.1.3, *Harassment, Injury, or Mortality*.

Rodent control. Measures to control California ground squirrel and pocket gopher could reduce the availability of upland burrows for use by California tiger salamanders (Loredo-Prendeville et al. 1994). Rodententicides will not be an allowed use in the reserve system for natural (non-cultivated) lands. Use of rodenticides is not a covered activity under the Yolo HCP/NCCP.

Fire break maintenance. Management of some reserves may require establishment and maintenance of new fire breaks. Maintenance of fire breaks (i.e., mowing, crushing) is primarily expected to retain the existing land cover (e.g., grassland); mowing of fire breaks during the dry season, however, could alter the vegetation structure. Although this would not eliminate California tiger salamander habitat, it could reduce its function of providing cover. On the other hand, tall vegetation can impede California tiger salamander movement, and mowing could therefore improve upland dispersal habitat for this species. Although conservation actions could result in short-term reduction in California tiger salamander habitat function, they will provide for long-term enhancement of habitat function.

Implementation of *AMM13, Minimize Take and Adverse Effects on California Tiger Salamander,* will minimize the reduction in habitat function as a result of covered activities.

5.7.3.1.3 Harassment, Injury, or Mortality

Equipment and vehicles operated to implement covered activities (e.g., construction of urban and rural development, operations and maintenance activities, and conservation actions) could crush or strike individual California tiger salamanders, resulting in injury or mortality. Outside of the breeding season, California tiger salamanders typically aestivate in rodent burrows; consequently, the likelihood of construction equipment or vehicles crushing or striking individuals is low during this period. With the exception of the Dunnigan Specific Plan Area (Figure 3-1, *General Plan Land Use in the Plan Area*), which is located adjacent to known occupied California tiger salamander habitat in

the Capay Hills planning unit, the covered activities will be implemented in areas that are not currently known to be occupied by California tiger salamander. Therefore, the likelihood for injury or mortality of individuals is considered to be low.

Over the long-term, traffic associated with new developments and operations and maintenance activities could injure or crush salamanders present on road surfaces. In addition, predation caused by increased numbers of nonnative species associated with occupancy of new permanent developments could result in harassment, injury, or mortality of the species.

Accidental introduction of contaminants associated with construction, operations, and maintenance activities (e.g., fuel spills) into aquatic habitats could result in harassment, injury, or mortality of individual eggs, larvae, juvenile, and adult California tiger salamander through changes in aquatic habitat structure and conditions. Oil and hydrocarbon contaminants in runoff have been detected in ponds adjacent to roads and were linked to die-offs of and deformities in California tiger salamanders (U.S. Fish and Wildlife Service 2000b).

Implementation of *AMM13, Minimize Take and Adverse Effects on California Tiger Salamander,* will minimize the harassment, injury, or mortality of California tiger salamander as a result of covered activities.

California tiger salamanders may disperse onto cultivated lands on the reserve system from nearby habitat. To minimize harassing, injuring, or killing salamanders as a result of normal agricultural practices on these lands, the Conservancy will avoid acquisition of California tiger salamander reserve lands within 1.3 miles (California tiger salamander dispersal distance) of cultivated lands acquired for the reserve system unless pre-approved by the wildlife agencies (Section 6.4.1.8.4, *California Tiger Salamander.*

5.7.3.1.4 Impact of Take on the Species

In the Central Valley and surrounding Sierra Nevada foothills, the California tiger salamander occurs from northern Yolo County southward to northwestern Kern County and northern Tulare and Kings Counties. Along the coastal regions of California, the species occurs from southern San Mateo County south to San Luis Obispo County, with isolated populations in Sonoma and northwestern Santa Barbara Counties. Throughout California, 1,003 California tiger salamander occurrences have been documented, six of which (less than one percent range-wide) are in the Plan Area (Appendix A, *Covered Species Accounts*).

The Plan Area supports an estimated 87,509 acres of modeled California tiger salamander habitat, including 1,004 acres of aquatic habitat and 86,505 acres of upland habitat. Of this, covered activities will permanently remove up to 398 acres of upland dispersal and aestivation habitat and up to 12 acres of aquatic breeding habitat (Table 5-5, *Covered Species Habitat Loss*). Take resulting from this habitat loss and other adverse effects, described above, is not expected to result in an adverse impact on the species' long-term conservation in the Plan Area for the following reasons.

- The Plan Area includes less than one percent of the range-wide number of occurrences of this species.
- Covered activities will remove a small proportion (less than one percent) of the modeled habitat in the Plan Area and will not remove any critical habitat (for critical habitat analysis, see Section 5.9, *Critical Habitat*).

- Indirect and fragmentation effects are expected to be minimal because the covered activities potentially affecting habitat are primarily at the edges of large habitat blocks.

5.7.3.2 Beneficial Effects

The Yolo HCP/NCCP will protect 4,430 acres of grassland natural community (Objective NC-AG1.1), at least 2,000 acres of which will be sited in California tiger salamander modeled upland habitat in the Dunnigan Hills planning unit (Objective NC-AG1.2) (Table 5-6, *Covered Species Benefits and Net Effects*). The Yolo HCP/NCCP will also protect at least 36 acres of aquatic California tiger salamander habitat in association with the 2,000 acres of protected upland habitat (Objective CTS1.2; Table 5-6, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will restore (or create, if restoration opportunities are limited) at least one acre of aquatic habitat for each acre lost, and an additional 24 acres of aquatic habitat independent of effect, for a total of 36 acres of aquatic restoration if all loss occurs. The Yolo HCP/NCCP will conserve at least five breeding pools supporting California tiger salamander. The Yolo HCP/NCCP will manage and enhance the functions of the protected and restored habitat by maintaining or increasing the abundance of native burrowing rodents that provide burrow habitat for California tiger salamander (Objective CTS1.4) and by controlling nonnative predator populations (CTS1.4). Achievement of these objectives will substantially benefit the California tiger salamander by providing a large, interconnected reserve system that is managed and enhanced to sustain this species in the Plan Area.

5.7.3.3 Net Effects

With full HCP/NCCP implementation, 66 percent of the aquatic habitat and 11 percent of the upland habitat in the Plan Area will be conserved in Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of all the Category 1 and 2 public and easement lands, at least 36 acres of aquatic habitat and 2,000 acres of upland habitat will consist of newly protected lands. All lands in the reserve system supporting California tiger salamander habitat will be monitored and adaptively managed to sustain habitat values for this species. Full implementation of the Yolo HCP/NCCP will result in a net two percent increase of California tiger salamander aquatic habitat and less than a one percent net decrease in upland habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*).

Overall, the Yolo HCP/NCCP will provide a substantial net benefit to the California tiger salamander through the assembly of a reserve system and conservation that is managed and monitored to support the species on critical habitat consistent with the species' recovery needs. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on California tiger salamander, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.7.4 Western Pond Turtle

The Plan Area includes 191,092 acres of modeled habitat for the western pond turtle, with 53,907 acres of aquatic habitat and 137,185 acres of upland habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). The aquatic habitat includes five land cover types: water, bulrush-cattail wetland alliance, bulrush-cattail freshwater marsh super alliance, alkali bulrush-bulrush brackish marsh super alliance, and rice. The nesting and overwintering habitat includes all undeveloped upland vegetation land cover types between 1,312 and 1,630 feet from aquatic habitat (Holland 1994). Additional detail on the habitat model is provided in Appendix A, *Covered Species Accounts*.

The distribution of western pond turtles throughout suitable habitat in the Plan Area is not well known. The species has been documented in Lower Putah Creek planning unit (planning unit 9), Lower Cache Creek planning unit (planning unit 7), and in the Willow Slough Bypass in the Willow Slough Basin planning unit (planning unit 11).

5.7.4.1 Adverse Effects

5.7.4.1.1 Habitat Loss and Fragmentation

The most significant threats to the western pond turtle are the continuing loss, degradation, and fragmentation of occupied habitat (U.S. Fish and Wildlife Service 1992; Holland pers. comm.). Covered activities will result in loss of up to 3,502 acres of western pond turtle habitat, including up to 369 acres of aquatic habitat and 3,133 acres of nesting and overwintering habitat, or two percent of the total western pond turtle habitat in the Plan Area (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Additionally, up to 143 acres of western pond turtle habitat (31 acres of aquatic and 112 acres of nesting and overwintering) will be temporarily disturbed as a result of construction for bridge replacements and Cache Creek Resources Management Plan operations and maintenance (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). An estimated 1,118 acres of upland habitat loss will result from habitat restoration as these uplands will be converted to aquatic habitat for western pond turtle.

An estimated 45 percent of the western pond turtle habitat loss, including 278 acres of aquatic habitat loss and 1,507 acres of nesting and overwintering habitat, is expected to result from urban development in the Woodland, Davis, West Sacramento, and Winters planning units (planning units 19–22). Another three percent (108 acres) and five percent (177 acres) of the habitat loss is expected to result from activities in planning units 5 and 15, respectively. The remainder of the habitat loss will likely be distributed in planning units 2 through 4, 6 through 14, and 17 (Table 5-5, *Covered Species Habitat Loss*).

Covered activities could result in fragmentation of western pond turtle habitat. In particular, ponds and other aquatic habitat could become isolated in urban development areas, affecting the ability for western pond turtles to travel between ponds. This would adversely affect dispersal and genetic exchange for the species. Ascent Environmental assessed the effects of fragmentation that would potentially result from western pond turtle aquatic habitat being removed from surrounding upland habitat (Appendix O, *Fragmentation Effects*). They identified upland habitat within 1,640 feet of the aquatic habitat that will be removed and deducted the upland habitat acreage that would be directly removed by covered activities. Of the habitat that would remain after loss resulting from covered activities, they identified areas that would remain within 1,640 feet of another source of aquatic habitat. They estimated that with the expected aquatic habitat loss, an estimated 569 acres of upland habitat would no longer be adjacent to suitable aquatic habitat.

5.7.4.1.2 Reduction in Habitat Function

In addition to the habitat removal described above, the following categories of covered activities could render habitat less suitable for the western pond turtle.

Noise, lighting, and vibrations. Noise, lighting, vibrations, and general human activity from urban and rural development (temporary from construction, or permanent and ongoing from the occupation of developed areas) could render nearby western pond turtle habitat less suitable for the

species, and cause western pond turtles to avoid these areas. Noise, lighting, and vibrations, however, have not been cited as stressors threatening this species.

Humans and pets. Increased activity of humans and pets in the vicinity of urban and rural development may have permanent, ongoing effects on western pond turtle habitat. Activity from humans and pets may cause western pond turtles to leave an area or behave in ways that adversely affect their survival. Studies have shown, for example, that western pond turtles basked for significantly shorter periods near human recreational trails (Nyhof 2013). Shorter basking periods can interfere with aquatic turtles' thermoregulation, leading to a decline in their ability to carry out necessary behaviors and physiological processes (Nyhof 2013). *AMM2, Design Developments to Minimize Indirect Effects at the Urban-Habitat Interface* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*) includes measures to minimize the effects of humans and pets in habitat surrounding development.

Invasive species. Invasive species could be introduced to western pond turtle habitat indirectly via urban and rural development. Invasion of nonnative tamarisk (present in Yolo County) has been found to change channel morphology and hydrology, degrading western pond turtle habitat along the Mojave River (Lovich and de Gouvenain 1998). Deliberate release into the wild by pet owners of nonnative turtles such as red-eared sliders and painted turtles may threaten western pond turtle populations in California (Dudley and Collins 1995). Additionally, the intensity of predation on western pond turtle hatchlings from bullfrogs has been great enough to eliminate recruitment in southern California populations (Overtree and Collings 1997).

Runoff. Runoff from rural and urban construction sites (temporary) and from developed areas (permanent, ongoing) could result in contamination and sedimentation of nearby western pond turtle habitat. *AMM2, Design Developments to Minimize Indirect Effects at Urban-Habitat Interfaces*, includes measures to minimize urban runoff into nearby areas.

Operations and maintenance activities. Equipment used for operations and maintenance activities generate noise and vibrations that could affect western pond turtles. Humans and equipment could cause activity and disturbances that result in western pond turtle avoidance of nearby areas. Operations and maintenance activities could also generate runoff that could affect nearby aquatic habitat. These effects would be similar to those described above for urban and rural development.

Conservation actions. Conservation actions could result in temporary noise and human activity, and runoff into adjacent habitat, affecting western pond turtle use of habitat, as described above for urban and rural development.

5.7.4.1.3 Harassment, Injury, or Mortality

Equipment and vehicles used to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, aggregate mining operations) could crush western pond turtle individuals, resulting in injury or mortality.

Over the long-term, traffic associated with new developments and operations and maintenance activities could injure or crush individual juvenile and adult western pond turtles. Urban and rural development activities could lead to an increased risk of pet-related (e.g., introduced pet turtle) disease transmission and the introduction of nonnative aquatic predators into breeding habitat adjacent to new permanent developments. In addition, vegetation maintenance activities associated

with maintaining existing and new canals, ditches, and flood control and other infrastructure may involve clearing or disturbing nesting and overwintering habitat, which could destroy or disturb active nests and overwintering pond turtles.

Accidental introduction of contaminants (e.g., fuel spills) associated with construction, operations, and maintenance activities into aquatic environments could also result in harassment, injury, or mortality of western pond turtles. The likelihood of this occurring is low, however, because turtles are expected to avoid work sites that produce ongoing noise, human activity, and other construction-related disturbances.

Project proponents will implement AMM1 through AMM10 (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*) to avoid and minimize these effects from construction activities.

5.7.4.1.4 Impact of Take on the Species

Take resulting from the permanent and temporary loss or conversion of western pond turtle habitat and other effects described above is not expected to result in an adverse impact on the long-term conservation of the western pond turtle for the following reasons.

- The Plan Area represents a small portion of the species' entire range in California and southern Oregon.
- Habitat loss will be widely dispersed throughout the Plan Area and will not be concentrated in any one location, minimizing effects on occupied areas.
- Only one percent of the species' habitat in the Plan Area will be removed or converted.

5.7.4.2 Beneficial Effects

The western pond turtle will benefit from the protection of 2,400 acres of aquatic habitat, 3,475 acres of upland habitat, and restoration of up to 369 acres of aquatic habitat. Additionally, 2,098 acres of aquatic habitat and 978 acres of upland habitat will be protected on pre-permit reserve lands (Table 5-6).

5.7.4.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in less than a one percent net decrease in aquatic western pond turtle habitat and a two percent net decrease (-3,502 acres) of total western pond turtle habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full implementation of the HCP/NCCP, an estimated 27 percent of the western pond turtle habitat in the Plan Area will be conserved in Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of these lands, at least 5,875 acres will consist of newly protected lands in the reserve system. All lands in the reserve system supporting western pond turtle habitat will be adaptively managed to sustain habitat values for this species in the Plan Area.

Overall, the Yolo HCP/NCCP will provide a substantial net benefit to the western pond turtle through the assembly of a reserve system in association with existing conservation lands, and the management and monitoring of reserve system lands to support the species. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on western pond turtle, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.7.5 Giant Garter Snake

The Plan Area includes 77,056 acres of modeled giant garter snake habitat, with 31,168 acres of rice habitat, 6,596 acres of aquatic (lacustrine and riverine) habitat, 25,897 acres of freshwater emergent wetland habitat, 6,612 acres of active season upland movement habitat, and 6,783 acres of overwintering habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Rice, aquatic (lacustrine and riverine), and freshwater emergent wetlands provide aquatic habitat for foraging and breeding, while uplands provide opportunities for basking and to find cover in burrows and crevices during the active season, and to provide cover and refuge during the dormant winter period (Hansen and Brode 1980; Hansen 1998). The modeled rice (rice lands and associated water conveyance channels) and freshwater emergent wetland habitats were based on the known distribution of the species, and limited to areas east of Highway 113 and east of Interstate 5 from its junction with Highway 113 (Appendix A, *Covered Species Accounts*, Figure A-5).[13] The modeled freshwater emergent wetland habitat is generally seasonal or managed wetlands that may also support perennial wetland. The modeled active season upland movement habitat includes all natural land cover types occurring within 200 feet of modeled rice and freshwater emergent wetland habitats within the geographic range described above (Hansen 1986; Wylie et al. 1997; U.S. Fish and Wildlife Service 1999). The modeled overwintering habitat consists of all natural land cover types occurring between 200 feet and 820 feet from modeled rice and freshwater emergent wetland habitats (Hansen 1986; Wylie et al. 1997). Projects typically only mitigate for loss of giant garter snake uplands within 200 feet of aquatic habitat, which is designated as active season upland movement habitat in the Yolo HCP/NCCP habitat model. Additional detail on the habitat model is provided in Appendix A, *Covered Species Accounts*.

Giant garter snakes are documented in two distinct subpopulations in the Plan Area: the Colusa Basin and Willow Slough/Yolo Bypass along the eastern edge of Yolo County (California Department of Fish and Wildlife 2014; Hansen 2006, 2007, 2008; Wylie et al. 2004; Wylie and Martin 2005; Wylie and Amarello 2006). The Colusa Basin subpopulation is located in the northeastern portion of the Plan Area, in the Colusa Basin and Colusa Basin Plains planning units (planning units 12 and 13). The Willow Slough/Yolo Bypass subpopulation is located in the southeastern portion of the Plan Area, primarily in the Willow Slough Basin and South Yolo Bypass planning units (planning units 11 and 18) but extending into the Woodland planning unit (planning unit 19). Appendix A, *Covered Species Accounts,* Figure A-5, shows the distribution of modeled habitat and giant garter snake occurrences in the Plan Area.

5.7.5.1 Adverse Effects

5.7.5.1.1 Habitat Loss and Fragmentation

Continued loss of wetland and other suitable habitat resulting from agricultural and urban development is one of the greatest threats to the giant garter snake: as much as 95 percent of historical habitat for the giant garter snake in the Central Valley has been lost as a result of agricultural and urban conversion (Wylie et al. 1997). Implementation of the covered activities will result in the removal of up to 87 acres of modeled giant garter snake rice habitat (less than one percent), 109 acres of aquatic habitat (two percent), 76 acres of fresh emergent wetland habitat (less than one percent), 441 acres of active season upland movement habitat (seven percent), and

[13] The acreages of rice lands vary from year to year. This data is from 2008, with some updating from 2014.

1,235 acres of overwintering habitat (18 percent) (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). These losses represent an estimated three percent of the total modeled giant garter snake habitat in the Plan Area (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). An estimated 57 miles (five percent) of drainage channels providing giant garter snake aquatic habitat will be permanently affected by covered activities, including 20 miles from development-related activities and 37 miles from operations and maintenance (Table 5-5, *Covered Species Habitat Loss*). All loss of giant garter snake habitat from covered activities is assumed to be permanent, although loss of one percent of the habitat in the Plan Area (343 acres) will result from conversion of upland habitat to aquatic habitat (i.e., restoration) (Table 5-5, *Covered Species Habitat Loss*).

An estimated 42 percent (1,121 acres) of the giant garter snake habitat loss will result from urban development in the Woodland, Davis, and West Sacramento planning units (planning units 19–21), with the greatest loss (610 acres, or 31 percent of total habitat loss) occurring in the West Sacramento planning unit. With the possible exception of the far eastern edge of the Woodland planning unit, these urban planning units are not known to be occupied by giant garter snake and are not generally considered high-value habitat areas for the species. Other smaller habitat losses are somewhat more broadly distributed in the Plan Area and occur as a result of a variety of activities including urbanization, pipeline and road construction, and operations and maintenance activities (Table 5-5, *Covered Species Habitat Loss*). In general, most activities will not substantially reduce modeled habitat near known population centers of giant garter snake, or result in fragmentation of giant garter snake habitat.

Up to 343 acres of upland habitat for giant garter snake may be removed as a result of restoration of freshwater emergent wetland natural community. This creation of giant garter snake aquatic habitat is expected to benefit the species; however, acreage is included in the total habitat loss described above.

Ascent Environmental assessed the effects of fragmentation that would potentially result from giant garter snake aquatic habitat being removed from the vicinity of surrounding upland habitat (Appendix O, *Fragmentation Effects*). They identified upland habitat within 200 feet (active season upland habitat) and 820 feet (overwintering habitat) of aquatic habitat that will be removed. They deducted the upland habitat acreage that would be directly removed by covered activities. Of the habitat that would remain after loss resulting from covered activities, they identified areas that would remain within 200 feet or 820 feet of another source of aquatic habitat. They estimated that with the expected aquatic habitat loss, and estimated 69 acres of active season upland habitat (within 200 feet of aquatic habitat) and 195 acres of overwintering habitat (between 200 and 820 feet from aquatic habitat) would no longer be adjacent to suitable aquatic habitat.

5.7.5.1.2 Reduction in Habitat Function

In addition to the habitat removal described above, the following categories of covered activities could render habitat less suitable for giant garter snake.

Noise, lighting, and vibrations. Noise, lighting, and vibrations from urban and rural development (temporary from construction, or permanent and ongoing from the occupation of developed areas) could render nearby giant garter snake habitat less suitable for the species, and cause giant garter snakes to avoid these areas. Noise, lighting, and vibrations, however, have not been cited as stressors affecting this species.

Humans and pets. Increased activity of humans and pets in the vicinity of urban and rural development could have permanent, ongoing effects on giant garter snake habitat. Human activity may cause giant garter snakes to leave an area. Predation by domestic cats has been cited as a threat to the giant garter snake (U.S. Fish and Wildlife Service 1993).

Invasive species. Invasive species that could be introduced to giant garter snake habitat indirectly via urban and rural development include bullfrog and predatory game fish. Although the extent of bullfrog predation and its effect on giant garter snake populations is not well understood, estimates suggest that 22 percent of newborn giant garter snakes on the Colusa National Wildlife Refuge succumb to bullfrog predation (Wylie et al. 2003). Introduced predatory game fish such as black bass, sunfish, and channel catfish prey on giant garter snakes and compete with them for smaller prey (Hansen 1988; U.S. Fish and Wildlife Service 1993).

Runoff. Runoff from rural and urban construction sites (temporary) and from developed areas (permanent, ongoing) could result in contamination and sedimentation of nearby giant garter snake aquatic habitat. Project proponents will implement *AMM15, Minimize Take and Adverse Effects on Habitat of Giant Garter Snake* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*), which requires that project design limit runoff into nearby covered species habitat.

Operations and maintenance. Equipment used for operations and maintenance activities generates noise and vibrations that could affect giant garter snakes. Humans and equipment could cause activity and disturbances that result in giant garter snake avoidance of nearby areas. Operations and maintenance activities could also generate runoff that could affect nearby aquatic habitat. These effects would be similar to those described above for urban and rural development. Operations and maintenance activities in aquatic habitat also could cause turbidity and sedimentation of aquatic habitat; project proponents will implement water quality maintenance requirements in *AMM15, Minimize Take and Adverse Effects on Habitat of Giant Garter Snake* to minimize these effects.

Conservation actions. Conservation actions could result in temporary noise and human activity, and runoff into adjacent habitat, affecting giant garter snake use of habitat, as described above for urban and rural development. Project proponents will implement *AMM15, Minimize Take and Adverse Effects on Habitat of Giant Garter Snake* to minimize these effects.

5.7.5.1.3 Harassment, Injury, or Mortality

Equipment and vehicles used to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, and agricultural and water infrastructure operations) could crush individual giant garter snakes or their nests resulting in injury or mortality. As described in Appendix P, ICF estimated that 352 to 815 individual garter snakes could potentially be harassed, injured, or killed as a result of covered activities.

Over the long-term, urban and rural development may lead to an increased risk for pet-related (e.g., unleashed dogs and cats) predation and the introduction of nonnative aquatic predators into habitat adjacent to new permanent developments.

During operations and maintenance activities, clearing or disturbing adjacent upland areas that provide suitable active season upland and overwintering habitat could injure or kill overwintering giant garter snakes. As most of the covered activities are not associated with known population

centers of giant garter snake, this would not be expected to substantially affect the species in the Plan Area.

Accidental introduction of contaminants (e.g., fuel spills) associated with construction, operations, and maintenance activities into aquatic habitats could also result in harassment, injury, or mortality of individual giant garter snakes. The likelihood of this occurring is low, however, because snakes are expected to avoid work sites that produce ongoing noise, human activity, and other construction-related disturbances.

Project proponents will implement AMM1 through AMM10 and AMM15 (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*) to avoid and minimize these effects from construction activities. In addition, seasonal restrictions and best management practices per *AMM15, Minimize Take and Adverse Effects on Habitat of Giant Garter Snake*, to limit these effects from maintenance activities will be implemented.

During normal and routine farming practices on the reserve system, channel maintenance activities could result in injury or mortality of giant garter snakes. This effect will be minimized as described in Section 4.3.5.3, *Giant Garter Snake*.

5.7.5.1.4 Impact of Take on the Species

The giant garter snake is endemic to the wetlands of the Central Valley. The Plan Area includes two of the 13 giant garter snake subpopulations identified in the species' draft recovery plan (USFWS 1993), making the Plan Area important for the long-term survival and conservation of the species.

The Plan Area supports an estimated 77,056 acres of giant garter snake habitat. Of this, covered activities will permanently remove up to 1,966 acres (3 percent). Take resulting from habitat loss and other adverse effects, described above, is not expected to result in an adverse impact on the long-term conservation of the species for the following reasons.

- The amount of giant garter snake habitat that will be removed is small relative to the amount available in the Plan Area. Moreover, removal will occur in multiple, widely separate areas and will not therefore affect any one area disproportionately.
- Most of the affected habitat is outside the two subpopulation centers for this species, and few giant garter snakes are expected to be affected.
- Avoidance and minimization measures will minimize the effects of covered activities on surrounding giant garter snake habitat.

5.7.5.2 Beneficial Effects

The Yolo HCP/NCCP will protect 7,195 acres of unprotected giant garter snake habitat, including 2,800 acres of rice habitat, 420 acres of aquatic habitat, 500 acres of freshwater emergent wetland habitat, 1,160 acres of active season upland movement habitat, and 2,315 acres of overwintering habitat (Objectives GGS1.1, GGS1.2, and GGS1.3, CM1) (Table 5-6, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will restore freshwater emergent wetland and aquatic habitat for giant garter snake to result in no net loss (Objective GGS1.3, CM2). In addition to the newly protected and restored giant garter snake habitat, the Yolo HCP/NCCP will enroll 2,910 acres of pre-permit reserve lands supporting giant garter snake into the reserve system, and will monitor, and adaptively manage these lands consistent with the Yolo HCP/NCCP conservation strategy.

The 10,290 acres of newly protected and pre-permit reserve lands supporting giant garter snake habitat will be sited in association with other Category 1 and 2 public and easement lands to establish a large, interconnected network of protected giant garter snake habitat in the Colusa Basin and Yolo Bypass/Willow Slough giant garter snake recovery units. These amounts and their configuration are consistent with the recovery needs of the giant garter snake in the Plan Area.

5.7.5.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in less than one percent net loss of rice habitat for giant garter snake, no net loss of fresh emergent wetland and aquatic habitat, and a net two percent decrease in total habitat for this species (Table 5-6, *Covered Species Benefits and Net Effects*). With full implementation of the HCP/NCCP, 43 percent of the giant garter snake habitat in the Plan Area will be conserved in Category 1 and 2 public and easement lands, including baseline and newly protected lands. Of these Category 1 and 2 public and easement lands, at least 7,195 acres will be newly protected lands, and at least 2,910 acres will be pre-permit reserve lands. All of the reserve system lands will be monitored and adaptively managed to sustain habitat values for giant garter snake. Management will include providing water during the giant garter snake's active season. Most of the habitat that will be lost as a result of covered activities is located outside of the two subpopulation centers for giant garter snake that occur in the Plan Area. Giant garter snake habitat will be protected in and around these two subpopulations to protect and facilitate their expansion. Additional lands will be protected and restored to provide connectivity and facilitate genetic exchange between these two important subpopulations.

Overall, the Yolo HCP/NCCP will provide a substantial net benefit to the giant garter snake through the assembly of a reserve system in association with existing conservation lands consistent with the recovery needs for the giant garter snake. The reserve system will be monitored and adaptively managed to support the species. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on giant garter snake, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.7.6 Swainson's Hawk

The habitat model for Swainson's hawk includes nesting habitat, cultivated lands foraging habitat, and natural foraging habitat in planning units 3–7 and 9–22. The Plan Area includes 309,087 acres of modeled Swainson's hawk habitat, with 15,673 acres of nesting habitat, 79,336 acres of natural foraging habitat, and 214,078 acres of cultivated lands foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). The nesting habitat includes all potentially suitable woodland and riparian land cover types, eucalyptus, and remnant woody vegetation outside of the blue oak woodland and oak and foothill pine natural communities; the model includes such habitat occurring in isolated patches or as isolated trees in agricultural fields or field borders outside of the South Blue Ridge and Capay Hills planning units (planning units 3 and 4) below an elevation of 350 feet. Cultivated lands foraging habitat includes all field crops, grain and hay crops including alfalfa, pasture, miscellaneous grasses, and truck and berry crops at an elevation of 500 feet or lower. The natural foraging habitat includes suitable uncultivated grassland and seasonal wetland land cover types. Additional detail on the habitat model is provided in Appendix A, *Covered Species Accounts*.

Swainson's hawks have been extensively surveyed in the Plan Area, and numerous nest trees have been recorded throughout the modeled habitat areas (Appendix A, *Covered Species Accounts*, Figure A-6). For example, surveys conducted in 2007 located a total of 290 active breeding territories in the

Plan Area (Estep 2008). The highest nesting concentrations are from north of Woodland to County Road 12; along oak and cottonwood dominated riparian corridors such as Willow Slough, Putah Creek, and the Sacramento River; and between Davis and Woodland and west to approximately Interstate 505 and east to the Sacramento River (Estep 2008).

5.7.6.1 Adverse Effects

5.7.6.1.1 Habitat Loss and Fragmentation

In California, causes of Swainson's hawk population decline are thought to be loss of nesting habitat (Schlorff and Bloom 1984), loss of foraging habitat to urban development, and conversion to unsuitable agriculture such as orchards and vineyards (Bechard et al. 2010; England et al. 1995). Covered activities will permanently remove up to 651 acres (four percent) of modeled nesting habitat and 10,806 acres (four percent) of modeled foraging habitat for Swainson's hawk in the Plan Area (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). In addition, covered activities will temporarily remove up to 224 acres of foraging habitat as a result of operations and maintenance, bridge replacement, and other temporary construction activities (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Each temporary disturbance is expected to be small, likely no greater than approximately ten acres (and often much less). Disturbance of small areas of cultivated lands during the 50-year permit term, with each disturbance to last for no more than one year, will remove minor amounts of foraging habitat but is unlikely to adversely affect Swainson's hawk foraging behavior. Cultivated lands regularly experience temporary disturbances and continue to provide habitat for Swainson's hawk when the disturbance is completed.

An estimated 52 percent of the Swainson's hawk nesting habitat loss (495 acres) and 41 percent of the foraging habitat loss (4,407 acres) is expected to result from development in the urban planning units: Woodland, Davis, West Sacramento, and Winters (planning units 19–22; Table 5-5). All of these activities will be required to avoid active Swainson's hawk nests, as described in Table 4-1, *Avoidance and Minimization Measures for Sensitive Species and Natural Communities*.

Covered activities will remove up to 20 nest trees. A nest tree is defined as a tree that has supported an active nest anytime within the previous five years. This estimate is based on the assumption that, on average, 80 percent of nest trees will be avoided in the covered activities footprint. If a nest tree is removed, the removal must occur outside the nesting season, during a year when the nest is not active, or after young have fledged and the nest is no longer being used by Swainson's hawks (Table 4-1, *Avoidance and Minimization Measures for Sensitive Species and Natural Communities*).

Habitat restoration could result in conversion of up to 1,039 acres of Swainson's hawk foraging habitat (an estimated 803 acres agricultural and 236 acres natural) to wetland natural communities that do not provide habitat for this species. An estimated 642 acres of this foraging habitat will be converted to nesting habitat for this species. No nesting habitat will be removed as part of habitat restoration.

Covered activities will result in minimal habitat fragmentation for Swainson's hawk. Most of the habitat loss will occur in concentrated areas. An estimated 99 percent of the natural foraging habitat and 96 percent of the cultivated lands foraging habitat will remain, primarily in large, interconnected blocks throughout the lower elevations of the Plan Area. As described in Chapter 7, Section 7.7.1.8, *Regional Loss of Swainson's Hawk Habitat,* the Conservancy will implement contingency measures such as a landowner incentive program to encourage farmers to grow suitable crops for Swainson's hawk if foraging habitat and population numbers drop below a

specified threshold. Where urban development is sited near nesting habitat, however, the nesting habitat could become less functional (Section 5.7.6.1.2, *Reduction in Habitat Function*).

Ascent Environmental assessed the effects of fragmentation that would potentially result from Swainson's hawk nesting habitat being removed from the vicinity of surrounding foraging habitat (Appendix O, *Fragmentation Effects*). They identified foraging habitat within 3.27 miles of the nesting habitat that will be removed. They deducted the upland habitat acreage that would be directly removed by covered activities. Of the habitat that would remain after loss resulting from covered activities, they identified areas that would remain within 3.27 miles of nesting habitat. They estimated that with the expected nesting habitat loss, all foraging habitat would still be within 3.27 miles of nesting habitat.

5.7.6.1.2 Reduction in Habitat Function

Covered activities may reduce the function of Swainson's hawk habitat in the following ways.

Noise, vibrations, lighting, and human activity. Swainson's hawks may be vulnerable to noise, vibrations, lighting, and human activity disturbance from construction, operations and maintenance, and restoration activities in the vicinity of active nests. Project proponents will minimize these effects through establishment of 1,300-foot buffers around active nests (Table 4-1, *Avoidance and Minimization Measures for Sensitive Species and Natural Communities*).

Increasing distance between nesting trees and foraging habitat. New urban development that will surround avoided nesting habitat is likely to render the avoided nesting habitat less functional, by creating a larger distance between nesting and foraging habitat. Swainson's hawks have been recorded nesting in urban landscapes in Yolo County (England et al. 1995); in all cases the nest trees were within five miles of suitable foraging habitat. Swainson's hawk nesting habitat in areas identified for urban development also will be within five miles of foraging habitat; therefore, Swainson's hawks are expected to be able to commute between their urban nesting habitat and foraging areas, even with the new development increasing the distance between foraging and nesting habitat. There is, however, an energy cost to commuting between nest trees and foraging habitat, and the reproductive success of urban birds is lower for those in urban landscapes than those in rural areas (England et al. 1995). An estimated 1,258 acres of Swainson's hawk nesting habitat and 50 nest trees in the vicinity of new urban development will not be removed but will be indirectly affected by expanding urbanization in the vicinity of nest trees that that could increase the distance between nesting habitat and foraging habitat. However, as described in Section 5.7.6.1.1, *Habitat Loss and Fragmentation*, with the riparian habitat loss, all foraging habitat would still be within 3.27 miles of nesting habitat. Therefore the effect, if any, is expected to be negligible.

Fire break maintenance. Management of some reserves may require establishment and maintenance of new fire breaks. Maintenance of fire breaks (i.e., mowing or disking) is primarily expected to retain the existing land cover (e.g., grassland); however, disking or mowing of fire breaks during the dry season could alter vegetation structure. Although this would not eliminate Swainson's hawk habitat, it could reduce its function by reducing suitability for rodents and other Swainson's hawk prey items. Although conservation actions could result in short-term loss of Swainson's hawk habitat function, they will provide for long-term enhancement of habitat function.

5.7.6.1.3 Harassment, Injury, or Mortality

Equipment and vehicles used to implement covered activities (e.g., construction for urban and rural development, operations and maintenance activities, and habitat restoration and enhancement) could result in injury or mortality of Swainson's hawk, as individual Swainson's hawk nests could be destroyed by construction-related equipment, and nests or juveniles could be abandoned due to disturbance, leading to nest failure or juvenile mortality. Construction of above-ground transmission lines as part of development activities could cause mortality of Swainson's hawks from strikes and electrocution.

Contaminants associated with construction, operations, and maintenance activities could result in harassment, injury, or mortality of individual hawks. The likelihood of this occurring is low, however, because Swainson's hawks generally spend little time on the ground.

Project proponents will avoid take of active nest trees, including eggs and juvenile and adult Swainson's hawks, through measures that include surveying for active nest trees, creating setbacks from potential nest trees, and conducting seasonal and height restrictions on tree pruning and removal near active nests (*AMM16, Minimize Take and Adverse Effects on Habitat of Swainson's Hawk and White-Tailed Kite* in Chapter 4, Section 4.3, *Avoidance and Minimization Measures*).

Normal and routine farming practices on cultivated lands in the reserve system are not expected to result in injury or mortality of Swainson's hawks because the species is mobile and can move out of harms way, and because the species is adapted to foraging in an agricultural setting.

5.7.6.1.4 Impact of Take on the Species

The Swainson's hawk breeds in the open grassland, shrub-steppe, and agricultural regions of western North America from southern Canada to northern Mexico. Central Valley Swainson's hawks winter from Central Mexico to northern and central South America (Appendix A, *Covered Species Accounts*). With the conversion of much of the species' historical range to agriculture, the Swainson's hawk has adapted to agricultural landscapes compatible with its foraging needs and in proximity to suitable nesting habitat. Most nesting Swainson's hawks in California are found in the Central Valley, from Tehama County south to Kern County, an area almost entirely converted to agricultural landscapes. Nearly 2,000 breeding pairs are estimated to occur in the Central Valley based on a survey of the statewide population (Anderson et al. 2007). The area comprising Yolo, Solano, Sacramento, and San Joaquin Counties is considered the core of the Central Valley breeding population of Swainson's hawk due to the area containing higher densities than anywhere else in the species' range. The population in the Plan Area is large and widely distributed, with an estimated 300 nesting pairs (Estep 2008), representing about 14 percent of the statewide population. Although covered activities will remove up to 20 nest trees from the Plan Area, removal of nest trees does not necessarily result in reduction in the Swainson's hawk population. If a nest tree is removed in the vicinity of other suitable nesting habitat, the nesting pair is likely to relocate to a nest tree elsewhere within its nesting territory.

Based on modeled habitat for the Swainson's hawk, the Plan Area supports an estimated 309,087 acres of potentially suitable habitat, including 15,673 acres of nesting habitat and 293,414 acres of foraging habitat. Sustainability of the Swainson's hawk population in the Plan Area is dependent on providing and maintaining suitable nesting sites interspersed in sufficient acreage of compatible agricultural and grassland landscapes that support abundant, accessible prey. Covered activities will permanently remove up to 11,457 acres (four percent) in the Plan Area, including 1,407 acres of

natural foraging habitat, 9,399 acres of cultivated lands foraging habitat, and 651 acres (seven percent) of nesting habitat. In addition, covered activities will temporarily remove up to 224 acres of Swainson's hawk foraging habitat (Table 5-5, *Covered Species Habitat Loss*).

Nesting pairs may successfully relocate to other nest trees within their territories. Some displaced nesting pairs may also successfully relocate to locations in the Plan Area outside their original nesting territories. Some displaced pairs may not find alternative nesting opportunities outside of their original nesting territories within the Plan Area, however, because the nesting population in the Plan Area is large and could be saturated (i.e., all available nesting habitat may already be occupied) due to limited suitable nesting. Therefore, covered activities could result in a reduction in the number of nesting pairs in the Plan Area, particularly near urban and rural development. Beneficial effects described below, however, will offset these effects and provide for species recovery in the Plan Area.

5.7.6.2 Beneficial Effects

The Yolo HCP/NCCP will protect, manage, and enhance 18,792 acres of unprotected Swainson's hawk foraging habitat, including 14,362 acres of cultivated lands foraging habitat and 4,430 acres of natural foraging habitat (Objectives SH1.1 and SH1.2, CM1) (Table 5-6, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will enroll 4,580 acres of pre-permit reserve lands that provide foraging habitat. The Conservancy will monitor and adaptively manage these lands consistent with the Yolo HCP/NCCP conservation strategy as required to meet Objective SH1.4 (CM1).

The Yolo HCP/NCCP will protect 1,600 acres of existing valley foothill riparian forest (Objective NC-VFR1.1) and restore additional valley foothill riparian forest to result in no net loss of this natural community providing additional nesting habitat for Swainson's hawk (Objective NC-VFR1.3, CM1, CM2). Restored habitats (e.g., valley foothill riparian nesting areas) may require several years to several decades to achieve conditions suitable for nesting by Swainson's hawks; however, sufficient nesting habitat is currently available in the Plan Area to support a very large and dense nesting population. Riparian habitats restoration will be designed to provide future nesting habitat and thereby increase nesting opportunities during the permit term.

Some biological objectives are designed to maintain habitat functions for Swainson's hawks by maintaining nest habitat diversity in the Plan Area. Agricultural practices have removed so much of the species' historical nesting habitat that Swainson's hawks often nest in isolated trees, tree rows along field borders or roads, or small clusters of trees on agricultural lands. Protection and maintenance of these small isolated nesting habitats are essential to sustaining the distribution and abundance of the species in the Plan Area. To achieve this, the Yolo HCP/NCCP will plant trees within cultivated lands foraging habitat in the reserve system as needed to achieve a density of one suitable nesting tree per 10 acres[14] across reserve system lands (Objective SH1.5, CM3).

The Yolo HCP/NCCP will protect at least 20 previously unprotected Swainson's hawk nest trees[15] in the reserve system (Objective SH1.3, CM1), including protected valley foothill riparian natural community and scattered habitat patches throughout the cultivated lands reserve system. This will

[14] A suitable Swainson's hawk nesting tree is defined as a native tree at least 20 feet in height.
[15] A Swainson's hawk nest tree is defined as a tree that has been used for Swainson's hawk nesting within the last five years.

ensure that the density of nest trees in protected nesting habitat will be comparable to the density of nest trees in suitable habitat throughout the Plan Area.

Habitat that provides cover and supports prey populations within the cultivated lands seminatural community has high foraging value for Swainson's hawk. To help retain this important habitat element, the Yolo HCP/NCCP will protect remnant noncultivated areas of high value to wildlife within cultivated land reserves (CM1) and establish new hedgerows along field borders and roadsides to enhance prey populations (Objective NC-CL1.4, CM3). The Conservancy will manage and enhance natural foraging lands to further enhance conditions suitable for prey populations and maintain habitat suitability for Swainson's hawk. These conservation actions will help ensure that Swainson's hawk populations are sustained throughout the protected Swainson's hawk habitat and the long-term viability of the species is enhanced in the Plan Area.

In an effort to maintain the plan area-wide nesting population in the event agricultural land use conversions on non-reserve lands reduce the extent of suitable foraging habitat in the future, the conservancy will monitor agricultural land uses/crop types and the nesting population. Monitoring will provide essential information on the availability of suitable foraging habitat in the plan area that can be compared with estimated minimum acreage thresholds established in order to maintain the current nesting population (Estep 2015). If available habitat drops below the threshold and the nesting population declines correspondingly, the conservancy will confer with the CDFW and USFWS and implement additional actions as needed to help overcome habitat deficits (Section 7.7.1.2.8, *Changed Circumstances, Regional Loss of Swainsons Hawk Foraging Habitat*).

5.7.6.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in an estimated two percent net decrease of Swainson's hawk natural foraging habitat and a four percent net decrease of cultivated lands foraging habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). The Yolo HCP/NCCP will result in an estimated three percent net decrease in nesting habitat for Swainson's hawk (Table 5-6, *Covered Species Benefits and Net Effects*), but the actual net loss is expected to be less than three percent because this does not factor in the tree plantings required under Objective SW1.5.

With full implementation of the HCP/NCCP, 19,286 acres of natural foraging habitat and 22,508 acres of cultivated lands foraging habitat will be conserved in Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including public and easement lands and newly protected lands. This represents 14 percent of the natural and cultivated lands foraging habitat in the Plan Area. Additionally, 4,517 acres of nesting habitat, representing 31 percent of the nesting habitat in the Plan Area, will be conserved in Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*). Of these Category 1 and 2 public and easement lands with Swainson's hawk nesting and foraging habitat, at least 20,285 acres will consist of newly protected lands, and at least 4,795 acres will consist of pre-permit reserve lands. These newly protected and pre-permit reserve lands will be included in the HCP/NCCP reserve system, and will be monitored and adaptively managed to sustain Swainson's hawk habitat values (Table 5-6, *Covered Species Benefits and Net Effects*). Overall, the Yolo HCP/NCCP will provide a substantial net benefit to the Swainson's hawk. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on Swainson's hawk, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

The potential effects of future land use changes in the Plan Area unrelated to Yolo HCP/NCCP implementation is provided in Section 5.8, *Cumulative Effects*.

5.7.7 White-Tailed Kite

The Plan Area includes 268,230 acres of modeled habitat for white-tailed kite, with 31,732 acres of nesting habitat, 101,758 acres of primary foraging habitat, and 134,740 acres of secondary foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Nesting habitat includes several woodland and riparian vegetation types, including isolated patches of trees in agricultural fields, below an elevation of 500 feet. One nest tree may be removed. Primary foraging habitat includes grassland, pasture, and alfalfa, which produce high densities of white-tailed kite prey, below an elevation of 500 feet and within one mile of modeled nesting habitat and reported nesting locations. Secondary foraging habitat includes several natural vegetation types and agricultural crops, which are used less frequently than those in the primary category, below an elevation of 500 feet and within one mile of modeled nesting habitat and reported nesting locations. Additional detail on the habitat model is provided in Appendix A, *Covered Species Accounts*.

Comprehensive surveys of the Plan Area for white-tailed kite have not been conducted. Jim Estep surveyed the lowland portion of Yolo County in 2007, and reported a total of 13 nest trees. Most of these nests were found in riparian areas, including three along Putah Creek, three along Willow Slough, two along Dry Slough, one along the Sacramento River, one along Willow Slough Bypass, and one along the Knights Landing Ridge Cut. Two nonriparian sites were reported in West Sacramento and Dunnigan.

5.7.7.1 Adverse Effects

5.7.7.1.1 Habitat Loss and Fragmentation

Covered activities will permanently remove up to 11,239 acres of modeled white-tailed kite habitat, including 661 acres of nesting habitat (with up to one nest tree), 2,609 acres of primary foraging habitat, and 7,969 acres of secondary foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). This loss represents four percent of the total white-tailed kite modeled habitat in the Plan Area. Additionally, covered activities will temporarily remove up to 234 acres of foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Each temporary disturbance is expected to be small, likely no greater than approximately ten acres (and often much less). Disturbance of small areas of cultivated lands during the 50-year permit term, with each disturbance to last for no more than one year, will remove minor amounts of foraging habitat but is unlikely to adversely affect white-tailed kite foraging behavior. Cultivated lands regularly experience temporary disturbances and continue to provide habitat for white-tailed kite when the disturbance is completed.

An estimated 44 percent of the white-tailed kite habitat loss will result from urban development in the urban planning units, including the Woodland, Davis, West Sacramento, and Winters (planning units 19, 20, 21, and 22; Table 5-5, *Covered Species Habitat Loss*). The remainder of the habitat loss will be distributed throughout modeled habitat in the Plan Area, and will result from various activities such as unincorporated community development in Dunnigan Hills, Monument Hills, and Madison.

Ascent Environmental assessed the effects of fragmentation that would potentially result from white-tailed kite nesting habitat being removed from the vicinity of surrounding foraging habitat (Appendix O, *Fragmentation Effects*). They identified foraging habitat within 0.8 miles of the nesting habitat that will be removed (based on the distance the species typically forages from the nest). They deducted the upland habitat acreage that would be directly removed by covered activities. Of the habitat that would remain after loss resulting from covered activities, they identified areas that would remain within 0.8 mile of nesting habitat. They estimated that with the expected nesting habitat loss, all foraging habitat that would still be within 0.8 mile of nesting habitat.

5.7.7.1.2 Reduction in Habitat Function

In addition to habitat removal and fragmentation, described above, the following categories of covered activities could render habitat less suitable for white-tailed kite.

Noise, vibrations, lighting, and human activity. Construction-related ground disturbances, including noise, vibrations, lighting, and human activity disturbances in urban and rural areas, and similar ongoing disturbances to nearby habitat as a result of human occupation, could affect the ecological functions of white-tailed kite habitat. Project proponents will minimize these effects through the establishment of buffers as described in *AMM16, Minimize Take and Adverse Effects on Habitat of Swainson's Hawk and White-Tailed Kite*, and through design measures described in *AMM2, Design Developments to Minimize Indirect Effects at Urban-Habitat Interface* (Chapter 4, Section 4.3.4, *Covered Species*).

Operations and maintenance. Operations and maintenance activities could indirectly affect surrounding white-tailed kite habitat through noise, lighting, and human activity disturbance, as described above for urban and rural development. Project proponents will adhere to *AMM16, Minimize Take and Adverse Effects on Habitat of Swainson's Hawk and White-Tailed Kite* (Chapter 4, Section 4.3.4, *Covered Species*) to reduce effects on nesting habitat during the nesting season.

Conservation actions. Conservation actions could result in temporary noise and human activity disturbances to white-tailed kite habitat, as described above for urban and rural development. Project proponents will avoid and minimize these effects through adherence to *AMM16, Minimize Take and Adverse Effects on Habitat of Swainson's Hawk and White-Tailed Kite*.

5.7.7.1.3 Harassment, Injury, or Mortality

Operation of equipment and vehicles to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, and agricultural and water infrastructure operations) could disturb nesting, causing abandonment of white-tailed kite juveniles that could result in their injury or mortality.

Over the long-term, urban and rural development activities could affect the reproductive success of white-tailed kite. Ongoing human activity, noise, and other disturbances associated with occupancy of new infrastructure and developments could disrupt nesting behavior and thereby reduce nest productivity.

Contaminants associated with construction, operations, and maintenance activities (e.g., fuel spills) could result in harassment, injury, or mortality of individual birds. These effects are unlikely, however, because white-tailed kite is a highly mobile species that can readily avoid such hazards

and is expected to avoid work sites that generate ongoing noise and human activity, and other construction-related disturbances.

Project proponents will avoid and minimize these potential effects by implementing measures to identify and avoid effects on nesting colonies (*AMM16, Minimize Take and Adverse Effects on Habitat of Swainson's Hawk and White-Tailed Kite*).

Normal and routine farming practices on cultivated lands in the reserve system are not expected to result in injury or mortality of white-tailed kites because the species is mobile and can move out of harm's way, and because the species is adapted to foraging in an agricultural setting.

5.7.7.1.4 Impact of Take on the Species

The distribution of the white-tailed kite includes the southwest United States from Texas to California, and north to Washington State, and from Mexico to South America. California is currently considered the breeding range stronghold for the white-tailed kite in North America, with nearly all areas up to elevations at the western Sierra Nevada foothills and southeastern deserts occupied (Small 1994; Dunk 1995). The Plan Area represents a small portion of the species' range-wide distribution.

The Plan Area provides an estimated 268,230 acres of modeled white-tailed kite habitat: 15,673 acres of nesting habitat and 236,498 acres of foraging habitat. Covered activities will remove 11,565 acres (four percent) of the modeled white-tailed kite habitat in the Plan Area, of which 987acres are nesting habitat and 10,578 acres foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). This habitat loss and other adverse effects on white-tailed kite resulting from covered activities, as described above, are not expected to adversely affect the long-term survival and conservation of the species for the following reasons.

- The Plan Area represents a small portion of the species' range.
- Covered activities will remove a small portion (four percent) of the modeled habitat in the Plan Area.
- Most of the loss of foraging habitat will occur in cultivated lands that are abundant throughout the Plan Area.
- The avoidance and minimization measures will minimize effects on nesting colonies.

5.7.7.2 Beneficial Effects

The white-tailed kite will benefit through achievement of the biological goals and objectives for natural communities and Swainson's hawk. The Yolo HCP/NCCP will protect 4,430 acres of grassland natural community (Objective NC-AG1.1) and 14,362 acres of non-rice cultivated lands seminatural community (Objective NC-CL1.1) to provide 18,792 acres of foraging habitat for the white-tailed kite (Table 5-6, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will enroll an estimated 3,330 acres of pre-permit reserve lands with white-tailed kite foraging habitat into the reserve system.

The Yolo HCP/NCCP will protect 1,600 acres of existing valley foothill riparian forest (Objective NC-VFR1.1) and restore valley foothill riparian natural community to result in no net loss of this natural community (Objective NC-VFR1.2, CM1, CM2), providing nesting habitat for white-tailed kite. Additional management and enhancement activities will further increase habitat functions for

white-tailed kite by improving habitat diversity in the Plan Area; these activities include enhancing grassland natural community and cultivated lands seminatural community to improve prey base, protecting existing nest trees on protected cultivated lands, and planting new trees within the cultivated landscape as well as within riparian and valley grassland communities.

5.7.7.3 Net Effects

The Yolo HCP/NCCP will result in an estimated zero percent net decrease of nesting habitat, and a four percent decrease in foraging habitat for white-tailed kite in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full HCP/NCCP implementation, one percent (41,342 acres) of white-tailed kite habitat in the Plan Area will be conserved in Category 1 and 2 public and easement lands, including baseline and newly protected lands. Of these, at least 20,285 acres will be newly protected and incorporated into the reserve system. All reserve system lands will be monitored and adaptively managed to sustain white-tailed kite habitat values. The Yolo HCP/NCCP will minimize and mitigate impacts to white-tailed kite, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.7.8 Western Yellow-Billed Cuckoo

The Plan Area includes 3,868 acres of modeled habitat for western yellow-billed cuckoo (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Modeled habitat for the western yellow-billed cuckoo includes suitable riparian vegetation types that occur in patch sizes of 25 acres or greater and have a width of at least 330 feet. Additional detail on the habitat model is provided in Appendix A, *Covered Species Accounts*.

Since 1965, nine occurrences of western yellow-billed cuckoo have been recorded in the Plan Area, two of which (both in the vicinity of Fremont Weir) are from the last 10 years (Appendix A). All of these records are presumed to be migrants and nonbreeding individuals.

5.7.8.1 Adverse Effects

5.7.8.1.1 Habitat Loss and Fragmentation

Covered activities will permanently remove up to 59 acres of modeled western yellow-billed cuckoo habitat, representing approximately three percent of the current extent of modeled habitat in the Plan Area (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). The habitat loss is distributed primarily among planning units 7, and 14, and 15 (Table 5-5, *Covered Species Habitat Loss*). Although covered activities will temporarily remove up to one acre of western yellow-billed cuckoo habitat, this acre is considered a permanent loss because restoration of the disturbed area is unlikely to be completed within one year of its removal. This acre is, therefore, included in the permanent loss acreage.

Covered activities are not expected to fragment habitat for western yellow-billed cuckoo. In accordance with avoidance requirements for riparian corridors (Table 4-1, *Avoidance and Minimization Measures for Sensitive Natural Communities and Covered Species*), development activities will limit removal of habitat to the edges of riparian corridors and will not bisect these corridors. Development will reduce the size of habitat patches, however, rendering them less suitable for supporting western yellow-billed cuckoo. Suitable modeled western yellow-billed

cuckoo habitat only includes patches that are 25 acres or greater in size, and covered activities may reduce patches to less than 25 acres in size.

5.7.8.1.2 Reduction in Habitat Function

In addition to habitat removal and fragmentation, described above, the following categories of covered activities could render habitat less suitable for western yellow-billed cuckoo.

Noise and lighting. Noise and lighting from urban and rural development (temporary from construction, or permanent and ongoing from the occupation of developed areas) could render nearby western yellow-billed cuckoo habitat less suitable for the species and could cause western yellow-billed cuckoos to avoid these areas or diminish their reproductive success. Traffic noise, for example, can reduce the distance over which migratory birds can detect acoustic signals such as song, an effect known as acoustic interference. Acoustic interference can impair the ability of birds to communicate with mates (Parris and Schneider 2008). Lighting has also been documented to adversely affect birds. Orientation under artificial lighting may result in alteration of bird behavior, such as causing diurnal birds to forage or sing at night or causing abnormal seasonal timing of migration and initiation of breeding behavior, although the effects of these altered behaviors on bird survival and reproductive success are unknown (Longcore and Rich 2004). Birds can also be disoriented and entrapped by lights at night, causing them to stay in an area that they would normally migrate through (Longcore and Rich 2004). Human disturbance, however, is rarely a factor affecting western yellow-billed cuckoos in California (Laymon 1998).

Humans and pets. The permanent, ongoing effect of increased activity of humans and pets in the vicinity of developed areas could reduce the suitability of western yellow-billed cuckoo habitat. Bird species richness in riparian areas has been found to decline as the level of development on surrounding lands increases, particularly as a factor of the density of buildings within 1,500 meters of riparian habitat (Miller et al. 2003). This effect appears to be strongest on ground-foraging and low-nesting birds (Miller et al. 2003), however, and western yellow-billed cuckoos forage in the tree canopy and are not low-nesters, nesting within a range of 1.3 to 13.0 meters from the ground (Laymon 1998). As stated above, however, human disturbance is rarely a factor affecting western yellow-billed cuckoos in California (Laymon 1998).

Invasive plants. Urban and rural development could result in the introduction and spread of invasive plant species that could in turn degrade western yellow-billed cuckoo habitat. The degradation of riparian habitat as a result of invasion by tamarisk and giant reed is a concern over much of the cuckoo's range (Laymon 1998). Domestic fig and black walnut have become dominant tree species along the Sacramento River, providing poor foraging and nesting opportunities for the species (Laymon 1998): species such as these could be introduced into habitat from nearby developed landscapes. Project proponents will implement *AMM2, Design Developments to Minimize Indirect Effects at Urban-Habitat Interface* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*) to minimize the spread of invasive species as a result of urban and rural development.

Operations and maintenance. Equipment used for operations and maintenance activities generates noise that could affect western yellow-billed cuckoos. Humans and equipment could result in disturbances from human activity that cause western yellow-billed cuckoos to avoid nearby areas. These effects would be similar to those described above for urban and rural development, and are expected to have minimal effect on the species.

Conservation actions. Conservation actions could result in temporary noise and other disturbances related to human activity in yellow-billed cuckoo habitat. As described above for urban and rural development, however, this effect is expected to be minimal.

Implementation of *AMM17, Minimize Take and Adverse Effects on Western Yellow-billed Cuckoo,* will minimize the reduction in habitat function as a result of covered activities.

5.7.8.1.3 Harassment, Injury, or Mortality

Equipment and vehicles used to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, and agricultural and water infrastructure operations) could crush individual cuckoo nests or cause nest disturbance that leads to juvenile abandonment and subsequent nesting failure or juvenile mortality.

Contaminants associated with construction, operations, and maintenance activities (e.g., fuel spills) could result in harassment, injury, or mortality of individual birds. The likelihood of this occurring is low, however, because western yellow-billed cuckoos are a highly mobile species that can readily avoid such hazards and are expected to avoid work sites.

Currently, western yellow-billed cuckoo occurs in the Plan Area as a rare migrant during fall or spring. Therefore, the likelihood that disturbance would affect a nesting pair is low. Should this species become established in the future, however, project proponents will minimize the potential for such adverse effects by implementing *AMM2, Design Developments to Minimize Indirect Effects at Urban-Habitat Interface* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*). In addition, project proponents will implement *AMM17, Minimize Take and Adverse Effects on Habitat of Western Yellow-Billed Cuckoo*, to minimize effects on individuals and nest trees.

5.7.8.1.4 Impact of Take on the Species

There are two recognized subspecies of yellow-billed cuckoo, *C. a. occidentalis*, found west of the Rocky Mountains, and *C. a. americanus*, found in deciduous forests east of the Rocky Mountains. There is a continuing debate over the taxonomic separation of the two subspecies based on genetic studies initiated by USFWS during the status review for federal listing. While the eastern subspecies' range includes all states east of the Rocky Mountains and the southern regions of Quebec and Ontario, breeding populations of the western subspecies are limited to California, Nevada, Utah, Arizona, southwestern Wyoming, southeastern Idaho, and the western parts of New Mexico, Texas, and Colorado (Halterman 1991). On October 3, 2014, the USFWS published a final rule designating the western distinct population segment of yellow-billed cuckoo as threatened (79 FR 59991–60038). Critical habitat for the western yellow-billed cuckoo was formally designated in 2014, but no critical habitat for this species is present in the Plan Area (79 FR 48548–48652). This species is also state listed as threatened. Studies conducted since the 1970s indicate that there may be fewer than 50 breeding pairs of western yellow-billed cuckoo in California (Gaines 1974; Halterman 1991; Laymon et al. 1997; 78 FR 192). Although sustained breeding populations occur to the north of the Plan Area at isolated sites along the Sacramento River, no western yellow-billed cuckoo breeding has been recorded recently in the Plan Area. The scattered sightings over the last 50 years are presumed to be from migrating birds.

The Plan Area supports an estimated 3,868 acres of modeled habitat for western yellow-billed cuckoo. Of this, covered activities will permanently remove up to 59 acres (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Take resulting from this habitat loss and other adverse effects,

described above, is not expected to adversely affect the long-term survival and conservation of western yellow-billed cuckoo for the following reasons.

- Cuckoo presence in the Plan Area is currently limited to infrequent migrants passing through the area.
- The potential breeding and migratory habitat to be lost is small (two percent) relative to the species' range and the amount of habitat that will remain in the Plan Area.
- Most permanently removed habitat consists of relatively small, fragmented riparian stands that are unlikely to support breeding populations of western yellow-billed cuckoo.

5.7.8.2 Beneficial Effects

The Yolo HCP/NCCP will protect 1,600 acres of unprotected valley foothill riparian natural community (Objective NC-VFR1.1), at least 500 acres of which will provide modeled habitat for western yellow-billed cuckoo (Objective WYBC1.1) (Table 5-6, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will restore valley foothill riparian natural community to result in no net loss of the valley foothill riparian natural community (Objective NC-VFR1.2), which will be restored to provide suitable habitat for western yellow-billed cuckoo (Objective WYBC1.2). The Yolo HCP/NCCP will prioritize conservation of habitat corridors along Cache Creek (Objective L1.4), Putah Creek (Objective L1.5), and Sacramento River/Yolo Bypass (L-1.6), each of which supports a large contiguous patch of modeled western yellow-billed cuckoo habitat, although there are no nesting records of the species in these areas. The Yolo HCP/NCCP will also enhance and maintain the functions of the protected and restored valley foothill riparian natural community by reducing the relative extent of nonnative plants that degrade habitat function, and improving native plant diversity and vegetation structure (Objective L-2.1).

The protection and restoration of large, interconnected blocks of habitat will benefit western yellow-billed cuckoo, as this species is particularly vulnerable to habitat fragmentation (U.S. Fish and Wildlife Service 2013). The control of invasive riparian plants will also benefit this species, as many invasive riparian plant species degrade habitat value for western yellow-billed cuckoo.

In the Plan Area, riparian areas primarily provide opportunities for western yellow-billed cuckoos to forage and rest during migration (no nesting of this species has been recorded in the Plan Area over the last 50 years). Moreover, the channelized and riprapped banks of rivers in parts the Plan Area provide few opportunities for river meandering and habitat restoration that would provide high-value yellow-billed cuckoo breeding habitat (Greco 2008). Western yellow-billed cuckoos will nest in a variety of marginal habitats, however, particularly at the edges of their range (Laymon 1998). The conserved habitat in the Plan Area will benefit migrating western yellow-billed cuckoos and may also increase nesting opportunities for this species in the Plan Area, although the likelihood for increased nesting is low because of the limited opportunities for restoring nesting populations in the Plan Area (Greco 2008).

5.7.8.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in no net loss of western yellow-billed cuckoo habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full implementation of the HCP/NCCP an estimated 45 percent of western yellow-billed cuckoo habitat in the Plan Area will be conserved on Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of these, at

least 500 acres will consist of lands held in conservation easements that are newly protected and enrolled into the Yolo HCP/NCCP reserve system. All reserve system lands supporting western yellow-billed cuckoo habitat will be monitored and adaptively managed to sustain habitat values for this species. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on western yellow-billed cuckoo, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.7.9 Western Burrowing Owl

The Plan Area includes 103,854 acres of modeled habitat for western burrowing owl, including 37,694 acres of primary habitat and 66,160 acres of other habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Primary habitat includes all suitable land cover types in preferred natural lands, pastures, and other open or barren areas on the lower slopes and valley floors. Other habitat includes selected pasture types where uncultivated field borders may be suitable for nesting burrows and fields that may be suitable for foraging. Additional detail on the habitat model is provided in Appendix A, *Covered Species Accounts*.

Although comprehensive surveys of the Plan Area have not been conducted, the Burrowing Owl Preservation Society, in partnership with the Institute for Bird Populations, conducted surveys in 2007 and 2014. Although these were not comprehensive county-wide surveys, the results indicate that the majority of *known* burrowing owl breeding locations are in the southern portion of Yolo County, centered in and around the City of Davis (in the Davis planning unit), the Yolo Bypass Wildlife Area (in the Yolo Basin Plains planning unit), and the South Yolo Bypass planning unit. No new occurrences were found during the 2014 surveys, although there may be breeding populations elsewhere in the planning area since the surveys were not comprehensive. These surveys do not represent the total number of burrowing owl breeding pairs, but they do indicate the locations of the most significant known breeding areas for the western burrowing owl in the Plan Area.

5.7.9.1 Adverse Effects

5.7.9.1.1 Habitat Loss and Fragmentation

Habitat loss and fragmentation are the primary factors that have led to the decline of western burrowing owls throughout California (California Department of Fish and Wildlife 2013; Gervais et al. 2008). Covered activities will remove up to 3,172 acres of modeled western burrowing owl habitat, including 861 acres of primary habitat and 2,311 acres of other habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). This loss represents three percent of the total western burrowing owl habitat in the Plan Area. Up to an additional 218 acres of other habitat and one acre of primary habitat will be temporarily removed through bridge replacement activities and other covered activities (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Each temporary disturbance is expected to be small, likely no greater than approximately ten acres (and often much less). Disturbance of small areas of cultivated lands during the 50-year permit term, with each disturbance to last for no more than one year, will remove minor amounts of foraging habitat but is unlikely to adversely affect western burrowing owl foraging behavior.

Western burrowing owls may be displaced from up to four occupied sites (an occupied site is a breeding or wintering burrow or burrow complex occupied by a single breeding pair or nonbreeding individual).

An estimated 19 percent (621 acres) of the western burrowing owl habitat loss will result from development in these urban planning units: Woodland, Davis, West Sacramento, and Winters (planning units 19–22; Table 5-5, *Covered Species Habitat Loss*). The remainder of the loss will be distributed throughout modeled habitat in the Plan Area, and will result from various activities such as rural development in Dunnigan Hills, Monument Hills, and Madison, and mining in the Lower Cache Creek planning unit (planning unit 7). Covered activities will not substantially reduce modeled habitat near known population centers of western burrowing owl, or result in fragmentation of western burrowing owl habitat.

5.7.9.1.2 Reduction in Habitat Function

In addition to habitat removal and fragmentation, described above, the following categories of covered activities could render habitat less suitable for the western burrowing owl.

Noise, vibrations, lighting, and human activity. Western burrowing owl may be vulnerable to noise, vibrations, lighting, and other disturbances related to human activity from construction of urban and rural development. Project proponents will minimize construction-related disturbance through implementation of *AMM18, Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl* (Chapter 4, Section 4.3.4, *Covered Species*).

Western burrowing owls may also be vulnerable to ongoing noise, vibrations, lighting, and visual disturbances as a result of human occupation of new developments. Increased disturbance of nesting birds by humans and dogs could diminish the ecological functions of western burrowing owl habitat adjacent to new development. Burrowing rodent populations, prey for burrowing owls, also could decline as a result of pets (i.e., domestic cats) and active control measures implemented as maintenance around new developments or facilities. Project proponents will minimize these effects through establishment of buffers as described in *AMM18, Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl* (Chapter 4, Section 4.3.4, *Covered Species*), and through leash laws, fencing, and other design measures described in *AMM2, Design Developments to Minimize Indirect Effects at Urban-Habitat Interface*.

Fire break maintenance. Management of some reserve system lands may require establishment and maintenance of new fire breaks. Maintenance of fire breaks (i.e., mowing or disking) is primarily expected to retain the existing land cover (e.g., grassland); however, disking or mowing during the dry season could alter vegetation structure of the fire breaks. Although this would not eliminate western burrowing owl habitat, it could decrease its function by reducing its suitability for rodents and other burrowing owl prey items. Although conservation actions could result in short-term loss of western burrowing owl habitat function, they will provide for long-term enhancement of habitat function.

Operations and maintenance. Operations and maintenance activities could indirectly affect surrounding western burrowing owl habitat through noise, lighting, and other disturbance related to human activity. Project proponents will implement to *AMM18, Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl*, to reduce these effects consistent with CDFW (2013) guidelines.

Conservation actions. Conservation actions could result in temporary noise and other disturbances to western burrowing owl habitat as a result of human activity. Project proponents will avoid and minimize these effects through adherence to *AMM18, Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl*, consistent with CDFW (2013) guidelines.

5.7.9.1.3 Harassment, Injury, or Mortality

Equipment and vehicles used to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, and agricultural and water infrastructure operations) could crush eggs and nestlings in burrows resulting in direct injury or mortality of western burrowing owls. Additionally, noise and other disturbances related to human activity associated with implementing the covered activities could cause adults to abandon nesting burrows, if present, or inhibit their brooding and feeding behaviors, which could cause juvenile mortality. Operation of construction equipment should not result in mortality or injury of adult individuals, however, because adult western burrowing owls are highly mobile.

Over the long-term, urban and rural development activities could affect the reproductive success of western burrowing owls. Western burrowing owls are sensitive to disturbances of nesting burrows during the reproductive period. Ongoing noise and other disturbances related to human activity associated with occupancy of new developments and facilities, in addition to disturbance by domestic cats and loose-running dogs, could disrupt nesting pairs, thereby reducing nest productivity. In addition, native or nonnative predators supported by human developments (e.g., raccoons, skunks) could cause mortality of western burrowing owl nestlings or fledglings, if nesting burrows are present near these developments.

Contaminants associated with construction, operations, and maintenance activities (e.g., fuel spills) could result in harassment, injury, or mortality of individual birds. These effects are unlikely, however, because western burrowing owls are expected to avoid work sites that generate ongoing noise and other disturbances related to human activity.

Project proponents will avoid and minimize these effects by implementing measures to identify and avoid habitat for western burrowing owls (*AMM18, Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl*).

5.7.9.1.4 Impact of Take on the Species

The breeding range of the western burrowing owl extends south from southern Canada throughout most of the western half of the United States and central Mexico. The winter range extends from central California southeast through Arizona, New Mexico, and Texas and south into northern and central Mexico, coinciding with southern breeding range where the species is resident year-round (Haug et al. 1993). Burrowing owls were once widespread and generally common over western North America in treeless, well-drained grassland, steppes, deserts, prairies, and agricultural lands (Haug et al. 1993). Burrowing owl populations throughout the species' North American range are reportedly declining (Klute et al. 2003).

The Plan Area supports an estimated 103,853 acres of modeled habitat for the western burrowing owl, of which covered activities will remove up to 3,172 acres (three percent). An estimated 62 percent of this loss is *other habitat*, which consists of cultivated lands that are typically less suitable for western burrowing owl than primary habitat. Take resulting from this habitat loss and other adverse effects, described above, is not expected to adversely affect the long-term survival and conservation of the species for the following reasons.

- The amount of habitat loss is small (three percent of habitat in Plan Area) relative to the species range and the amount remaining in the Plan Area.

- Implementation of the avoidance and minimization measures will substantially minimize effects on occupied burrowing owl burrows.

5.7.9.2 Beneficial Effects

The Yolo HCP/NCCP will protect 3,000 acres of unprotected modeled primary habitat (Objective WBO1.1, CM1) and at least 2,500 acres of unprotected modeled other habitat (Objective WBO1.2) for the western burrowing owl (Table 5-6, *Covered Species Benefits and Net Effects*). Additional western burrowing owl habitat is likely to be protected to meet the Swainson's hawk habitat protection commitment (Objective SH1.1, CM1) because much of the Swainson's hawk modeled cultivated lands foraging habitat is also modeled habitat for western burrowing owl (Appendix A, *Species Accounts*, Figures A-6 and A-9). Within the protected burrowing owl habitat, the Conservancy will prioritize acquisition of occupied habitat in the Yolo Bypass and adjacent lands, the area with the greatest potential for long-term sustainability of the species, and acquisition of lands adjacent to protected occupied sites that have enhancement potential (Objective WBO1.3).

Protected western burrowing owl habitat will be managed and enhanced to improve habitat value for the species. The Yolo HCP/NCCP will enhance and maintain the functions of protected grassland (primary habitat) by installing artificial burrows, creating conditions for increasing the abundance of native rodents and reducing the relative cover of nonnative grasses and forbs that reduces habitat value for covered and native species (Objectives WBO 1.5, NC-G1.2). The Yolo HCP/NCCP will also maintain and enhance the cultivated lands seminatural community (other habitat) to maintain or increase the abundance of native rodent species that provide prey for raptors (Objective NC-CL1.4).

5.7.9.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in an estimated net three percent decrease of modeled western burrowing owl habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full implementation of the Yolo HCP/NCCP, an estimated 17 percent of the burrowing owl habitat in the Plan Area will be conserved on Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of these lands, at least 5,500 acres will consist of newly protected lands supporting modeled western burrowing owl habitat, which will be incorporated into the reserve system, and an additional 1,100 acres of pre-permit reserve lands supporting modeled western burrowing owl habitat will be enrolled into the reserve system. All reserve system lands will be monitored and adaptively managed to sustain habitat value for this species. The Conservancy will prioritize acquisition in areas occupied by the species that have the highest potential for sustainability, and lands with enhancement potential adjacent to protected, occupied sites. Therefore, the Yolo HCP/NCCP will minimize and mitigate impacts on western burrowing owl, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.7.10 Least Bell's Vireo

The Plan Area includes 4,719 acres of modeled least Bell's vireo habitat (Table 5-2, *Habitat-Based Take Limits, Covered Species*). The model for least Bell's vireo habitat consists of various land cover types in the valley foothill riparian natural community. Detail on the habitat model is provided in Appendix A, *Covered Species Accounts*. The USFWS indicates that the least Bell's vireo may have been extirpated from the Plan Area by 1996 (51 FR 16474). In April 2010, however, two least Bell's vireos were positively identified in the southern portion of the Yolo Bypass Wildlife Area, and the two birds

subsequently returned in the spring of 2011 (Appendix A, *Covered Species Accounts*). Least Bell's vireo was confirmed nesting in the Putah Creek Sinks in the Yolo Bypass Wildlife Area on April 26, 2010, although nesting was not successful (Whisler pers. comm. 2015). It is likely to occur during the permit term, however, because incidences of breeding least Bell's vireos have been increasing in the species' northern range.

5.7.10.1 Adverse Effects

5.7.10.1.1 Habitat Loss and Fragmentation

Habitat loss is a major factor that had contributed to the decline of least Bell's vireo (Kus 2002). Covered activities will permanently remove up to 39 acres (less than one percent) of modeled least Bell's vireo habitat in the Plan Area (Table 5-2, *Habitat-Based Take Limits, Covered Species*). No least Bell's vireo habitat will be temporarily lost as a result of covered activities.

An estimated 10 percent (three acres) of the least Bell's vireo habitat loss will result from operations and maintenance activities, including stream maintenance and enhancement along Cache Creek through the Cache Creek Resources Management Plan. The remainder of the habitat loss is distributed among planning units 7, 12, 14, and 17 (Table 5-5, *Covered Species Habitat Loss*).

5.7.10.1.2 Reduction in Habitat Function

In addition to habitat removal, described above, the following categories of covered activities could render habitat less suitable for the least Bell's vireo.

Noise and lighting. Noise and lighting from urban and rural development (temporary from construction, or permanent and ongoing from the occupation of developed areas) could render nearby least Bell's vireo habitat less suitable for the species, and cause least Bell's vireos to avoid these areas or diminish reproductive success. Traffic noise, for example, can reduce the distance over which acoustic signals such as song can be detected by migratory birds, an effect known as acoustic interference, which can impair the ability of birds to communicate with mates (Parris and Schneider 2008). Lighting has also been documented to adversely affect birds. Orientation under artificial lighting may result in alteration of bird behavior, such as causing diurnal birds to forage or sing at night or causing abnormal seasonal timing of migration and initiation of breeding behavior, although the effects of these altered behaviors on bird fitness are unknown (Longcore and Rich 2004). Birds can also be disoriented and entrapped by lights at night, causing them to stay in an area that they would normally migrate through (Longcore and Rich 2004).

Humans and pets. The permanent, ongoing effect of increased activity of humans and pets in the vicinity of developed areas could reduce the suitability of least Bell's vireo habitat. Bird species richness in riparian areas has been found to decline as the level of development on surrounding lands increases, particularly as a factor of the density of buildings within 1,500 meters of riparian habitat (Miller et al. 2003). Least Bell's vireos often nest near trails, and human disturbance such as trampling of nests or nest trees or clearing of vegetation can result in nest failure and abandonment (Kus 2002).

Invasive plants. Urban and rural development could result in the introduction and spread of invasive plant species that could in turn degrade least Bell's vireo habitat. The degradation of riparian habitat as a result of invasion by nonnative species is a threat to least Bell's vireo (Kus 2002). Project proponents will implement *AMM2, Design Developments to Minimize Indirect Effects*

at Urban-Habitat Interface (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*) to minimize the spread of invasive species as a result of urban and rural development.

5.7.10.1.3 Harassment, Injury, or Mortality

Operation of equipment and vehicles to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, and agricultural and water infrastructure operations) could result in injury or mortality of least Bell's vireo, as individual vireo nests could be crushed by moving construction-related equipment, and nests or juveniles could be abandoned due to disturbance, leading to nesting failure or juvenile mortality.

Contaminants associated with construction, operations, and maintenance activities (e.g., fuel spills) could result in injury or mortality of individual birds. The likelihood of this occurring is low, however, because least Bell's vireo is a highly mobile species that can readily avoid such hazards and is expected to avoid work sites that produce ongoing noise and other construction-related disturbances.

5.7.10.1.4 Impact of Take on the Species

The least Bell's vireo's historical breeding distribution in California once extended from coastal southern California through the San Joaquin and Sacramento Valleys as far north as Tehama County near Red Bluff. The Sacramento and San Joaquin Valleys are considered the center of the species' historical breeding range, supporting 60 to 80 percent of the historical population (51 FR 16474). Coinciding with widespread loss of riparian vegetation throughout California (Katibah 1984), Grinnell and Miller (1944) began to detect population declines in the Sacramento and San Joaquin Valley region. Surveys conducted in the late 1970s (Goldwasser et al. 1980) detected no least Bell's vireos in the Sacramento and San Joaquin Valleys, and the species was considered extirpated from the region. In 1986, the estimated statewide least Bell's vireo population was approximately 300 pairs (51 FR 16474), and the population was confined to southern California. By 1998, the population had increased to an estimated 2,000 pairs after extensive cowbird trapping efforts (Kus 2002), but the population remained confined to southern California. Recent sightings have been recorded in Yolo County, however, including 2010 and 2011 observations as described above, suggesting that the species range has expanded towards the northern extent of its historical breeding range. The recent sightings in the Yolo Bypass represent one of 300 occurrences recorded throughout the state (Appendix A, *Covered Species Accounts*). Covered activities are not expected to affect this occurrence. Breeding of least Bell's vireo has been not been documented in the Plan Area since the 1970s.

Based on modeled habitat for the least Bell's vireo, the Plan Area supports an estimated 4,719 acres of potentially suitable nesting and migratory habitat. Of this, covered activities will permanently remove up to 39 acres (less than one percent) (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Take resulting from this habitat loss and other adverse effects, described above, is not expected to adversely affect the long-term survival and conservation of the species for the following reasons.

- Least Bell's vireo occurrence is expected to be uncommon in the Plan Area.

- The nesting and migratory habitat to be lost is small relative to the amount of habitat in the Plan Area and the species range throughout California.
- Most of the permanently removed habitat consists of relatively small, fragmented riparian stands that provide low-value habitat for the vireo.

5.7.10.2 Beneficial Effects

The Yolo HCP/NCCP will protect 1,600 acres (Objective NC-VFR1.1) of unprotected valley foothill riparian natural community and restore 608 acres of this natural community (Objective NC-VFR1.2) (Table 5-6, *Covered Species Benefits and Net Effects*). Within this acreage, the Yolo HCP/NCCP will protect and restore 1,208 acres of least Bell's vireo habitat (600 acres protected and 608 restored) if all habitat loss occurs (Objectives LBV1.1). The Yolo HCP/NCCP will focus conservation within a habitat corridor along Cache Creek (Objectives L1.5), Putah Creek (Objective L1.6), and Sacramento River (Objective L.7), each of which supports a large contiguous patch of modeled least Bell's vireo habitat. The Yolo HCP/NCCP will also enhance and maintain the functions of the protected and restored valley foothill riparian community by reducing the relative extent of nonnative plants that degrade habitat function, and improving native plant diversity and vegetation structure.

The protection and restoration of large, interconnected blocks of habitat will benefit least Bell's vireo, countering the habitat fragmentation that is a primary factor contributing to this species' decline (Kus 2002). The control of invasive riparian plants will also benefit this species, as many invasive riparian plant species degrade habitat value for least Bell's vireo (Kus 2002). The conserved habitat will increase nesting opportunities for this species in the Plan Area.

5.7.10.3 Net Effects

The Yolo HCP/NCCP will result in an estimated 11 percent net increase of least Bell's vireo habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full implementation of the HCP/NCCP, an estimated 63 percent of least Bell's vireo habitat in the Plan Area will be conserved in Category 1 and 2 public and easement lands, including baseline and newly protected lands. Of these Category 1 and 2 public and easement lands, at least 1,168 acres (600 protected and 568 restored) will consist of newly protected lands that will be incorporated into the reserve system. All of the least Bell's vireo habitat in the reserve system will be monitored and adaptively managed to sustain habitat values for this species. The Yolo HCP/NCCP will minimize and mitigate impacts on least Bell's vireo to the maximum extent practicable and provide for the conservation of this species in the Plan Area.

5.7.11 Bank Swallow

The Plan Area includes 962 acres of modeled nesting habitat for bank swallow (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Modeled habitat for the bank swallow includes stream channels with suitable nesting substrate of vertical and friable river banks free of rip-rap (barren-gravel and sand bars land cover type). An active colony of bank swallow is present along the Cache Creek corridor, where bank swallows have nested on the banks of off-channel aggregate mines. In 2000, four colonies with an estimated 202 pairs were found along the Sacramento River in Yolo County between Verona and Knights Landing (Schlorff and Swolgaard unpublished data).

5.7.11.1 Adverse Effects

5.7.11.1.1 Habitat Loss and Fragmentation

One of the greatest threats to the bank swallow is ongoing habitat loss (Garrison 1998). There will be no permanent loss of bank swallow habitat as a result of covered activities. Up to 37 acres of barren floodplain providing potential bank swallow nesting habitat may be permanently affected by bank stabilization activities along Cache Creek, undertaken through the CCRMP as needed to protect property or valuable resources. The Conservancy expects that additional barren floodplain will form during the 50-year permit term, however, as a result of the natural, dynamic fluvial processes along Cache Creek. All covered activities, however, will avoid nesting colonies as described in *AMM20*, *Minimize Take and Adverse Effects on Habitat of Bank Swallow* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*).

Covered activities are not expected to fragment bank swallow habitat because the amount of habitat removal will be minimal and temporary.

5.7.11.1.2 Reduction in Habitat Function

In addition to habitat removal, described above, the following categories of covered activities could render habitat less suitable for bank swallow.

Mining. With the exception of mining, urban and rural development is not expected to occur in the vicinity of bank swallow habitat and, therefore, is not expected to affect the bank swallow. Mining activities will maintain a minimum 200-foot buffer adjacent to bank swallow habitat, consistent with guidance in the *Bank Swallow* (Riparian riparia) *Conservation Strategy for the Sacramento River Watershed* (Bank Swallow Technical Advisory Committee 2013). Bank swallows appear relatively insensitive to moderate levels of disturbance. Banks swallows have been nesting successfully along Cache Creek in the vicinity of mining activities, and colonies are known to persist in the vicinity of active farming, major roads, and public seashores where human activity can be substantial (Garrison 1998).

Operations and maintenance. Heavy equipment used for operations and maintenance activities generate noise that could affect western bank swallow, and humans and equipment could cause other disturbances related to human activity that result in bank swallows avoiding nearby areas. These effects would be similar to those described above for urban and rural development, and are expected to have minimal effect on the species. As described in *AMM20, Minimize Take and Adverse Effects on Habitat of Bank Swallow* (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*), operations and maintenance activities will typically maintain a 200-foot setback from active bank swallow colonies. Project proponents may apply a smaller buffer with approval by the Conservancy, USFWS, and CDFW.

Conservation actions. Conservation actions could result in temporary noise and other disturbances related to human activity in bank swallow habitat. As described above for urban and rural development, however, this effect is expected to be minimal.

5.7.11.1.3 Harassment, Injury, or Mortality

Equipment and vehicles used to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, and agricultural and water infrastructure operations) could result in direct injury or mortality of bank swallow. The

likelihood that nests or nestling birds would be injured or killed by equipment or vehicles is extremely low, because bank swallows usually nest in steep, eroding banks along streams. Burrow collapse due to human-related alteration of banks has been found to be the most significant, direct cause of mortality. Disturbance of incubating or nesting adults could lead to abandonment of the nest, or reduced brooding or feeding of young, which could lead to juvenile mortality. Project proponents will implement *AMM20*, *Minimize Take and Adverse Effects on Habitat of Bank Swallow*, including establishment of 200-foot setbacks from nesting colonies, to avoid harassment, injury, or mortality of individuals and nesting colonies.

5.7.11.1.4 Impact of Take on the Species

During the breeding season, bank swallows range throughout most of Alaska and Canada, southward from eastern Montana to Nevada, and eastward across the United States to Georgia. They are variably distributed throughout California, Texas, and New Mexico. In California, regular breeding occurs in Siskiyou, Shasta, Lassen, and Yolo Counties, and along the Sacramento River from Shasta County south to Yolo County. In the Plan Area, they nest along the Sacramento River and Cache Creek. Between 2000 and 2008, estimated numbers of breeding pairs in California have fluctuated between 6,320 and 8,530 (Garcia et al. 2008).

The Plan Area supports an estimated 962 acres of modeled bank swallow habitat. Of this, up to 37 acres will be removed by covered activities, although additional habitat is expected to be created through natural fluvial processes. Take resulting from this habitat loss and other adverse effects, described above, is not expected to adversely affect the long-term survival and conservation of the species for the following reasons.

- The species is relatively widespread outside the Plan Area.
- The habitat to be lost is temporary and is small (four percent) relative to the species range and the amount that will remain in the Plan Area.
- Avoidance and minimization measures will protect bank swallows from effects that may otherwise result from covered activities.

5.7.11.2 Beneficial Effects

The Yolo HCP/NCCP will conserve land within a habitat corridor along Cache Creek (Objective L1.4), which supports much of the bank swallow habitat in the Plan Area. In this area, the Yolo HCP/NCCP will protect at least 50 acres of unprotected bank swallow habitat, on a site that is occupied by bank swallows (Objectives BS1.1) (Table 5-6, *Covered Species Benefits and Net Effects*). Additionally, the Conservancy will manage the protected floodplain along Cache Creek to provide high-value foraging habitat for bank swallows by promoting open grass and wildflower vegetation and by controlling invasive plant species (Objective BS1.2). Natural floodplain land cover, particularly riparian grassland, provides vital foraging habitat for locally nesting bank swallow colonies (Bank Swallow Technical Advisory Committee 2013). These actions are expected to sustain the bank swallow nesting population along Cache Creek.

5.7.11.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in no 4 percent decrease in bank swallow habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full HCP/NCCP implementation, an estimated six percent of the bank swallow habitat in the Plan Area will be

conserved in Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of this, 50 acres of protected habitat will be monitored and adaptively managed to sustain habitat values for this species. The Yolo HCP/NCCP will minimize and mitigate impacts on the bank swallow, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.7.12 Tricolored Blackbird

The Plan Area includes 265,813 acres of tricolored blackbird habitat, with 4,680 acres of nesting habitat and 261,133 acres of foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Nesting habitat includes marsh vegetation (e.g., bulrush and cattail) or thorny vegetation (e.g., blackberry) in the Yolo Bypass, Capay Valley, and Dunnigan Hills areas. Foraging habitat includes all potentially suitable vegetation types within eight miles of nesting habitat. Foraging habitat generally consists of grassland and agricultural areas with similar structure (e.g., pasture, grain and hay crops). The model also includes known recent colonies and sightings. Additional detail on the habitat model is provided in Appendix A, *Covered Species Accounts*.

Although comprehensive surveys of the Plan Area have not been conducted, species locality databases document 14 colonies in Yolo County from 1994 to 2004 (Appendix A, *Covered Species Accounts*). Most of these occurrences were recorded within and adjacent to the Willow Slough Basin planning unit, and several recent colonies and sightings were recorded in the North and South Yolo Bypass planning units. Surveys in 2007 identified a colony of 30,000 breeding adults nesting in milk thistle on the Conaway Ranch in the Yolo Bypass. The model for nesting habitat includes most of the records for the North and South Yolo Bypass planning units but does not include the colony records in the Willow Slough Basin planning unit. Based on a review of aerial imagery, it is likely that these nesting colonies are in small patches of nesting habitat below the minimum mapping unit used for the land cover mapping.

5.7.12.1 Adverse Effects

5.7.12.1.1 Habitat Loss and Fragmentation

One of the greatest threats to tricolored blackbird is the direct loss of habitat from human activities (Beedy and Hamilton 1999). Covered activities will permanently remove up to 9,028 acres of modeled tricolored blackbird habitat, including 86 acres of nesting habitat and 8,942 acres of foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). This loss represents one percent of the total tricolored blackbird modeled habitat in the Plan Area. Additionally, covered activities will temporarily remove up to 230 acres of foraging habitat (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). Each temporary disturbance is expected to be small, likely no greater than approximately ten acres (and often much less). Disturbance of small areas of cultivated lands during the 50-year permit term, with each disturbance to last for no more than one year, will remove minor amounts of foraging habitat but is unlikely to adversely affect tricolored blackbird foraging behavior. Cultivated lands regularly experience temporary disturbances and continue to provide habitat for tricolored blackbird when the disturbance is completed.

An estimated 43 percent of the tricolored blackbird habitat loss will result from urban development in the urban planning units: Woodland, Davis, West Sacramento, and Winters (planning units 19, 20, 21, and 22; Table 5-5, *Covered Species Habitat Loss*). Roughly half of the nesting habitat losses (48 acres) in the Plan Area are modeled in the West Sacramento planning unit and likely to result from

levee improvements. The remainder of the habitat loss will be distributed throughout modeled habitat in the Plan Area, and will result from various activities such as unincorporated community development in Dunnigan Hills, Monument Hills, and Madison. An estimated 11 percent (1,030 acres) of tricolored blackbird habitat loss will result from habitat restoration (Table 5-5, *Covered Species Habitat Loss*). Of this, 91 acres involve conversion of foraging habitat to fresh emergent wetland that will provide nesting habitat value for tricolored blackbird. Covered activities are not expected to reduce modeled habitat near known colonies of tricolored blackbird, or result in fragmentation of modeled tricolored blackbird habitat.

Ascent Environmental assessed the effects of fragmentation that would potentially result from tricolored blackbird foraging habitat being removed from the vicinity of surrounding foraging habitat (Appendix O, *Fragmentation Effects*). They identified foraging habitat within 8 miles of the nesting habitat that will be removed (based on the distance the species typically forages from the nest). They deducted the upland habitat acreage that would be directly removed by covered activities. Of the habitat that would remain after loss resulting from covered activities, they identified areas that would remain within 8 miles of nesting habitat. They estimated that with the expected nesting habitat loss, all foraging habitat would still be within 8 miles of nesting habitat.

5.7.12.1.2 Reduction in Habitat Function

In addition to habitat removal and fragmentation, described above, the following categories of covered activities could render habitat less suitable for tricolored blackbird.

Noise, vibrations, lighting, and human activity. Nesting tricolored blackbirds are sensitive to noise, vibrations, lighting, and other human-related disturbance from construction or urban and rural development, and similar ongoing disturbances to nearby habitat as a result of human occupation. The ecological functions of tricolored blackbird nesting and foraging habitat adjacent to new urban and rural developments (e.g., aggregate mining in Lower Cache Creek) could be diminished as a result of ongoing noise, pet-related, and other disturbances related to human activity associated with occupancy of new infrastructure and disturbance associated with developments.

Project proponents will minimize these effects through the establishment of buffers as described in *AMM20, Minimize Take and Adverse Effects on Habitat of Tricolored Blackbird*, and implementation of design measures described in *AMM2, Design Developments to Minimize Indirect Effects at Urban-Habitat Interface* (Chapter 4, Section 4.3.4, *Covered Species*).

Operations and maintenance. Operations and maintenance activities could indirectly affect surrounding tricolored blackbird habitat through noise, lighting, and other disturbance related to human activity as described above for urban and rural development. Project proponents will adhere to *AMM20, Minimize Take and Adverse Effects on Habitat of Tricolored Blackbird*, to reduce effects on nesting habitat during the nesting season.

Conservation actions. Conservation actions could result in temporary noise and other disturbances to tricolored blackbird habitat related to human activity. Project proponents, however, will avoid and minimize these effects through adherence to *AMM21, Minimize Take and Adverse Effects on Habitat of Tricolored Blackbird*.

5.7.12.1.3 Harassment, Injury, or Mortality

Equipment and vehicles used to implement covered activities (e.g., construction of new developments, restoration of habitat, maintenance of new and existing facilities, and agricultural and water infrastructure operations) could crush individual tricolored blackbird nests or cause nest disturbance that leads to juvenile abandonment and subsequent nesting failure or juvenile mortality.

Over the long-term, urban and rural development activities could affect the reproductive success of tricolored blackbird. Increased presence of vehicles and equipment could result in increased collisions with blackbirds on rural roads. Ongoing noise and other disturbances associated with occupancy of new infrastructure and developments, in addition to disturbance by domestic cats and loose-running dogs, could disrupt nesting colonies, thereby reducing nest productivity. In addition, native or nonnative predators supported by human developments (e.g., crows, coyotes) could cause mortality of eggs, nestlings, or fledglings located near new permanent developments.

Contaminants associated with construction, operations, and maintenance activities (e.g., fuel spills) could result in harassment, injury, or mortality of individual birds. The likelihood of these effects is low, however, because tricolored blackbird is a highly mobile species that can readily avoid such hazards and is expected to avoid work sites that generate ongoing noise and other construction-related disturbances.

Project proponents will avoid and minimize these potential effects through implementation of *AMM21, Minimize Take and Adverse Effects on Habitat of Tricolored Blackbird*.

Normal and routine farming practices on cultivated lands in the reserve system are not expected to result in injury or mortality of tricolored blackbirds because the species is mobile and can move out of harms way, and because the species is adapted to foraging in an agricultural setting. Tricolored blackbirds potentially nest in grain crops in counties other than Yolo. If they nest in grain crops in the Plan Area there is potential for crop harvesting to result in injury or mortality of eggs or chicks. This effect will be avoided, however, through implementation of the measures described in Section 4.3.5.7, *Tricolored Blackbird.*

5.7.12.1.4 Impact of Take on the Species

The tricolored blackbird is a colonial nesting passerine that is largely restricted to California. More than 95 percent of the California breeding population of tricolored blackbirds occurs in the Central Valley (Kyle and Kelsey 2011). Breeding also occurs in the foothills of the Sierra Nevada south to Kern County, the coastal slopes from Sonoma County to the Mexican border, and sporadically in the Modoc Plateau. The Plan Area constitutes a relatively small portion of the species' total range. Although the overall range of the tricolored blackbird is largely unchanged since the 1930s (Neff 1937; Hamilton 1998), large gaps now exist in the species' former range. Surveys during the 1990s (Hamilton et al. 1994; Beedy and Hamilton 1997; Hamilton 2004) indicated a significant declining trend in California populations since the 1930s, and a particularly dramatic decline since 1994. Statewide surveys conducted during the 2000s indicated some recovery from the recent (1999) population low; however, the population increases have primarily been limited to the San Joaquin Valley and the Tulare Basin (Kyle and Kelsey 2011). Recent surveys revealed very few nesting colonies in the Plan Area (Meese pers. comm.).

The Plan Area supports an estimated 265,813 acres of modeled tricolored blackbird habitat: 4,680 acres of nesting habitat and 261,133 acres of foraging habitat. Covered activities will remove 9,028 acres (three percent) of the modeled habitat in the Plan Area, 8,942 acres of which is foraging habitat and 86 acres of which is nesting habitat for tricolored blackbirds (Table 5-2, *Habitat-Based Take Limits, by Covered Species*). This habitat loss and other adverse effects on tricolored blackbird resulting from covered activities, as described above, are not expected to adversely affect the long-term survival and conservation of the species for the following reasons.

- The habitat loss is small (one percent of habitat in the Plan Area) relative to the species range and the amount that will remain in the Plan Area.
- Most of the loss of foraging habitat will be to cultivated lands that are abundant throughout the Plan Area.
- The avoidance and minimization measures will minimize effects on nesting colonies.

5.7.12.2 Beneficial Effects

The protection of grassland and cultivated lands seminatural community (Objectives NC-CL1.1, NC-CL1.2, and NC-G1.1) is expected to contribute an estimated 16,610 acres of tricolored blackbird foraging habitat to the reserve system (Table 5-6, *Covered Species Benefits and Net Effects*). The Yolo HCP/NCCP will also protect 500 acres of fresh emergent wetland natural community (Objective NC-FEW1.1), at least 200 acres of which will be sited in modeled tricolored blackbird nesting habitat (Objective TRBL1.1 and Table 5-6, *Covered Species Benefits and Net Effects*). The Yolo HCP/NCCP will restore fresh emergent wetland to achieve no net loss of this natural community (Objective NC-FEW1.2), potentially providing additional nesting opportunities for tricolored blackbird. Additionally, at least 4,150 acres of existing protected tricolored blackbird habitat on pre-permit reserve lands will be enrolled into the reserve system, including 4,000 acres of foraging habitat and 150 acres of nesting habitat (Objective TRBL1.2). The reserve system will include at least two tricolored blackbird colonies, which will be managed to maintain the colonies (Objective TRBL1.3), and the Conservancy will prioritize protection of additional colonies as they are found.

5.7.12.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in no net change in acres of tricolored blackbird nesting habitat, and a net three percent decrease in tricolored blackbird foraging habitat in the Plan Area (Table 5-6, *Covered Species Benefits and Net Effects*). With full implementation, an estimated 49 percent of nesting habitat (2,260 acres) and 14 percent of foraging habitat (34,529 acres) for tricolored blackbird in the Plan Area will be conserved in Category 1 and 2 public and easement lands (Table 5-6, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of these Category 1 and 2 public and easement lands, at least 16,810 acres will be newly protected lands in the reserve system, and an additional 4,150 acres of pre-permit reserve lands will be enrolled into the reserve system. All reserve system lands supporting tricolored blackbird habitat will be monitored and adaptively managed to sustain habitat value for tricolored blackbird. The Yolo HCP/NCCP will minimize and mitigate impacts on tricolored blackbird, to the maximum extent practicable, and provide for the conservation of this species in the Plan Area.

5.8 Cumulative Effects

As described above, the effects of covered activities were assessed in the context of existing conditions in the Plan Area. Some activities and projects that are outside the scope of the Yolo HCP/NCCP may nonetheless contribute to cumulative effects on covered species. An analysis of cumulative effects is not required in an HCP or NCCP; however, the Conservancy provides one here to support the federal biological opinion for the USFWS Section 7 internal consultation process (Chapter 1, *Introduction*, provides details). The scope of the cumulative analysis in a biological opinion is limited to non-federal actions because federal actions (i.e., any federal project, project with federal funding, or project that requires a federal permit) will be the subject of future Section 7 consultations in which cumulative effects can be considered more fully. To support this analysis, the cumulative projects evaluated in this section are limited to non-federal projects that are not covered by the Yolo HCP/NCCP. The EIS/EIR prepared for the Yolo HCP/NCCP presents a thorough analysis of the cumulative effects of all projects, federal and non-federal, when combined with the effects of the Yolo HCP/NCCP (Yolo Habitat Conservancy 2017).

5.8.1 Flood Control Infrastructure and Improvements

This section addresses local and state flood control infrastructure and improvements that are not covered under the Yolo HCP/NCCP. The California Department of Water Resources (DWR) maintains flood control levees along the Sacramento River and the Yolo Bypass. Levee maintenance activities are expected to be ongoing throughout the permit term of the Yolo HCP/NCCP. DWR levee maintenance and improvement activities are expected to result in the periodic removal of riparian vegetation that may support habitat for western yellow-billed cuckoo, least Bell's vireo, and valley elderberry longhorn beetle between levee improvement and maintenance events. Ongoing maintenance of levees and channel banks will perpetuate conditions that inhibit the natural floodplain processes (i.e., sedimentation, erosion, and channel migration); natural floodplain processes support the establishment of riparian vegetation that provides habitat for riparian-associated covered species. Effects on covered species from flood control infrastructure maintenance and improvement activities implemented by local flood control agencies[16] would be similar to those described for DWR actions.

DWR's FloodSafe Program is in the process of developing the Central Valley Flood Management Planning Program, which will identify flood improvement projects to be implemented over many years in the Central Valley (California Department of Water Resources 2010). The draft plan identified the potential development of an expansion of the Yolo Bypass (California Department of Water Resources 2012). Expansion of the Yolo Bypass capacity could remove agricultural lands from production of crop types that support habitat for western pond turtle, giant garter snake, Swainson's hawk, white-tailed kite, western burrowing owl, and tricolored blackbird. The proposed expansion could affect the core occupied habitat area of the Willow Slough/Yolo Bypass giant garter snake subpopulation adjacent to and west of the bypass. Additional agricultural lands could be removed from production during years that the bypass is operated, if the timing of flooding precludes cultivation of crops or if the frequency of bypass operation is such that it becomes no longer economically feasible to farm within the flood footprint of the bypass. Changes to the operation of

[16] For example, local reclamation and water districts that are not covered under the Yolo HCP/NCCP through Certificates of Inclusion.

the bypass could also result in increases in drowning of giant garter snakes that hibernate within the expanded bypass area and that cannot escape inundation.

5.8.2 Ongoing Management and Use of State Wildlife Areas

The Yolo Bypass Wildlife Area, Sacramento Bypass Wildlife Area, and Fremont Weir State Wildlife Area are located within the Plan Area in the Yolo Bypass. CDFW manages these wildlife areas primarily for controlled recreation (e.g., bird watching, hunting) and environmental education (e.g., school tours). CDFW manages the Yolo Bypass Wildlife Area primarily to provide habitat for wintering waterfowl and migratory shorebirds and for waterfowl viewing and hunting, as well as educational activities in partnership with the Yolo Basin Foundation. CDFW generally passively manages the Sacramento Bypass and Fremont Weir State Wildlife Area as natural habitat areas. Management of these wildlife areas includes maintenance of existing recreational access and facilities. Any proposed expansion of these facilities could result in removal of riparian, wetland, herbaceous, and agricultural land cover types that support modeled habitat for valley elderberry longhorn beetle, California tiger salamander, western pond turtle, giant garter snake, Swainson's hawk, white-tailed kite, western burrowing owl, least Bell's vireo, and tricolored blackbird. Effects of removing these habitats on associated covered species are expected to be minimal, however, because CDFW is expected to design any such expansion of facilities to avoid and minimize adverse effects on sensitive resources.

Habitat management practices (e.g., the areal extent of maintained habitat types) that CDFW implements in the Yolo Bypass Wildlife Area are expected to change over the term of the Yolo HCP/NCCP. Changes in the acreage of each managed habitat could reduce or increase the availability or value of habitat for western pond turtle, giant garter snake, Swainson's hawk, white-tailed kite, and tricolored blackbird.

5.8.3 Wind Energy Development

Wind energy development and operation is not a covered activity under the Yolo HCP/NCCP. The Yolo County General Plan Policies CC-4.5 and PF-10.2 encourage small- and large-scale wind energy development, and individual and community-based wind energy developments (Yolo County 2009); and Section 8-2.2418 of the County Code provides for the construction and operation of wind turbines on lands designated as agriculture within its jurisdiction. By Yolo County ordinance, large utility-scale wind energy systems are limited to lands zoned for specified agricultural uses, and small wind energy systems for onsite energy use may be established in specified lands zoned for agriculture, residential, commercial, and industrial uses.

Wind turbine farms are expected to include large commercial operations and smaller noncommercial operations comprising from one to several small turbines. Construction of wind turbine towers could remove agricultural, grassland, and riparian land cover types within the footprint of towers and associated facilities (e.g., maintenance roads and transmission lines). Removal of these land cover types, depending on their location, could remove habitat for all covered species except those that are valley foothill riparian obligates (i.e., western yellow-billed cuckoo, least Bell's vireo, tricolored blackbirds, and bank swallow). Construction and operation and maintenance equipment could result in death or injury of covered amphibian and reptile species and western burrowing owl, if present at project sites.

Rotating wind turbine blades are known to cause mortality or injury of birds during seasonal migrations and local foraging flights. The susceptibility of each species for wind turbine fatalities is a function of its flight behavior (e.g., flying height above the ground), wind speed, and atmospheric conditions (e.g., fog). Operation of wind turbines in the Plan Area could result in injury and mortality of all the covered bird species, though the flight location and behavior of some species are such that risk for turbine-collision mortality would be minimal (e.g., western yellow-billed cuckoo).

5.8.4 Solar Farms

Solar farms are not covered activities under the Yolo HCP/NCCP. As of the preparation of this HCP/NCCP, there are no solar farms being planning in the Plan Area. Solar farm projects may occur, however, during the 50-year permit term. Construction of solar farms may result in habitat loss and fragmentation. Additionally, covered bird species may be injured or killed as a result of striking solar panels due to the "lake effect" in which birds and their insect prey mistake reflective solar panels for water bodies. Concentrated solar plants can kill birds as they are incinerated while flying through the concentrated beams of light (American Bird Conservancy 2015).

5.8.5 Utilities Infrastructure

The PG&E HCP would cover activities associated with PG&E's utility infrastructure and these activities are not covered by the Yolo HCP/NCCP, except as necessary for development identified in the General Plans. During the Yolo HCP/NCCP permit term, new or replacement gas and electric utility infrastructure and facilities (e.g., gas pipelines, electric transmission lines, and substations) that are not covered under the Yolo HCP/NCCP could be constructed and operated within the Plan Area. Depending on where such facilities are located and the constructed footprints of these and associated facilities (e.g., maintenance roads), habitat for any of the covered species could be removed. Operation of construction and maintenance equipment could result in mortality and injury of covered amphibian and reptile species and western burrowing owl, if present at construction sites. New aboveground electric transmission lines would also create a collision and electrocution hazard for covered bird species, although Swainson's hawk is likely to be more susceptible to these hazards because of its foraging flight habits. Pacific Gas & Electric Company (PG&E) owns and operates most utilities in the Plan Area. PG&E is developing their own HCP for all operations and maintenance of their electric and gas utility lines (distribution and transmission) throughout the Sacramento Valley, including all of Yolo County.

5.8.6 Agricultural and Ranching Practices

The Yolo HCP/NCCP does not cover routine cultivation practices on agricultural lands and grazing practices by agricultural and ranching operations outside the Yolo HCP/NCCP reserve system and the neighboring landowner protection program. These activities will continue over the Yolo HCP/NCCP permit term.

Ongoing farming practices, such as the operation of farm equipment to till and harvest fields and to maintain irrigation water delivery channels, could result in injury or mortality of western pond turtle and giant garter snake if present when equipment is operated. Ongoing ranching operations such as road construction, road maintenance, and livestock grazing may limit or degrade habitat for covered species, including California tiger salamander and western pond turtle. Ranching activities such as pond maintenance and moderate livestock grazing, however, contribute to maintaining

habitat functions for associated covered species, such as western pond turtle. Rodent control on grazing lands may adversely affect western burrowing owl through reductions in prey and nesting habitat. Some ongoing agricultural activities on cultivated lands may limit or degrade foraging habitat for tricolored blackbird and western burrowing owl. Cattle in ranchlands could trample covered species, and habitat could be lost due to agricultural practices that change the hydrology of an area.

Water transfers that result in fallowing or idling farm land or changing the mix of crop types grown could remove, increase, or decrease the function of crop lands as habitat for agricultural-associated covered species, such as western pond turtle, giant garter snake, and Swainson's hawk. For example, fallowing or idling of rice land would remove habitat for western pond turtle and giant garter snake while creating foraging habitat for Swainson's hawk. Water transfers may also directly affect the availability of aquatic habitat for giant garter snake and western pond turtle (e.g., dewatering of conveyance channels that support habitat). Changes in crop types and cropping practices in response to changing agricultural markets and new technologies could result in similar effects on agricultural-associated covered species.

Conversion of natural habitats to agriculture may result in removing habitat for covered species (e.g., California tiger salamander) or altering the function of the converted land as habitat for covered species (e.g., conversion of grassland to cropland may result in increased or decreased foraging habitat value of the converted land for Swainson's hawk, depending on the crop types grown). Conversion of cropland to orchards and vineyards and conversion from alfalfa to other crop types on lands outside of the reserve network could diminish the value of these lands for Swainson's hawk foraging. This conversion could ultimately lead to a declining nesting population within the plan area as food availability becomes increasingly limited. Estep (2015) reviewed current and historic land use/crop patterns and Swainson's hawk nesting distribution and abundance, and developed a model to establish an estimated threshold acreage of suitable and high value foraging habitat required to sustain the current nesting population. In an effort to maintain the plan area-wide nesting population the Yolo HCP/NCCP will implement measures described in Chapter 7, Section 7.7.1.2.8, *Regional Loss of Swainson's Hawk Habitat,* if Swainson's hawk foraging habitat throughout the Plan Area drops below threshold levels and there is in a decline the county-wide Swainson's hawk population.

5.8.7 Existing and New Roadways

Ongoing vehicular traffic on existing roadways, private roads, and new roadways will continue to result in collisions and subsequent mortality or injury of susceptible covered species (e.g., giant garter snake, western pond turtle, California tiger salamander) and, to a lesser extent, covered bird species (the behaviors and mobility of the covered bird species along roadways typically result in low risk for vehicle collisions). Construction of new roadways not covered under the Yolo HCP/NCCP could remove habitat for covered species, depending on where these roads are located, and operation of construction and maintenance equipment could result in mortality and injury of covered wildlife species if present in construction rights-of-way.

5.8.8 Tribal Lands Management

The Yocha Dehe Wintun Nation is the only federally recognized tribe with trust landholdings in the Plan Area. Potential new and ongoing tribe activities that could result in cumulative effects include transportation, utility, flood control, and water supply infrastructure development, improvements,

and maintenance; ongoing agricultural and ranching practices; land development; and any other type of development or land use that may be undertaken by the tribe. These activities could result in the adverse effects on covered species described above. Based on the location of tribal trust lands in the Plan Area, however, the potential for effects on occurrences and habitat is likely limited to valley elderberry longhorn beetle, Swainson's Hawk, California tiger salamander, white-tailed kite, western pond turtle, and tricolored blackbird.

5.8.9 Climate Change

Climate change is likely to affect covered species during the HCP/NCCP permit term. The following are examples of potential effects of climate change on covered species in the Plan Area.

- Higher temperatures and earlier spring conditions may disrupt environmental cues that covered plants (palmate bracted bird's-beak) and covered animal species rely on to initiate critical life-history events such as migration, as with Swainson's hawk, least Bell's vireo, and western yellow-billed cuckoo (Parmesan 2006; Parmesan and Yohe 2003; Penuelas and Filella 2001; Miller-Rushing et al. 2010; Ibáñez et al. 2010).
- Higher temperatures may exceed the thermal tolerances of some species, which may displace species or reduce growth and survival (Parmesan 2007; Albright et al. 2010; Perry et al. 2012).
- Higher temperatures already are resulting in more winter precipitation falling as rain and earlier snowmelt, which has increased the risk of winter flooding of terrestrial habitats and reduced water availability for plants and animals in late summer (Knowles and Cayan 2004). Increased winter flooding could result in flooding of giant garter snake overwintering habitat, resulting in giant garter snake mortality and rendering previously suitable overwintering habitat unsuitable.
- An increase in heat waves and a greater likelihood of prolonged drought will reduce the growth and survival of vegetation and the survival of terrestrial wildlife in summer (Gershunov et al. 2009; Mastrandrea et al. 2009).
- Warmer spring and summer temperatures, combined with reduced precipitation as a result of reduced snowpack and earlier spring snowmelts, increase the risk of wildland fires and wildfire-related deaths of terrestrial wildlife and damage to terrestrial habitats (Westerling et al. 2006).
- Reduced precipitation and runoff volumes may reduce the extent of water-dependent habitats such as ponds (Pyke 2004).
- Sea level rise, increased storm surge, and heavy winter rains will increase the risk of catastrophic flooding of wetland and riparian habitats in winter (Parker et al. 2011).

The physical changes associated with climate change are expected to be widespread and long-lasting, even if meaningful climate change actions (e.g., reductions in greenhouse gas emissions) are made now (Solomon et al. 2009).

5.8.10 Summary of the Effects of Covered Activities in Addition to Cumulative Effects

Covered activities will remove covered species habitat and result in the harassment, injury, and mortality of covered species. The net effect of implementing the Yolo HCP/NCCP on covered species, however, is beneficial, as described in Section 5.7, *Effects on Covered Species*. Therefore, implementation of the Yolo HCP/NCCP will not contribute to cumulative effects.

5.9 Critical Habitat

Critical habitat is defined in Section 3 of the ESA as follows.

1. The specific areas within the geographical area occupied by a species at the time it is listed in accordance with the Act, on which are found those physical or biological features essential to the conservation of the species and that may require special management considerations or protection; and
2. Specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Although a critical habitat analysis is not required content for an HCP, the USFWS must evaluate whether the federal action of issuing a section 10(a)(1)(B) permit will adversely modify designated critical habitat in their Section 7 Biological Opinion prepared to issue the federal Section 10(a)(1)(B) Incidental Take Permit for this HCP/NCCP. This assessment is provided to support that analysis.

Critical habitat is present in the Plan Area for California tiger salamander, Colusa grass, Solano grass, vernal pools tadpole shrimp, delta smelt, and Chinook salmon (Figure 5-5, *Critical Habitat in the Plan Area*).[17] Of these, only the California tiger salamander is a covered species under the Yolo HCP/NCCP. The USFWS formally designated critical habitat for the Central Valley population of the California tiger salamander in 2005 (70 FR 49379–49458). Planning units 5 and 13, in the Dunnigan Hills area, include 2,730 acres designated by the USFWS as California tiger salamander Critical Habitat Unit 1. Approximately 1,050 acres of HCP/NCCP modeled California tiger salamander habitat are present in Critical Habitat Unit 1.

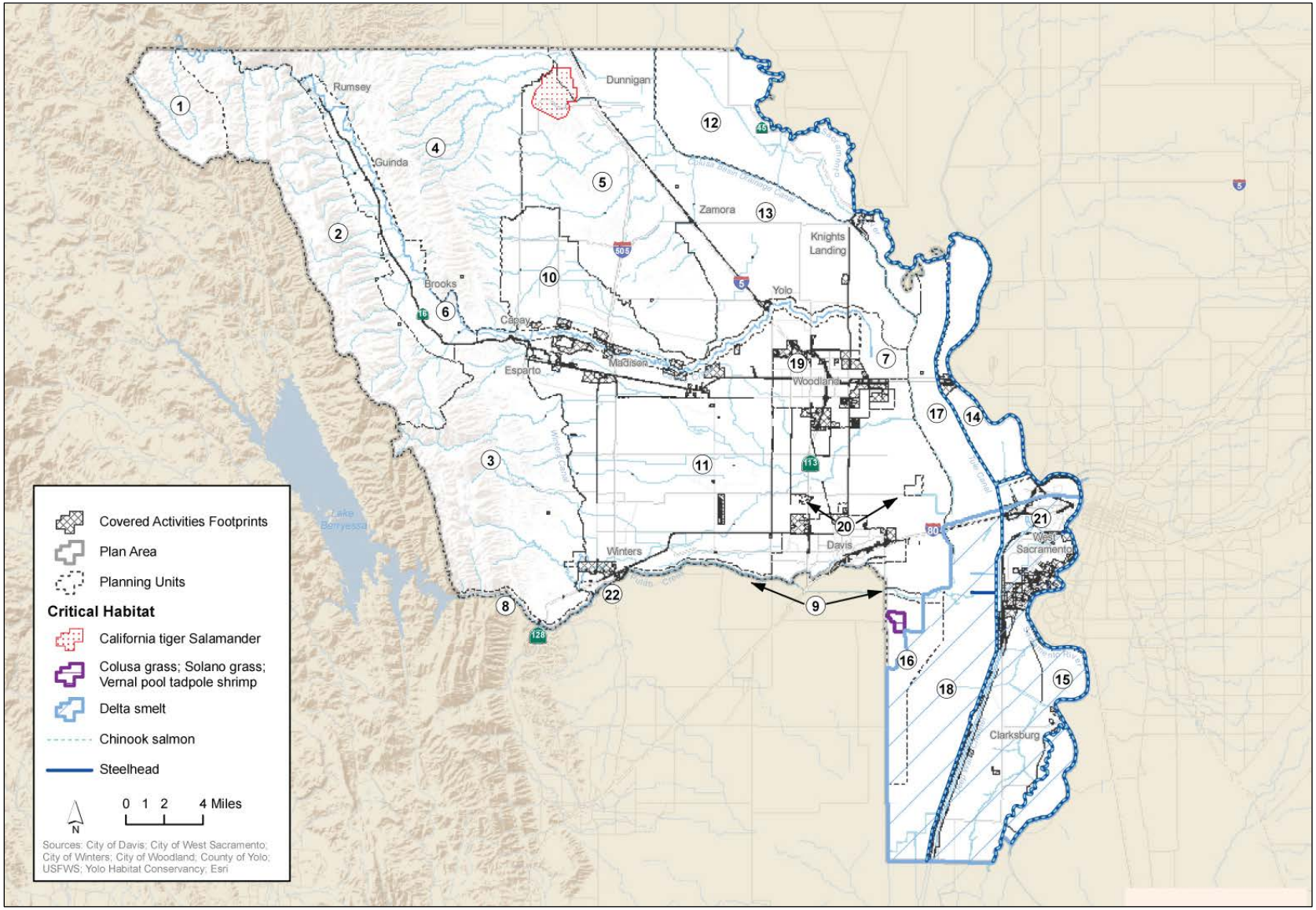
AMM13, Minimize Take and Adverse Effects on Habitat of California Tiger Salamander (Chapter 4, Section 4.3, *Avoidance and Minimization Measures*) prohibits the removal of California tiger salamander habitat by covered activities within the boundary of Critical Habitat Unit 1. Based on this assessment, the covered activities are not expected to adversely modify designated critical habitat.

The critical habitat for Colusa grass, Solano grass, and vernal pool tadpole shrimp is at the Davis Communications Site (Figure 5-5). There are no Yolo HCP/NCCP covered activities on this site, therefore the HCP/NCCP will not affect critical habitat for these species. Activities that affect wetlands or waters of the U.S. within critical habitat for delta smelt or Chinook salmon will necessitate permitting under Section 404 of the Clean Water Act, and this permitting will require USFWS to make a finding that the project does not adversely modify critical habitat for the delta

[17] Critical habitat for the western yellow-billed cuckoo was formally designated in 2014, but no critical habitat for this species is present in the Plan Area (79 FR 48548–48652).

smelt and NMFS to make the same finding for Chinook salmon. The Yolo HCP/NCCP does not result in adverse modification of critical habitat for these species.

Figure 5-5. Critical Habitat in the Plan Area



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