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 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, *Species Accounts*). Effects are assessed, both qualitatively and quantitatively, based 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 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)
- Rural projects and activities (planning units 1–18; Figure 5-1)
  - General rural development
  - Rural public services, infrastructure, and utilities

[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.

    - Agricultural economic development and open space
- Public and private operations and maintenance
- Conservation strategy implementation
- Neighboring landowner protection program

Over 79% of the covered activities will be concentrated within urban and unincorporated community growth boundaries, and over 90% 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, *Effects 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 effects, including information necessary for compliance with the 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 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 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 (placeholder for EIS/EIR citation).
- 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 federal Endangered Species Act (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.

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 conservation measures in an NCCP 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 1996) 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* 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. 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 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 versus permanent effect. For the purpose of this analysis, *temporary loss* is defined as the alteration of land cover for less than 1 year that allows the disturbed area to recover to pre-project or ecologically improved conditions within 1 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 ability prior to ground disturbance. Any natural community or species habitat loss associated with a covered activity that has a duration exceeding 1 year, or that has a duration of less than 1 year but takes more than 1 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 the National Environmental Policy Act or other environmental laws.

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.

[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 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 EIR/EIS for this HCP/NCCP, the Yolo HCP/NCCP adopts the CEQA guidelines' definition for indirect effects.

- Loss of 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, *Future Planned Development 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.

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, *Plan Area Units and Conservation Reserve Area*). Urban development will result in loss of an estimated 5,920 acres of natural communities and another 6,518 acres of other land cover types (Table 5-4, *Loss of Natural Communities and Other Land Cover Types:* planning units 19-22). Figure 3-2, *Planned General Plan Development in the 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

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, *Plan Area Units and Conservation Reserve Area*): general rural development, rural public services, infrastructure, and utilities; and agricultural economic development and open space. This will result in loss of an estimated 5,906 acres of natural communities (Table 5-4, *Loss of Natural Communities and Other Land Cover Types:* planning units 1-18). The locations for these activities are shown in Figure 3-2, *Planned Uses in the Plan Area*; Figure 3-3, *Public and Private Infrastructure*, *and Utilities in the Plan Area*; Figure 3-4, *Aggregate Mining Opportunity in the Plan Area*; and Figure 3-5, *Parks and Open Space in the Plan Area.*

The effects mechanisms related to development activities in the rural planning units are similar to those described in Section 5.4.1.1, *Urban Development*. In general, losses in the rural planning units will consist of smaller acreages distributed over a larger area than in the urban planning units. Rural development, however, will result in larger affected areas consolidated within unincorporated community growth boundaries.

While the footprint of development per acre in rural areas is significantly lower proportionately than in urban areas, the effect of habitat fragmentation is higher in these areas than in urban areas, because the existing landscape is generally less disturbed prior to project construction. Construction of linear projects in rural areas, such as new roads and trails, utility rights-of-way, and private access roads, could fragment the landscape and create obstructive barriers between species' habitats. Wildlife could be prevented from accessing breeding or foraging habitat due to the hazards created by the roadway (e.g., traffic, lack of vegetative cover, increased exposure to predators). This disruption of wildlife movement results in increased habitat and population fragmentation. These effects are particularly limited in Yolo County, however, because the cities and county have agreed to "hard" edges dividing urban and rural areas, rather than an intervening area of decreasing densities often referred to as "rural residential." Yolo County as a matter of policy does not support rural residential development.

Moreover, 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 5-2, *Operations and Maintenance, Methods and Assumptions*, describes the methods and assumptions used to estimate acres of effect from operations and maintenance activities. An estimated 505 acres of land cover would be permanently affected by operations and maintenance activities (Table 5-2, *Operations and Maintenance, 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 and 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 1 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 1 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 grasslands 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 grasslands. The Yolo HCP/NCCP will restore wetland natural communities at a ratio of one acre restored for each acre lost as a result of covered activities.

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.

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 JPA 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 which otherwise would reduce 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 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

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 example, likely due to the 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).

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.

Effects from light pollution and noise may also be more significant when introduced into areas where they 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.

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, 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 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 National Pollutant Discharge Elimination System (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 and affect 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 fire breaks. Maintenance of fire breaks (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.

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. 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 JPA 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, *Conditions on Covered Activities*).

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 5.5, *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. All biologists conducting monitoring under the Yolo HCP/NCCP (i.e., JPA staff or their consultants) will be covered for their monitoring activities should any take occur. 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 species may disperse from the reserve system, in response to this active management, onto neighboring private lands. The Yolo HCP/NCCP includes a Neighboring Landowner Protection Program to protect landowners in the Plan Area near reserves from the regulatory consequences of four special-status species dispersing onto their property: valley elderberry longhorn beetle, western burrowing owl, giant garter snake, and western pond turtle.

The effects associated with the dispersal of covered species onto neighboring lands are anticipated to be very limited and restricted to the five 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 onto neighboring lands as their populations increase.
- Covered species for which there is a reasonable likelihood of take from routine, ongoing agricultural activities.

Participation in this program is voluntary and interested landowners wanting coverage must sign an Opt-in Agreement. Owners of private lands within 1 mile of the reserve system that are actively used for agricultural purposes (e.g., crop production) will receive take coverage for these four species under the Yolo HCP/NCCP if they opt in to this program. Although these species are capable of dispersing further than 1 mile, this radius accounts for the most likely area of effect.

Coverage will be provided to agricultural operations only for take beyond the baseline condition that existed prior to the establishment of the neighboring reserves and only for ongoing and routine agricultural activities on lands enrolled in the Neighboring Landowner Protection Program. Ongoing and routine activities would include normal farming practices and would not include major construction actions. Coverage under the Neighboring Landowner Protection Program expires when the Permits expire. See Chapter 7, Section 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 does not transfer if the property is sold.

Based on the landowner participation in other counties with approved HCPs that have similar programs (e.g., San Joaquin County, East Contra Costa County), it is assumed that up to 5% of eligible lands will enter into neighboring land agreements, for a total of no more than [To be determined] 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 western burrowing owl, 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, western pond turtle, and western burrowing owl 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. While 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. The estimated range of acres affected represents between [To be determined]% and [To be determined]% of modeled habitat for the species covered in the Neighboring Landowner Protection Program.

Adverse effects from allowable agricultural activities on western burrowing owl, giant garter snake, and western pond turtle could result from rodent control, active farming practices, vehicle and machinery travel, runoff from fields, or disturbance to adjacent streams or wetlands.

The Neighboring Landowner Protection Program does not allow take of species present before establishment of the reserve system; rather, coverage is restricted to species that disperse onto lands after the creation of the neighboring reserve only if it is above baseline levels as determined by surveys. Take granted through the Neighboring Landowner Protection Program could slightly reduce the beneficial effects of the conservation strategy. The Neighboring Landowner Protection Program is described in detail in Chapter 7, Section 7.7.7.1, *Neighboring Landowner Protection Program*.

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, *Loss and Fragmentation*), 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
- Reduction in function of natural community or covered species habitat
- Harassment, injury, or mortality of covered species
- Impact of take on covered species

5.5.1.1 Loss and Fragmentation of Natural Community or Covered Species Habitat

Total 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; termed the *covered activities layer*) over GIS baseline data (layers of geographic data for each of the natural communities and covered species habitat models)(Section 2.6.2, *Covered Species Habitat Models*, and Appendix A describe how habitat models were developed). Approximately 91% 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 loss. Table 5-1, *Urban and Rural Development, Methods and Assumptions,* describes how existing information was used to develop the covered activities layer. The covered activities layer includes is 18,055 acres in size. 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 orchards and vineyards that do not make up natural communities or covered species habitat models.

The JPA 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 need coverage under this HCP/NCCP[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 and white-tailed kite nest sites, and ponds providing habitat for California tiger salamander were also assessed by overlapping GIS data for nest sites 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 5-2, *Operations and Maintenance, Methods and Assumptions*. These assumptions were also used to establish limits for

[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.

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.

Table 5-1. Urban and Rural Development, Methods and Assumptions

Covered Activity Category	Covered Activity Type	GIS Detail	Total Spatial Extent (acres)[1]	Methods, Assumptions
Urban Projects and Activities				
		Planning Unit 19 (City of Woodland)	3,385	Includes legally incorporated city boundary, LAFCO approved sphere of influence, and voter approved Urban Limit Line.
		Planning Unit 20 (City of Davis)	1,352	Includes legally incorporated city boundary and LAFCO approved sphere of influence.
		Planning Unit 21 (West Sacramento)	4,055	Includes legally incorporated city boundary
		Planning Unit 22 (City of Winters)	714	Includes legally incorporated city boundary and a portion of the LAFCO approved sphere of influence (excludes El Rio Villa)
		SUBTOTAL	**9,506**[1]	
Rural Projects and Activities				
General Rural Development				
		Capay	7	From general plan land use map
		Clarksburg	146	From general plan land use map
		Davis Solar/Business Park	280	Davis project within unincorporated County Planning Unit 11; 50 acres of solar and 230 acres of business park (9/23/2014 pers. comm. H. Tschudin and M. Webb).
		Dunnigan	2,722	From general plan land use map
		Elkhorn[6]	383	From general plan land use map
		El Rio Villa	5	From general plan land use map
		Esparto	250	From general plan land use map
		Guinda	7	From general plan land use map
		I-505/CR14	10	From general plan land use map; could also be located at I-505/CR 12A
		Knights Landing	249	From general plan land use map
		Madison	428	From general plan land use map
		Monument Hills[5]	727	From general plan land use map

Covered Activity Category	Covered Activity Type	GIS Detail	Total Spatial Extent (acres)[1]	Methods, Assumptions
		North Davis Meadows	7	From general plan land use map
		Rumsey	>0.5	From general plan land use map
		Willow Oak	13	From general plan land use map
		Yolo	54	From general plan land use map
		Yolo Fruit Stand/I-80	3	From general plan land use map (Chiles Road)
		Zamora	22	From general plan land use map
		SUBTOTAL	**5,313[1]**	
Rural Public Services, Infrastructure, and Utilities				
Roads and Bridges				
Roads[3]				
		CR 85B	3	From general plan land use map
		CR 89	19	From general plan land use map
		CR 99W	7	From general plan land use map
		CR 102	19	From general plan land use map
		SR 16	48	From general plan land use map (includes CR 21A improvements)
	Bridges[4]	Repair, replace, rehab construct bridges	0.5 perm. 18 temp.	Each bridge is assumed to have a 0.2 acre permanent footprint plus 1 acre is assumed to be temporarily affected. Footprints generated using the point location of the bridges, as provided by the County of Yolo; buffering 0.2 acres and 1 acres from that point. The inside 0.2 acres were coded as permanent and the outer remaining (0.8 acres) were classified as temporary.
	Bike lanes and multi-use trails	Woodland bike lanes (4 locations)	8	Based on general plan circulation element
		Woodland-Davis Alternative Transportation Corridor	11	Based on Alternative Transportation Corridor: Final Feasibility Study, September 2009
		Yolo County -- bike lanes in unincorporated area	113	Based on description in general plan
	Airports[7]	County airport	420	From general plan
		SUBTOTAL	**666.5[1]**	

Covered Activity Category	Covered Activity Type	GIS Detail	Total Spatial Extent (acres)[1]	Methods, Assumptions
Agricultural Economic Development and Open Space				
	Agricultural Industrial and Agricultural Commercial			
	Parks/Open Space	Targeted Ag Commercial/Industrial Site at SE corner of I-505 and SR-128	65	From general plan
		Targeted Ag/ Commercial near Zamora	16	From general plan
		Other possible sites	308	From County zoning layer for ag commercial and ag industrial
		Nine 10-acre nodes to represent developed areas within 4,103 acres of open space park preservation assumed in the County GP parks	90	Nine 10-acre GIS polygons were placed within planning units 2, 3, 4, 5, 11, 13, 16, 17, and 18. They were randomly placed in the grasslands natural community.
	Aggregate Mining	Planned Aggregate Mining	506[2]	County zoning layer sand and gravel mining designation
		Additional Future Mining	1,584[8]	Potential future sand and gravel mining as identified by the County Planning Director and Natural Resources Program Manager comprised of additional acres within OCMP plan area that are most likely to be mined, beyond the SGR sites, over the next 50 years (1/6/2014 figure)
		SUBTOTAL	**2,569[1]**	
		TOTAL	**18,055[1]**	

[1] These acreages are the maximum aerial extent of the GIS covered activities footprint, and do not represent acreage of natural community or species habitat loss. They include orchards, vineyards, and other land cover types that do not make up natural communities or provide modeled covered species habitat.

[2] This acreage is not correct. Missing 249 acres of sand and gravel left out of the covered activities layer plus 306 acres miscoded as Additional Future Mining. Will be corrected to 1,060 acres for the Public Review Draft.

[3] It is not clear if all County planned roadway projects are included. This will be verified for the Public Review Draft.

[4] It is not clear if three planned new bridges are included. This will be researched and corrected for Public Review Draft.

[5] This acreage assumes significant new development on all existing rural residential in Monument Hills that is not currently reflected in the County General Plan. This will be verified with County Planning and corrected if necessary for Public Review Draft.

[6] This acreage appears to be in error. The County General Plan Land Use layer shows 298 acres of planned Specific Plan development in this area. This will be verified with County Planning and corrected for the Public Review Draft.

[7] Watts-Woodland Airport included in Monument Hills acreage. Acreage may be overstated. This will be verified with County Planning and corrected for Public Review Draft.

[8] This acreage is not correct. Includes 306 acres that are actually SGR. Will be corrected to 1,278 acres for Public Review Draft.

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. Operations and Maintenance, Methods and Assumptions

Covered Activity Type	Acres	Methods, Assumptions
Road maintenance	244	4,880 acres of road rights-of-way are spatially defined in GIS. Assumed 5% (**244 acres**) will be permanently removed as a result of ongoing operations and maintenance activities. These 4,880 acres were distributed proportionately among the land use types occurring within the road rights-of-way.
Reclamation Districts	100	Assumed up to **100 acres** will be permanently removed as a result of ongoing operations and maintenance activities. These 100 acres were distributed proportionately among the land use types occurring within the reclamation districts.
Yolo County Flood Control and Water Conservation District	50	1,000 acres of levees within the district are spatially defined in GIS. Assumed 5% (**50 acres**) will be permanently removed as a result of ongoing operations and maintenance activities. These 1,000 acres were distributed proportionately among the land use types occurring within the district.
Cache Creek Resources Management Plan	111	The Cache Creek Resources Management Plan is spatially defined in GIS from CCAP and general plan Cache Creek OS area and consists of 2,235 acres. Within this area, only an estimated **111 acres** will be removed through operations and maintenance activities, including 17 acres grasslands, 37 acres barren, 16 acres riverine, and 41 acres of valley foothill riparian. Most removal will be temporary. The removal of 41 acres of valley foothill riparian is treated as permanent because this natural community will take more than one year to recover from disturbance.
TOTAL	**505**	

Table 5-3A. Maximum Allowable Permanent Loss, Natural Communities

Natural Community	Existing Acreage	Maximum Allowable Permanent Loss	% Lost[1]
Rice	35,724	88	less than 1%
Cultivated Lands (non-rice)	214,843	9,805	95%
Grassland	80,896	2,142	97%
Serpentine	247	0	less than 1%
Chamise Chaparral	30,137	0	less than 1%
Mixed Chaparral	14,493	0	less than %
Blue Oak and Foothill Pine	43,764	4	less than 1%
Blue Oak Woodland	35,891	3	less than 1%
Closed-Cone Pine-Cypress	212	0	less than 1%
Montane Hardwood	3,064	0	less than 1%
Valley Oak Woodland	181	0	less than 1%
Alkali Prairie	309	4	1%
Vernal pool complex	299	0	less than 1%
Fresh Emergent Wetland	26,297	92	less than 1%
Valley Foothill Riparian	12,442	641	5%
Lacustrine and Riverine	13,203	248	2%
TOTAL NATURAL COMMUNITIES	**512,002**	**13,027**	**3%**

[1] Rounded to nearest percent.

Table 5-3B. Take Limits, Covered Species

Species	Existing in Plan Area (acres)	Take Limit, Permanent	Take Limit, Temporary	% Remaining[1]
Valley elderberry longhorn beetle				
Riparian habitat	9,358	602	0	94%
Non-riparian habitat	3,932	79	43	98%
Total	**13,290**	**681**	**43**	**95%**
California tiger salamander				
Aquatic breeding habitat	1,004	12	1	99%
Upland habitat	86,499	361	1	100%
Total	**87,504**	**373**	**2**	**100 %**
Western pond turtle				
Aquatic habitat	53,601	394	18	99%
Nesting and overwintering habitat	137,026	3,225	98	98%
Total	**190,627**	**3,619**	**115**	**99%**
Giant garter snake				
Rice habitat	31,169	87	0	100%
Aquatic habitat	6,503	111	0	98%
Freshwater emergent habitat	25,885	75	0	100%
Active season upland movement	6,073	450	0	93%
Overwintering habitat	6,589	1,228	0	86%
Total	**76,219**	**1,951**	**0**	**97%**
Swainson's hawk				
Nesting habitat	15,666	1,066	0	93%
Natural foraging habitat	79,330	1,769	18	98%
Agricultural foraging habitat	213,983	9,203	2	96%
Total	**308,979**	**12,038**	**20**	**96%**
Nest sites	531	20	0	93%
White-tailed kite				
Nesting habitat	31,546	1,084	0	97%
Primary foraging habitat	130,974	3,070	18	98%
Secondary foraging habitat	177,303	8,982	3	95%
Total	**339,824**	**13,136**	**21**	**96%**
Western yellow-billed cuckoo				
Nesting/foraging habitat	**3,791**	117	0	97%
Western burrowing owl				
Primary habitat	37,690	1,430	1	97%
Other habitat	66,129	2,294	18	98%
Total	**103,819**	**3,724**	**19**	**97%**
Least Bell's vireo				
Nesting/foraging habitat	**4,642**	**110**	0	98%
Bank swallow				
Nesting habitat	**962**	**0**	**37**	**100%**
Tricolored blackbird				
Nesting habitat	4,669	86	0	98%
Foraging habitat	261,044	9,213	20	96%
Total	**265,713**	**9,299**	**20**	**99%**
Palmate-bracted bird's beak				
Habitat	**309**	**4**	1	99%

[1] Rounded to nearest percent

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 6.6.2 through 6.6.8). For each natural community, adverse, beneficial, and net effects are described. Only those natural communities affected by Yolo HCP/NCCP covered activities are addressed in this section[5]. 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.

Table 5-4, *Natural Community Habitat Loss*, provides the amount of natural community loss by planning unit, for both permanent and temporary loss. Table 5-5, *Natural Community Benefits and Net Effects*, provides the amount of each natural community loss in relation to the amount conservation for each natural community.

[5] 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, blue oak and foothill pine, closed-cone pine-cypress, montane hardwood, valley oak woodland, and vernal pool complex.

Table 5-4. Loss of Natural Communities and Other Land Cover Types

		Permanent Loss from Covered Activities by Planning Unit (acres)[1]																										
Natural Community	**Existing Acreage**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**Total Perm Loss PUs**	**O&M**	**Restoration**	**Total Perm Loss**	**Total Temp. Loss (acres)**
Natural Communities																												
Rice	35,724	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0	0	69	19	0	88	0
Cultivated Lands (non-rice)	214,843	0	0	6	0	1,399	25	397	0	0	378	1,813	175	25	256	320	0	34	0	1,406	548	1,812	361	8,956	85	765	9,806	3
Grassland	80,896	0	11	10	10	144	3	59	0	0	0	450	0	28	0	27	0	10	0	729	53	215	155	1,903	14	225	2,142	18
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	30,137	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	14,493	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 and Foothill Pine	43,764	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	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	1	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	3,064	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	309	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	4	0	0	4	1
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	26,297	0	0	0	0	7	0	0	0	0	0	10	0	10	0	17	0	1	0	0	0	42	0	87	5	0	91	0
Valley Foothill Riparian	12,442	0	0	6	0	2	10	44	0	0	0	12	7	0	17	127	0	1	0	0	18	329	5	579	63	0	641	0
Lacustrine and Riverine	13,203	0	0	1	0	2	0	4	0	0	5	16	0	1	8	17	0	0	0	53	5	112	5	229	19	0	248	17
Total Natural Communities	**512,002**	**0**	**11**	**23**	**10**	**1,554**	**38**	**504**	**0**	**0**	**383**	**2,302**	**182**	**64**	**281**	**508**	**0**	**46**	**0**	**2,260**	**624**	**2,510**	**526**	**11,826**	**151**	**990**	**13,027**	**39**
Other Land Cover Types																												
Other Agriculture	62,144	0	0	1	0	713	17	79	2	54	84	172	11	67	0	24	0	0	0	128	237	12	80	1,681	19	0	1,700	2
Semiagriculture, Incidental to Ag	30,494	0	0	8	0	130	61	57	1	7	35	403	55	21	33	52	0	9	0	131	129	49	57	1,237	115	0	1,352	7
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	47,608	0	1	8	0	207	59	15	1	3	1	480	1	150	66	198	0	1	0	829	235	946	13	3,215	110	0	3,325	37
Total Other Land Cover Types	**140,615**	**0**	**1**	**17**	**0**	**1,050**	**137**	**151**	**4**	**64**	**120**	**1,055**	**67**	**332**	**99**	**274**	**0**	**10**	**0**	**1,088**	**601**	**1,007**	**196**	**6,274**	**244**	**0**	**6,518**	**46**

[1]The numbers in these columns correspond with planning unit numbers

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Table 5-5. Natural Community Benefits and Net Effects

Natural Community	(A) Existing Acres in Plan Area	(B) Baseline PEL 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 Contribution to Recovery	Minimum Open Space Protection			
									HCP/NCCP Protection Requirements and Category 1 Baseline PEL		HCP/NCCP Protection Requirements and Categories 1-2 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	88	less than 1%	30,433	1,300	4,775	13%	6,503	18%
Cultivated Lands - Non-rice	214,843	6,394	3,552	204,897	9,806	5%	195,092	11,810	18,204	8%	21,756	10%
Grassland	80,896	4,608	3,456	72,832	2,142	3%	70,690	4,500	9,108	11%	12,564	16%
Serpentine	247	0	162	85	0	0%	85	0	0	0%	162	66%
Chamise	30,137	1,040	13,784	15,313	0	less than 1%	15,313	0	1,040	3%	14,824	49%
Mixed Chaparral	14,493	444	3,490	10,559	0	less than 1%	10,559	0	444	3%	3,934	27%
Blue Oak and Foothill Pine	43,764	5,175	10,683	27,906	4	less than 1%	27,902	0	5,175	12%	15,858	36%
Blue Oak Woodland	35,891	6,118	3,490	26,283	3	less than 1%	26,281	0	6,118	17%	9,608	27%
Closed-Cone Pine-Cypress	212	0	209	3	0	less than 1%	3	0	0	0%	209	99%
Montane hardwood	3,064	232	821	2,011	0	less than 1%	2,011	0	232	8%	1,053	34%
Valley Oak Woodland	181	20	0	161	0	less than 1%	161	0	20	11%	20	11%
Alkali Prairie	309	163	0	146	4	1%	0	33.7	174.7	57%	174.7	57%
Vernal pool complex	299	1	285	13	0	less than 1%	13	0	1	0%	286	96%
Fresh Emergent Wetland	26,297	5,391	9,559	11,347	91	less than 1%	11,255	300	5,691	22%	15,250	58%
Valley foothill Riparian	12,442	609	1,421	10,412	641	5%	9,771	1,600	2,209	18%	3,630	29%
Lacustrine and Riverine	13,203	615	926	11,662	248	2%	11,414	800	1,415	11%	2,341	18%
Total Natural Communities	**512,002**	**34,263**	**53,730**	424,009	**13,027**	3%	410,981	**20,310**	54,573	11%	108,303	21%

[For Public Review draft - INSERT NEW TABLE here that includes restoration acreages, including acreages independent of effects and mitigation acreages]

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 6.6.2 through 6.6.8.

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% of the covered activities will be concentrated within urban planning units that support approximately 2% of the natural community acres in the Plan Area (10,490/512,002 acres), however, and over 90% of the Plan Area will remain undeveloped. As shown in Table 5-4, *Loss of Natural Communities and Other Land Cover Types.*

Community Loss, there is no permanent loss expected from covered activities with spatially defined footprints in four Planning Units (1, 8, 15, and 18) and another six Planning Units have less than 100 acres of loss (2, 3, 4, 6, 13, and 17). Over 98% of the permanent loss of natural communities expected from covered activities with spatially defined footprints occurs in only 6 of 22 Planning Units (5, 7, 11, 19, 20, and 21) that support approximately 44% of the natural community acres in the Plan Area (223,448/515,002 acres) concentrated in the easternmost third of the Plan Area. The loss from operations and maintenance activities is expected to follow a similar pattern.

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.

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 (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 described in *AMM9 Establish Buffers around Sensitive Natural Communities* and *AMM10 Avoid and Minimize Effects on Wetlands and Waters* (Chapter 4, Section 4.3, *Conditions on Covered Activities*).

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 Natural Community and Permanent Loss*).[6] 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, including rice and non-rice, accounts for 250,567 acres (49%) of the natural communities in the Plan Area; it is most prevalent in the eastern portion of the Plan Area (Table 2.1 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 9,893 acres (4%) of cultivated lands seminatural community of in the Plan Area: up to 88 acres (less than 1%) of rice lands and 9,806 acres (5%) of non-rice lands (Tables 6-3(a), *Maximum Allowable Loss, Natural Communities*, and 6-4, *Loss of Natural Communities and Other Land Cover Types*).

All the development related loss (69 acres) of the rice lands is expected to result from urban development in the Woodland Planning Unit (Table 5-4, *Loss of Natural Communities and Other Land Cover Types*).[7] The remaining estimated 22% (19 acres) of permanent loss of rice lands is expected to result from operations and maintenance activities (Table 5-4, *Loss of Natural Communities and Other Land Cover Types*).

[6] Rangelands are lands grazed by livestock and typically include grasslands, oak woodlands, and other natural communities that are not cultivated.

[7] 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 5-3A, not by covered activity type.

An estimated 42% (4,127 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, and 25 (Table 5-4, *Loss of Natural Communities and Other Land Cover Types*). An estimated 765 acres of permanent loss is expected to result from restoration, and another 85 acres of permanent loss is expected to result from operations and maintenance activities. Construction activities will also result in an estimated 3 acres of temporary loss of this natural community.

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 11,810 acres of unprotected non-rice cultivated lands seminatural community (Objective NC-CL1.1) and 1,300 acres of unprotected rice lands seminatural community (Objective NC-CL1.2) through implementation of CM1 (Table 5-5, *Natural Communities Benefits and Net Effects*). The entire protected cultivated lands seminatural community will be managed and enhanced, particularly to enhance food base and provide cover (Objective NC-CL1.3; CM1).

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 1,300 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, grasslands, ponds, and wetlands will also be protected (Conservation Measure 1, Section 5.4.1.4.1, *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.

Conservation of the cultivated lands seminatural community will provide many ecosystem benefits in the Plan Area. Although the conversion of natural vegetation to cultivated lands has eliminated large areas of habitats for native species, some agricultural systems continue to support abundant wildlife and provide important breeding, foraging, and roosting habitat for many resident and migrant 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 conversion to orchards and vineyards.

5.6.2.3 Net Effects

Implementation of the Yolo HCP/NCCP will result in less than a 1% net decrease (- 88 acres) of the rice component of the cultivated lands seminatural community and an estimated 5% net decrease (-9,806 acres) of the non-rice component in the Plan Area (Tables 6.5, *Natural Community Benefits and Net Effects*). The Yolo HCP/NCCP will protect 11,810 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 13% for rice lands and 8% for non-rice cultivated lands. With full implementation of the Yolo HCP/NCCP, 18% (6,503 acres) of the rice lands component and 10% (21,754) of the non-rice cultivated lands seminatural community in the Plan Area will be in Public and Easement Lands Categories 1 and 2 (Table 5-5, *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 comprised of five vegetation types that support grasses and associated annual and perennial forbs, as described in Chapter 2, *Existing Conditions*. In many cases, grasslands are 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 80,896 acres (12%) of the Plan Area (Table 5-3A, *Maximum Allowable Permanent 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 on Figure 5-3, *Grasslands and Permanent Loss*).

5.6.3.1 Adverse Effects

Covered activities will permanently remove up to 2,142 acres (3%) of grassland natural community in the Plan Area (Tables 6-3A, *Maximum Allowable Permanent Loss, Natural Communities* and 6-4, *Natural community Loss*). Of this, 53% (1,152 acres) will result from development in the urban planning units (19–22). Another 22% (450 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 9% (324 acres) will occur in the Lower Cache Creek Planning Unit (Planning Unit 7) as a result of mining activities. An estimated 10% (225 acres) of the permanent grassland natural community loss is expected to occur as a result of wetland or riparian natural community restoration (Table 5-4, *Loss of Natural Communities and Other Land Cover Types*). Covered activities are expected to result in temporary loss of up to 18 acres of the grassland natural community, primarily resulting from

stream enhancement activities associated with the Cache Creek Resources Management Plan (Table 5-4, *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 as least 4,500 acres of unprotected grassland natural community, including a large, interconnected block in the Dunnigan Hills Planning Unit (Planning Unit 5) (Objective NC-AG1.1; CM1) (Table 5-5, *Natural Community Benefits and Net Effects*). This natural community will be managed and enhanced in the reserve system (Objective NC-AG1.2; CM1). Grasslands will be protected in large contiguous landscapes encompassing the range of vegetation, hydrologic, and soil conditions that characterize this community. Grasslands in 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.

Grasslands 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 grasslands, 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 grasslands. Some animal species have also adjusted well to nonnative grassland. Thus, the current grassland community still offers highly valuable habitats to many grassland dependent species. The protected grasslands 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 3% decrease (-2,142 acres) of the grassland natural community in the Plan Area (Table 5-5, *Natural Community Benefits and Net Effects*). With full implementation of the Yolo HCP/NCCP, 16% (12,564 acres) of the grasslands natural community in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-5). 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.

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 comprised 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 12,442 acres (2%) of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*; Figure 5-4, *Riparian and Wetlands, and Permanent Loss*). A more detailed description of the valley foothill riparian natural community is provided in Chapter 2, Section 2.4.5.2, *Valley Foothill Riparian Natural Community*.

5.6.4.1 Adverse Effects

Covered activities will remove up to 641 acres (5%) of valley foothill riparian natural community in the Plan Area (Table 5-3A, *Maximum Allowable Permanent Loss, Natural Communities*: Figure 5-4, *Riparian and Wetlands, and Permanent Loss*)). An estimated 55% (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 5-4, *Loss of Natural Communities and Other Land Cover Types*; Figure 5-4, *Riparian and Wetlands, and Permanent Loss*). Operations and maintenance activities will result in the removal of an estimated 63 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, *Conditions on Covered Activities*) 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 as 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 5-5, *Natural Community Benefits and Net Effects*). The HCP/NCCP will also restore valley foothill riparian natural community to result in no net loss as a result of covered activities (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. 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 Section

5.4.3.7.1, 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 5.4.3.7.2, *Lower Putah Creek*.

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, 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 no net loss of the valley foothill riparian natural community in the Plan Area, restoring up to 641 acres to offset the maximum of 641 acres of loss. With full HCP/NCCP implementation, 29% (3,630 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 is located at elevations below Cache and Putah Creeks and the Sacramento River, and its 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 309 acres, or 0.04% of the Plan Area, most of which is southeast of the city of Woodland (Table 5-3A, *Maximum Allowable Loss, Natural* Communities; Figure 5-4, *Riparian and Wetlands, and Permanent Loss*). A more detailed description of the alkali prairie natural community is provided in Chapter 2, Section 2.4.5.2, *Alkali Prairie Natural Community*.

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 5-3A, *Maximum Allowable Loss, Natural Communities*: Figure 5-4, *Riparian and Wetlands, and Permanent Loss*). 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 enroll into the reserve system the existing 163 acres of Category 1 Public and Easement Lands supporting alkali prairie natural community at the Alkali Grasslands Preserve (Figure 5-5, *Alkali Prairie Natural Community and Public and Easement Lands*). Additionally, 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 Field and incorporate this land into the reserve system. The JPA will prepare a management and monitoring framework for both the Alkali Grasslands Preserve and the Woodland Regional Park. 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 JPA will monitor the enhanced sites to assess the effectiveness of these actions toward improving and expanding habitat for palmate-bracted bird's beak. These lands will support and sustain the only remaining palmate-bracted bird's beak population in the Plan Area.

[**Note to reader:** We will be coordinating with Center for Lands Management to develop further details for the alkali prairie strategy.]

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 5-5, *Natural Community Benefits and Net Effects*). With full HCP/NCCP implementation, 100% (305 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.

5.6.6 Fresh Emergent Wetlands Natural Community

The fresh emergent wetlands natural community accounts for 26,297 acres (4%) of the Plan Area (Table 5-3A, *Maximum Allowable Permanent Loss, Natural Communities*, Figure 5-4, *Riparian and Wetlands, and Permanent Loss*). 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 2.4.5.2, *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.

5.6.6.1 Adverse Effects

Covered activities will permanently remove up to 92 acres (less than 1%) of fresh emergent wetlands natural community in the Plan Area (Table 5-3A, *Maximum Allowable Loss, Natural Communities*; Figure 5-4, *Riparian and Wetlands, and Permanent Loss*). Of this, 46% (42 acres) is expected to result from urban development in the West Sacramento Planning Units (Planning Unit 21); the remaining development related loss will likely be distributed among Planning Units 5, 11, 13,15, and 16 (Table 5-4, *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 5-4, *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.

5.6.6.2 Beneficial Effects

The Yolo HCP/NCCP will protect 300 acres of unprotected fresh emergent wetland (Objective NC-FEW1.1; CM1) and restore up to 92 acres to result in no net loss of this natural community (Objective NC-FEW1.2; CM2) of fresh emergent wetland (Table 5-5, *Natural Community Benefits and Net Effects*). An additional 243 acres of fresh emergent wetlands on pre-permit reserve lands will be enrolled into the reserve system (see Appendix D, *Glossary*, for 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, 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.

5.6.6.3 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 300 acres of unprotected fresh emergent wetland (Table 5-5, *Natural Community Benefits and Net Effects*). With full implementation of the Yolo HCP/NCCP, 58% of the fresh emergent wetland natural community in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-5, *Natural Community Benefits and Net Effects*), including baseline and newly protected lands. At least 635 acres of this natural community will be included in the Yolo HCP/NCCP reserve system 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.

5.6.7 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 13,203 acres in the Plan Area.

5.6.7.1 Adverse Effects

Covered activities will remove up to up to 248 acres (2%) of lacustrine and riverine natural community in the Plan Area (Table 5-3A, *Maximum Allowable Loss, Natural Communities*; Figure 5-4). An estimated 70% (175 acres) of the lacustrine and riverine natural community loss will result from development in the urban planning units (Planning Units 19 through 22) (Table 5-4, *Riparian and Wetlands, and Permanent Loss*). 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 19 acres of fresh emergent wetland (Table 5-4, *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, *Conditions on Covered Activities*).

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.

5.6.7.2 Beneficial Effects

The Yolo HCP/NCCP will protect as least 800 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). Within the 500 acres of protected lacustrine and riverine natural community, the JPA will protect at least 50 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.

5.6.7.3 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 5-5, *Natural Community Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will protect 800 acres of this natural community. With full implementation of the Yolo HCP/NCCP, an estimated 6,503 acres, comprising 18% of the lacustrine and riverine natural community in the Plan Area, will be conserved on Categories 1 and 2 Public and Easement Lands (Table 5-5, *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.

5.6.7.4 Other Land Cover Types

Covered activities will convert 6,518 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 semi-natural 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 have provide greater habitat value than these other land cover types.

5.7 Effects on Covered Species

Table 5-6, *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 5-7, *Covered Species Benefits and Net Effects*, provides the amount of habitat lost in relation to the amount 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, *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 the California Department of Fish and Wildlife. The total extent of palmate-bracted bird's-beak modeled habitat in the NHP Plan Area is 309 acres (Table 5-BA, *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 Areas. Palmate-bracted bird's-beak has not been documented from the Colusa Basin Plains Planning Unit. However, the Woodland and Willow Slough Basin Planning Areas support two known occurrences of palmate-bracted bird's-beak. One occurrence (CNDDB Element Occurrence #1) was originally documented in 1963 and has been surveyed on multiple occasions between 1981 and 2012 (CNDDB 2014). The second occurrence (CNDDB Element Occurrence #27) was documented in 1996 but has not been closely monitored, and the current status of the occurrence is uncertain (CNDDB 2014). More specific detail on this habitat and the ecology of palmate-bracted bird's-beak is provided in Appendix A, *Covered Species Accounts*.

Table 5-6. Covered Species Habitat Loss

		Permanent Loss from Covered Activities with a Spatially Defined Footprint by Planning Unit (acres)																										
Covered Species	**Existing Acreage**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**Total Planning Units Perm. Loss (acres)**	**O&M Perm Loss (acres)**	**Restoration**	**Total Perm. Loss (acres)**	**% Remaining**	**Total Temp. Loss**
Valley elderberry longhorn beetle																													
Riparian habitat	9,358	0	0	6	0	0	10	44	0	0	0	0	7	0	17	127	0	1	0	0	0	329	5	546	56	0	602	94%	0
Non-riparian habitat	3,932	0	0	0	0	0	0	23	0	0	0	0	0	0	0	21	0	0	0	0	0	32	2	78	1	0	79	98%	43
Total	**13,290**	**0**	**0**	**6**	**0**	**0**	**10**	**66**	**0**	**0**	**0**	**0**	**7**	**0**	**17**	**147**	**0**	**1**	**0**	**0**	**0**	**361**	**7**	**624**	**55**	**0**	**681**	**95%**	**43**
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	86,499	0	0	0	10	311	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	348	13	12	361	100%	1
Total	**87504**	**0**	**0**	**0**	**10**	**312**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**38**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**360**	**13**	**12**	**373**	**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	53,601	0	0	1	0	3	1	4	0	0	5	18	0	1	8	34	0	1	0	121	7	145	5	354	40	0	394	99%	18
Nesting and overwintering habitat	137,026	0	10	11	10	107	7	103	0	0	0	201	7	67	17	154	0	11	0	694	69	545	199	2,212	35	978	3,225	98%	98
Total	**190,627**	**0**	**11**	**12**	**10**	**110**	**7**	**107**	**0**	**0**	**5**	**219**	**8**	**68**	**25**	**188**	**0**	**12**	**0**	**815**	**76**	**690**	**204**	**2,566**	**74**	**978**	**3,619**	**98%**	**115**
Giant garter snake																													
Rice habitat	31,169	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	6,503	0	0	0	0	0	0	0	0	0	0	3	0	1	8	15	0	0	0	9	0	69	0	106	6	0	112	98%	0
Freshwater emergent habitat	25,885	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	6,073	0	0	0	0	13	0	0	0	0	0	0	6	3	23	80	0	1	0	107	0	210	0	443	7	0	450	81%	0
Overwintering habitat	6,589	0	0	0	0	20	0	0	0	0	0	1	0	13	22	219	0	3	0	330	0	289	0	897	4	327	1,228	97%	0
Total	**76,219**	**0**	**0**	**0**	**0**	**34**	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**27**	**52**	**331**	**0**	**6**	**0**	**515**	**0**	**610**	**0**	**1,584**	**40**	**327**	**1,951**	**97%**	**0**
Drainage miles	1,083																							20	37	0	57	95%	0
Swainson's hawk																													
Nesting habitat	15,666	0	0	0	0	21	8	64	0	1	6	86	24	115	37	131	0	2	0	36	32	361	66	990	76	0	1,066	93%	0
Natural foraging habitat	79,330	0	0	10	0	145	3	57	0	0	0	444	0	33	0	27	0	10	0	55	53	0	152	989	15	765	1,769	98%	18
Agricultural foraging habitat	213,983	0	0	6	0	1,397	25	390	0	0	374	1,799	173	25	255	319	0	34	0	1,401	547	1,810	358	8,913	65	225	9,203	96%	2
Total	**308,979**	**0**	**0**	**16**	**0**	**1,563**	**36**	**511**	**0**	**1**	**381**	**2,329**	**197**	**173**	**292**	**477**	**0**	**45**	**0**	**1,492**	**632**	**2,171**	**576**	**10,892**	**152**	**990**	**12,038**	**96%**	**20**
Nest sites	531	0	0	0	0	1	0	1	0	0	0	8	0	1	2	0	0	0	0	4	5	13	0	35	3	0	38	93%	0
White-tailed kite																													
Nesting habitat	31,546	0	0	7	0	21	11	64	1	1	6	86	24	115	37	131	0	2	0	36	32	361	66	1,001	83	0	1,084	97%	0
Primary foraging habitat	130,974	0	11	11	0	311	10	141	0	0	73	885	40	30	0	198	0	10	0	422	176	279	216	2,813	32	225	3,070	98%	18
Secondary foraging habitat	177,303	0	0	6	0	1,526	18	315	0	0	305	1,520	136	33	256	149	0	34	0	1,394	425	1,749	300	8,166	51	765	8,982	95%	3
Total	**339,823**	**0**	**11**	**23**	**0**	**1,857**	**39**	**520**	**1**	**1**	**384**	**2,492**	**201**	**179**	**293**	**478**	**0**	**45**	**0**	**1,852**	**633**	**2,388**	**582**	**11,980**	**160**	**990**	**13,136**	**96%**	**21**
Nest sites	531	0	0	0	0	1	0	1	0	0	0	8	0	1	2	0	0	0	0	4	5	13	0	35	3	0	38	93%	0
Western yellow-billed cuckoo																													
Nesting/foraging habitat	3,791	0	0	0	0	0	0	22	0	0	0	3	0	0	13	33	0	0	0	0	0	0	0	71	45	1	117	97%	0
Western burrowing owl																													
Primary habitat	37,690	0	0	0	0	149	0	67	0	0	0	691	0	29	0	29	0	10	0	52	55	0	110	1,192	13	225	1,430	96%	1
Other habitat	66,129	0	0	0	0	175	0	91	0	0	80	506	47	6	0	180	0	0	0	139	131	65	69	1,488	41	765	2,429	97%	18
Total	**103,819**	**0**	**0**	**0**	**0**	**323**	**0**	**158**	**0**	**0**	**80**	**1,197**	**47**	**35**	**0**	**210**	**0**	**10**	**0**	**192**	**186**	**65**	**178**	**2,680**	**54**	**990**	**3,725**	**96%**	**19**
Least Bell's vireo																													
Nesting/foraging habitat	4,642	0	0	0	0	0	0	38	0	0	0	0	7	0	17	0	0	1	0	0	0	0	0	64	46	0	110	97%	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	0	0	0	100%	37
Tricolored blackbird																									0				
Nesting habitat	4,669	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	261,044	0	11	16	10	1,221	24	209	0	0	113	1,756	41	48	212	261	0	29	0	1,397	370	1,996	439	8,152	80	981	9,213	96%	20
Total	**265,713**	**0**	**11**	**16**	**10**	**1,222**	**24**	**209**	**0**	**0**	**113**	**1,756**	**41**	**48**	**212**	**295**	**0**	**30**	**0**	**1,397**	**370**	**2,044**	**439**	**8,236**	**81**	**981**	**9,299**	**97%**	**20**
Palmate-bracted bird's beak																													
Habitat	309	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	4	0	0	4	99%	1

Table 5-7. Covered Species Benefits and Net Effects

	Existing Condition				Effect of HCP/NCCP Implementation				Outcome for Plan Area with HCP/NCCP Implementation			
Covered Species	**(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 Categories 1 and 2 Public and Easement Lands (acres) B+C**	**(E) Permanent Loss (acres)**	**(F) Newly Protected (acres)**	**(G) Restored (acres – assuming max. allowable loss)**	**(H) Pre-permit Reserve Lands (acres)[8]**	**(I) % Net Change (G-E)/A**	**(J) Total Categories 1 and 2 Public and Easement Lands in Plan Area (acres, including restored) D+F+G**	**(K) Percent of Plan Area in Categories 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												0
Riparian habitat	9,358	421	1,138	1,560	602	1,600	642	13	Less than 1 %	4,223	48%	2,255
Non-riparian habitat	3,932	284	208	491.89	79	0	0	130	-2%	776	20%	130
Total	**13,290**	**706**	**1,346**	**2,052**	**681**	**1,600**	**642**	**133**	**Less than 1 %**	**4,999**	**40%**	**2,375**
California tiger salamander												0
Aquatic breeding habitat	1,004	26	543	569	12	50	12	0	0%	657	66%	62
Upland habitat	86,499	4,214	3,682	7,896	361	1,500	0	0	Less than 1%	11,632	13%	1,500
Total	**87,504**	**4,240**	**4,225**	**8,465**	**373**	**1,550**	**12**	**0**	**Less than 1 %**	**12,289**	**20%**	**1,562**
Ponds - seasonal in aquatic breeding habitat (no. of ponds)	434	16	120	136	3		3	0	Less than 1 %	152	35%	3
Western pond turtle												0
Aquatic habitat	53,601	4,821	3,946	8,766	394	2,400	236	3,611	Less than 1 %	11,402	21%	6,247
Nesting and overwintering habitat	137,026	14,458	20,652	35,110	3,225	3,475	0	490	-2%	45,596	33%	3,965
Total	**190,627**	**19,279**	**24,598**	**43,877**	**3,619**	**5,875**	**0**	**4,100**	**-2%**	**56,998**	**30%**	**9,975**
Giant garter snake												0
Rice habitat	31,168	3,475	1,728	5,202	87	1,300	0	3,340	Less than 1 %	9,978	32%	4,640
Aquatic habitat	6,503	569	549	1,117	112	420	111	244	0.0	2,218	35%	775
Freshwater emergent habitat	25,885	5,348	9,541	14,889	76	300	76	244	0.0	20,614	80%	620
Active season upland movement	6,073	627	1,267	1,894	450	1,160	0	187	-7%	3,681	65%	1,347
Overwintering habitat	6,589	408	1,464	1,872	1,228	2,315	0	78	-19%	4,595	86%	2,393
Total	**76,219**	**10,427**	**14,549**	**24,976**	**1,951**	**5,495**	**188**	**4,093**	**-2%**	**41,086**	**55%**	**9,776**
Swainson's hawk												0
Nesting habitat	15,666	600	1,360	1,960	1,062	1,600	642	202	-3%	4,802	33%	2,444
Natural foraging habitat	79,330	7,071	7,830	14,900	1,769	4,500	0	190	-2%	26,471	34%	4,690
Agricultural foraging habitat	213,983	6,387	1,821	8,208	9,203	11,810	0	2,016	-4%	26,405	13%	14,226
Total	**339,823**	**14,058**	**11,010**	**25,067**	**12,052**	**17,910**	**642**	**2,408**	**-3%**	**57,677**	**18%**	**21,360**
Nest sites	531	12	26	38	38	34		TBD	-7%	84	17%	TBD
White-tailed kite												0
Nesting habitat	31,546	3,212	1,418	4,630	1,084	1,600	642	202	-1%	10,084	33%	2,444
Foraging Habitat	308,278	13,382	9,717	23,099	12,052	16,300	0	2,635	-7%	36,481	12%	18,935
Total	**339,823**	**16,594**	**11,135**	**27,729**	**13,136**	**17,900**	**642**	**2,838**	**-4%**	**62,865**	**19%**	**21,380**
Western yellow-billed cuckoo												0
Nesting/foraging habitat	3,791	349	803	1,152	116	240	116	123	+3%	1,980	54%	479
Western burrowing owl												0
Primary habitat	37,690	818	2,490	3,308	1,430	3,000	0	190	-4%	7,127	20%	3,190
Other habitat	66,129	1,351	1,546	2,896	2,429	2,500	0	489	-4%	6,747	11%	2,989
Total	**103,819**	**2,169**	**4,036**	**6,205**	**3,725**	**5,500**	**0**	**679**	**-4%**	**13,874**	**14%**	**6,179**
Least Bell's vireo												0
Nesting/foraging habitat	4,642	357	901	1,258	110	600	642	129	+11%	2,858	63%	1,371
Bank swallow												0
Nesting habitat	962	0	5	5	0	50	0.0	0	0.0	55	6%	50
Tricolored blackbird												0
Nesting habitat	4,669	719	1,244	1,963	86	200	91.0	21	Less than 1 %	2,973	65%	312
Foraging habitat	261,044	11,616	6,303	17,919	9,213	16,310	0.0	4,698	-3%	45,845	18%	21,008
Total	**265,713**	**12,335**	**7,547**	**19,882**	**9,299**	**16,510**	**91.0**	**4,719**	**-3%**	**48,818**	**19%**	**21,320**
Palmate-bracted bird's beak												0
Habitat	309	141	0	141	4	0		162.9	-1%	282	92%	163

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

5.7.1.1 Adverse Effects

5.7.1.1.1 Habitat Loss and Fragmentation

Habitat loss has been the primary threat responsible for 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 up to four acres of modeled habitat for palmate-bracted bird's-beak in the Woodland Planning Unit (Table 5-3B). This loss represents 1% of the total modeled habitat for palmate-bracted bird's-beak in the Yolo HCP/NCCP Plan Area. This 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 activities will include a installation of a stormwater conveyance and pre-treatment system, maintenance and/or future upgrade of a well on the property, and construction of an access way to monitoring wells. In addition, road widening and infrastructure installation at the Woodland Regional Park parcel will contribute to habitat fragmentation by increasing the existing spatial separation between habitat areas.

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. 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. 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. 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, 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

Because plants are not mobile, any loss of occupied habitat will result in the loss of individual plants. 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.

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%). Loss of this habitat could result in the direct loss of individual plants and the indirect loss of individual plants through reduced habitat functions. Based on the amount of habitat loss, the resulting loss of individuals will also be relatively small. However, because palmate-bracted bird's-beak is currently known from only seven small population groups, adverse effects on the alkali prairie habitat in the Plan Area could result in a substantial impact on the species. Only two population groups (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 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 acreage of alkali prairie habitat in the Plan Area, by enhancing the function of the protected habitat, and by maintaining or increasing the amount of occupied habitat and the number of individual plants. Overall, protecting 33 acres of alkali prairie habitat will protect approximately 11% 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 1% (four acres) loss of palmate-bracted bird's beak habitat in the Plan Area. The Yolo HCP/NCCP will enroll 141 acres of existing protected palmate-bracted bird's beak habitat into the Yolo HCP/NCCP reserve system, and place a conservation easement on an additional 131 acres of Category 2 Public and Easement Lands at the City of Woodland Regional Park/Mavis Henson, and incorporate this land into the reserve system. With full implementation of the Yolo HCP/NCCP, 92% of the palmate-bracted bird's beak habitat in the Plan Area will be protected on Category 1 Public and Easement Lands. This land will be monitored and adaptively managed to sustain or 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.

5.7.2 Valley Elderberry Longhorn Beetle

The Plan Area includes 13,290 acres of modeled habitat for valley elderberry longhorn beetle, with 9,358 acres of riparian and 3,932 acres of nonriparian habitat (Table 5-3B, *Take Limits, 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). The model overestimates the actual amount of occupied valley elderberry longhorn beetle habitat in the Plan Area, because only those areas supporting elderberry shrubs are capable of being occupied, 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 and 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 602 acres (5%) of valley elderberry longhorn beetle riparian habitat in the Plan Area and up to 79 acres (2%) of valley elderberry longhorn beetle nonriparian habitat in the Plan Area (Table 5-3B, *Take Limits, Covered Species*)[9]. Bridge construction activities will result in temporary loss of up to 43 acres of non-riparian valley elderberry longhorn beetle habitat (Table 5-6, *Covered Species Habitat Loss*).

This section reports riparian and nonriparian habitat loss separately, because riparian habitat has higher value for the valley elderberry longhorn beetle. The greatest expected habitat losses resulting from covered activities are in West Sacramento Planning Unit and South Yolo Basin Planning Unit (Planning Units 21 and 15). Approximately 54% of the riparian (329 acres) and 40% of the nonriparian (32 acres) habitat loss is expected to occur in the West Sacramento Planning Unit as a result of urban development and levee improvements. Approximately 21% of riparian (127 acres) and 27% 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 Clarksburg unincorporated community. Operations and maintenance are expected to permanently remove an estimated 56 acres of riparian habitat and 1 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 U.S. Fish and Wildlife Service (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

[9] The accounting of loss of modeled species habitat is based on estimates of development throughout the permit term. Actual loss by habitat type are likely to vary from these estimates. Loss of species habitat is limited by the permits to the total amounts listed in Table 5-3, not by covered activity type.

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*).

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 (*AMM 12*, 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 (9% range-wide) are in the Plan Area (Appendix A, *Covered Species Accounts*).

The Plan Area supports an estimated 13,290 acres of modeled valley elderberry longhorn beetle habitat, including 9,358 acres of riparian habitat and 3,932 acres of nonriparian habitat. Of this, covered activities will permanently remove up to 681 acres (5%) of habitat, including 602 acres (4%) of riparian habitat and 79 acres (2%) of nonriparian habitat. Since 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% of the species' range-wide distribution.
- Most (65%) 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 (3%) 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 as well as along Putah Creek and the Sacramento River.
- 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 642 acres of valley foothill riparian natural community in the Plan Area (Objectives NC-VFR1.1 and NC-VFR1.3; Table 5-7, *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: Lower Cache Creek and Lower Putah Creek (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 1 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 40 acres (642 acres restored and 602 acres lost, or less than 1% increase) of valley elderberry longhorn beetle riparian habitat in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). With full HCP/NCCP implementation, 40% of the valley elderberry longhorn beetle habitat in the Plan Area will be conserved on Categories 1 and 2 Public and Easement Lands (Table 5-7, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. At least 1,600 acres of these Categories 1 and 2 Public and Easement Lands will be newly protected and incorporated into the reserve system. All reserve system lands will be monitored and adaptively managed to sustain populations of valley elderberry longhorn beetle and their habitat (Table 5-7, *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. 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 (40 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 87,504 acres of modeled habitat for California tiger salamander, with 1,004 acres of aquatic breeding habitat and 86,499 acres of upland habitat (Table 5-3B*, Take Limits, Covered Species*). The modeled aquatic breeding habitat consists of all mapped vernal pools, alkali prairies, and ponds (except those known to be perennial) 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 (1%) of California tiger salamander aquatic breeding habitat and up to 361 acres (less than 1%) of the California tiger salamander upland habitat in the Plan Area (Table 5-3B, *Take Limits, Covered Species*). Operations and maintenance activities may result in additional temporary loss of up to 1 acre of aquatic habitat and 1 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 92% (11 acres) of the aquatic habitat loss and 92% (339 acres) of the upland habitat loss. The majority of California tiger salamander occurrences in the Plan Area (5 out of 6) 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 5% (10 acres) of the upland habitat loss will occur.

Conservation actions could result in the conversion of up to 12 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.

Fragmentation effects are expected to be minimal, because the covered activities potentially affecting habitat are primarily at the edges of large habitat blocks. No covered roadway construction or expansion activities would fragment existing California tiger salamander 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 Dunnigan Hills, Guinda, and Davis Migrant Center 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). Rodent control 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 firebreaks during the dry season, however, could alter the vegetation structure. While 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, *Planned Land Uses in the Plan Area*), which is located adjacent to known occupied California tiger salamander habitat in 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.

5.7.3.1.4 Impact of Take on the Species

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

The Plan Area supports an estimated 87,504 acres of modeled California tiger salamander habitat, including 1,004 acres of aquatic habitat and 86,499 acres of upland habitat. Of this, covered activities will permanently remove up to 361 acres of upland dispersal and aestivation habitat and up to 12 acres of aquatic breeding habitat (Table 5-6, *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 1% of the range-wide number of occurrences of this species.
- Covered activities will remove a small proportion (less than 1%) of the modeled habitat in the Plan Area, and will not remove any critical habitat (for critical habitat analysis, see Section 5.5, *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 4,500 acres of grassland natural community (Objective NC-AG1.1), at least 1,500 acres of which will be sited in California tiger salamander habitat in the Dunnigan Hills Planning Unit (Objective NC-AG1.2) (Table 5-9, *Covered Species Benefits and Net Effects*). The Yolo HCP/NCCP will also protect at least 50 acres of aquatic California tiger salamander habitat in association with the 1,500 acres of protected upland habitat (Objective CTS1.2; Table 5-7, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will restore (or create, if restoration opportunities are limited) at least six ponds for California tiger salamander in association with the newly protected uplands (Objective CTS1.3). With an average size of 0.5 acre per pond, restoration is expected to restore or create an estimated 12 acres of aquatic habitat for 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% of the aquatic habitat and 13% of the upland habitat in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-7, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of all the Categories 1 and 2 Public and Easement Lands, at least 50 acres of aquatic habitat and 1,500 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 no net loss of California tiger salamander aquatic habitat and less than a 1% net decrease in upland habitat in the Plan Area (Table 5-7, *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. 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 190,627 acres of modeled habitat for the western pond turtle, with 53,601 acres of aquatic habitat and 137,026 acres of upland habitat (Table 5-3B, *Take Limits, 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 Davis Creek in the Davis planning unit (planning unit 20), 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 3,619 acres of western pond turtle habitat, including up to 394 acres of aquatic habitat and 3,225 acres of nesting and overwintering habitat, or 1% of the total western pond turtle habitat in the Plan Area (Table 5-3B, *Take Limits, Covered Species*). Additionally, up to 115 acres of western pond turtle habitat (18 acres of aquatic and 98 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 5-3B, *Take Limits, Covered Species*). An estimated 978 acres of upland habitat loss will result from habitat restoration: these lands will be converted to aquatic habitat for western pond turtle.

An estimated 49% 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 10% (481 acres) and 9% (432 acres) of the habitat loss is expected to result from activities in the Lower Cache Creek and Willow Slough Basin Planning Units (planning units 7 and 11), respectively. The remainder of the habitat loss will likely be distributed in planning units 2 through 7, 10 through 15, and 17 (Table 5-6, *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.

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, *Conditions on Covered Activities*) includes measures to minimize the effects of human 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 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 associated with construction, operations, and maintenance activities (e.g., fuel spills) 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, *Conditions on Covered Activities*) 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 1% 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 through achievement of the biological goals and objectives for natural communities and giant garter snake. The Yolo HCP/NCCP will protect 1,300 acres of unprotected rice lands (Objective NC-CL1.2) and 300 acres of unprotected freshwater emergent

wetland (Objective NC-FEW1.1). The Plan will also restore freshwater emergent wetland to result in no net loss of this natural community (Objective NC-FEW1.2) (Table 5-7, *Covered Species Benefits and Net Effects*). The protected and restored rice and freshwater emergent wetland will be sited in locations suitable for giant garter snake (Objectives GGS1.1, GGS1.2), and will therefore be capable of supporting western pond turtle. Additionally, the Yolo HCP/NCCP will protect 800 acres of lacustrine and riverine natural community (Objective NC-LR1.1), which is expected to provide western pond turtle habitat. The Yolo HCP/NCCP will protect at least 3,475 acres of giant garter snake upland habitat (GGS1.2), which is also expected to provide western pond turtle habitat. Giant garter snake habitat corresponds closely with western pond turtle habitat in the Yolo and Colusa Basins and the Willow Slough area; therefore, protection and restoration of giant garter snake habitat will directly benefit western pond turtle.

5.7.4.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in less than a 1% net decrease in aquatic western pond turtle habitat and a 2% net decrease (-3,383 acres) of total western pond turtle habitat in the Plan Area (Table 5-7, *Covered Species Beneficial and Net Effects*). With full implementation of the HCP/NCCP, an estimated 30% of the western pond turtle habitat in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-7, *Covered Species Beneficial and Net Effects*), including baseline and newly protected lands. Of these lands, at least 5,876 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 76,219 acres of modeled giant garter snake habitat, with 31,168 acres of rice habitat, 6,503 acres of aquatic (lacustrine and riverine) habitat, 25,885 acres of freshwater emergent wetland habitat, 6,073 acres of active season upland movement habitat, and 6,589 acres of overwintering habitat (Table 5-3B, *Take Limits, 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, Figure A-5)[10]. 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

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

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, 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% 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 1%), 75 acres of freshwater emergent habitat (less than 1%), 111 acres of aquatic habitat (2%), 450 acres of active season upland movement habitat (7%), and 1,228 acres of overwintering habitat (14%) (Table 5-3B, *Take Limits, Covered Species*). These losses represent an estimated 3% of the total modeled giant garter snake habitat in the Plan Area (Table 5-3B, *Take Limits, Covered Species*). An estimated 57 miles (5%) 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 5-6, *Covered Species Habitat Loss*). All loss of giant garter snake habitat from covered activities is assumed to be permanent, although loss of 1% of the habitat in the Plan Area (327 acres) will result from conversion of upland habitat to aquatic habitat (i.e., restoration) (Table 5-6, *Covered Species Habitat Loss*).

An estimated 42% (1,125 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 (690 acres, or 26% 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 5-6). 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 327 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.

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. While the extent of bullfrog predation and its effect on giant garter snake populations is not well understood, estimates suggest that 22% 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 *AMM 14 Minimize Take and Adverse Effects on Habitat of Giant Garter Snake* (Chapter 4, Section 4.3, *Conditions on Covered Activities*), 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 *AMM 1415* 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 *AMM 1415* 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.

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. Because 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 associated with construction, operations, and maintenance activities (e.g., fuel spills) 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 AMM 14 (Chapter 4, Section 4.3, *Conditions on Covered Activities*) to avoid and minimize these effects from construction activities. In addition, seasonal restrictions and best management practices per *AMM15* to limit these effects from maintenance activities will be implemented.

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 76,219 acres of giant garter snake habitat. Of this, covered activities will permanently remove up to 2,679 acres (3%). 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 5,495 acres of unprotected giant garter snake habitat, including 1,300 acres of rice habitat, 420 acres of aquatic habitat, 300 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 5-7, *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 3,583 acres of pre-permit reserve lands into the reserve system, and will, monitor, and adaptively manage these lands consistent with the Yolo HCP/NCCP conservation strategy.

The 9,087 acres of newly protected and pre-permit reserve lands supporting giant garter snake habitat will be sited in association with other Categories 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 1% net loss of rice habitat for giant garter snake, no net loss of fresh emergent wetland and aquatic habitat, and a net 2% decrease in total habitat for this species (Table 5-7, *Covered Species Benefits and Net Effects*). With full implementation of the HCP/NCCP, 55% of the giant garter snake habitat in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands, including baseline and newly protected lands. Of these Categories 1 and 2 Public and Easement Lands, at least 5,495 acres will be newly protected lands, and at least 3,583 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, agricultural foraging habitat, and natural foraging habitat in Planning Units 3-7 and 9-22. The Plan Area includes 308,979 acres of modeled Swainson's hawk habitat, with 15,666 acres of nesting habitat, 79,330 acres of natural foraging habitat, and 213,983 acres of agricultural foraging habitat (Table 5-3B, *Take Limits, 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 blue 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. Agricultural 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 nests sites have been recorded throughout the modeled habitat areas (Appendix A, 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 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 1,066 acres (7%) of nesting habitat and 10,972 acres (4%) of foraging habitat for Swainson's hawk in the Plan Area (Table 5-3B, *Take Limits, Covered Species*). In addition, covered activities will temporarily remove up to 20 acres of habitat as a result of operations and maintenance and bridge replacement activities (Table 5-3B, *Take Limits, Covered Species Habitat*).

An estimated 47% of the Swainson's hawk nesting habitat loss (495 acres) and 40% of the foraging habitat loss (4,346 acres) is expected to result from development in the urban planning units: Woodland, Davis, West Sacramento, and Winters (planning units 19–22; Table 5-6). 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 5 years. This estimate is based on the assumption that, on average, 80% of nest sites 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 990 acres of Swainson's hawk foraging habitat (an estimated 765 acres agricultural and 225 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 96% of the natural foraging habitat and 95% of the agricultural foraging habitat will remain, primarily in large, interconnected blocks throughout the lower elevations of the Plan Area. Chapter 7, Section 7.7.1.10, *Loss of Swainson's Hawk Habitat Below Threshold*. Where urban development is sited near nesting habitat, however, the nesting habitat will likely become less functional (Section 5.8.6.1.2, *Reduction in Habitat Function*).

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).

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 sites were within 5 miles of suitable foraging habitat. Swainson's hawk nesting habitat in areas identified for urban development also will be within 5 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 sites 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 sites in these areas of urban development will not be removed but will be indirectly affected by expanding urbanization that increases the distance between nesting habitat and foraging habitat.

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 firebreaks 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 (e.g., fuel spills) 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 sites, including eggs and juvenile and adult Swainson's hawks, through measures to survey for active nest sites, create setbacks from potential nest trees, and conduct seasonal and height restrictions on tree pruning and removal near active nests (*AMM15 Minimize Take and Adverse Effects on Habitat of Swainson's Hawk and White-Tailed Kite* in Chapter 4, Section 4.3, *Conditions on Covered Activities*).

5.7.6.1.4 Impact of Take on the Species

The Swainson's hawk breeds in the open grasslands, 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, *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 because of 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% 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 278,114 acres of potentially suitable habitat, including 15,666 acres of nesting habitat and 262,457 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 12,038 acres (4%) in the Plan Area, including 1,769 acres of natural foraging habitat, 9,203 acres of agricultural foraging habitat, and 1,066 acres (7%) of nesting habitat. In addition, covered activities will temporarily remove up to 20 acres of Swainson's hawk habitat (Table 5-6, *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 16,310 acres of unprotected Swainson's hawk foraging habitat, including 11,810 acres of agricultural foraging habitat and 4,500 acres of natural foraging habitat (Objectives SH1.1 and SH1.2, CM1) (Table 5-7, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will enroll 2,606 acres of pre-permit reserve lands providing foraging habitat, to be monitored and adaptively managed 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 (Objective NC-VFR1.3, CM1, CM2), providing additional nesting habitat for Swainson's hawk. 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 agricultural foraging habitat in the reserve system as needed to achieve a density of one suitable nesting tree per 10 acres[11] (Objective SH1.5, CM3).

The Yolo HCP/NCCP will protect at least 34 Swainson's hawk unprotected nest trees[12] 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 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 prey and supports prey populations within the cultivated lands seminatural community enhances its 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-CL1.2, CM3). The JPA will manage and enhance natural foraging lands to further enhance prey populations and 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.

[11] A suitable Swainson's hawk nesting tree is defined as a native tree at least 20 feet in height.

[12] A Swainson's hawk nest tree is defined as a tree that has been used for Swainson's hawk nesting within the last 5 years.

5.7.6.3 Net Effects

Full implementation of the Yolo HCP/NCCP will result in an estimated 2% net decrease of total Swainson's hawk natural foraging habitat and a 4% net decrease of agricultural foraging habitat in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). The Yolo HCP/NCCP will result in an estimated 3% net decrease in nesting habitat for Swainson's hawk (Table 5-7, *Covered Species Benefits and Net Effects*), but the actual net loss is expected to be less than 3% because this does not factor in the tree plantings required under Objective SW1.5.

With full implementation of the HCP/NCCP, 26,471 acres of natural foraging habitat and 26,405 acres of agricultural foraging habitat will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-7, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. This represents 20% of the natural and agricultural foraging habitat in the Plan Area. Additionally, 4,802 acres of nesting habitat, representing 33% of the nesting habitat in the Plan Area, will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-7, *Covered Species Benefits and Net* Effects). Of these Categories 1 and 2 Public and Easement Lands with Swainson's hawk nesting and foraging habitat, at least 17,910 acres will consist of newly protected lands, and at least 2,606 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 5-7, *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 339,824 acres of modeled habitat for white-tailed kite, with 31,546 acres of nesting habitat, 130,974 acres of primary foraging habitat, and 177,303 acres of secondary foraging habitat (Table 5-3B, *Take Limits, 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. 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 1 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 1 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 sites. 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 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 13,136 acres of modeled white-tailed kite habitat, including 1,078 acres of nesting habitat, 3,070 acres of primary foraging habitat, and 8,981 acres of secondary foraging habitat (Table 5-3B, *Take Limits, Covered Species*). This loss represents 4% of the total white-tailed kite modeled habitat in the Plan Area. Additionally, covered activities will temporarily remove up to 21 acres of habitat (Table 5-3B, *Take Limits, Covered Species*).

An estimated 41% 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 5-6, *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.

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 *AMM15 Minimize Take and Adverse Effects on Habitat of Swainson's Hawk and White-Tailed Kite* and through design measures described in *AMM 2 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 *AMM15 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 *AMM15*.

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 construction-related disturbances.

Project proponents will avoid and minimize these potential effects by implementing measures to identify and avoid effects on nesting colonies (*AMM15*).

5.7.7.1.4 Impact of Take on the Species

The distribution of the white-tailed kite includes the East Coast and southeast United States, 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 339,824 acres of modeled white-tailed kite habitat: 31,546 acres of nesting habitat and 308,277 acres of foraging habitat. Covered activities will remove 13,136 acres (4%) of the modeled white-tailed kite habitat in the Plan Area, of which 1,084 acres are nesting habitat and 12,052 acres foraging habitat (Table 5-3B, *Take Limits, 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 (4%) 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 4,500 acres of grassland natural community (Objective NC-AG1.1) and 11,800 acres of non-rice cultivated lands seminatural community (Objective NC-CL1.1) , to provide 16,300 acres of foraging habitat for the white-tailed kite (Table 5-7, *Covered Species Benefits and Net Effects*). Additionally, the Yolo HCP/NCCP will enroll 2,606 acres of pre-permit reserve lands into the reserve system consistent with 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 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 1% net decrease of nesting habitat, 7% net decrease in primary foraging habitat, and 4% decrease in secondary foraging habitat for white-tailed kite in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). With full HCP/NCCP implementation, 19% (62,865 acres) of white-tailed kite habitat in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands, including baseline and newly protected lands. Of these, at least 17,910 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 on 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 3,791 acres of modeled habitat for western yellow-billed cuckoo (Table 5-3B, *Take Limits, 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 117 acres of modeled western yellow-billed cuckoo habitat, representing approximately 3% of the current extent of modeled habitat in the Plan Area (Table 5-3B, *Take Limits, Covered Species*). An estimated 39% (45 acres) of the habitat loss will result from operations and maintenance activities, including 41 acres from creek maintenance and enhancement activities associated with the Cache Creek Resources Management Plan. The remainder of the habitat loss is distributed primarily among Planning Units 7, 13, and 14 (Table 5-6, *Covered Species Habitat Loss*). Although covered activities will temporarily remove up to 1 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 1 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* (Section 4.3, *Conditions on Covered Activities*) 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 *AMM16, 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* (Section 4.3, *Conditions on Covered Activities*). 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 sites.

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 east 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 3,791 acres of modeled habitat for western yellow-billed cuckoo. Of this, covered activities will permanently remove up to 116 acres (Table 5-3B, *Take Limits, 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 (2%) 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 240 acres of which will provide modeled habitat for western yellow-billed cuckoo (Objective WYBC1.1) (Table 5-7). 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 (Objectives L1.5) and Putah Creek (Objective L1.6), each of which supports a large contiguous patch of modeled western yellow-billed cuckoo habitat. 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 NC-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 an estimated 3% net increase of western yellow-billed cuckoo habitat in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). With full implementation of the HCP/NCCP an estimated 54% of western yellow-billed cuckoo habitat in the Plan Area will be conserved on Categories 1 and 2 Public and Easement Lands (Table 5-7, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of these, at least 17,900 acres will consist of lands held in conservation easements that are newly

protected and incorporated 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 103,819 acres of modeled habitat for western burrowing owl, including 37,690 acres of primary habitat and 66,129 acres of other habitat (Table 5-3B, *Take Limits, 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*.

While comprehensive surveys of the Plan Area have not been conducted, CDFW and the Burrowing Owl Preservation Society, in partnership with the Institute for Bird Populations, conducted surveys in 2007 and 2014. While 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. Based on the results of 2007 surveys and additional data gathered by SAIC and reported incidentally to SAIC by knowledgeable individuals from other areas of the County, a total of 50 breeding pairs were present in the County as of 2007. No new occurrences were found during the 2014 surveys. These surveys do not represent the total number of burrowing owl breeding pairs, but they do indicate the locations of most significant known breeding areas for the western burrowing owl in the Plan Area.

[**note to reader:** The 2014 surveys followed a sampling methodology and they did not constitute a comprehensive survey. The Institute for Bird Populations is currently analyzing the sampling results and the Public Review Draft will reflect the results of this analysis.]

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 3,724 acres of modeled western burrowing owl habitat, including 1,430 acres of primary habitat and 2,294 acres of other habitat (Table 5-3B, *Take Limits, Covered Species*). This loss represents 3% of the total western burrowing owl habitat in the Plan Area. Up to an additional 19 acres of habitat will be temporarily removed through bridge replacement activities and operations and maintenance activities (Table 5-3B, *Take Limits, Covered Species*).

An estimated 17% (621 acres) of the western burrowing owl habitat loss will result from development in the urban planning units: Woodland, Davis, West Sacramento, and Winters (Planning Units 19–22; Table 5-6, *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.

[**note to reader**: for next iteration, we will include an analysis of loss of breeding occurrences, if any.]

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 will be minimized through implementation of *AMM18 Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl* (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. Also, burrowing rodent populations, prey for burrowing owls, 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 *AMM17 Minimize Take and Adverse Effects on Habitat of Western Burrowing Owl* (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 *AMM17* 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 *AMM17* 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 (*AMM17*).

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 grasslands, 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 103,819 acres of modeled habitat for the western burrowing owl, of which covered activities will remove up to 3,724 acres (4%). An estimated 62% 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 (4% 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 5-7, *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 agricultural foraging habitat is also modeled habitat for western burrowing owl (See Appendix A, *Species Accounts*, Figures A-6 and A-9). Within the protected burrowing owl habitat, the Yolo HCP/NCCP will protect at least [To be determined] occupied western burrowing owl nesting burrows. Additionally, the Yolo HCP/NCCP will enroll at least [To be determined] acres of pre-permit reserve lands into the Yolo HCP/NCCP reserve system, consistent with Objective SH1.4 (CM1).

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 grasslands (primary habitat) by 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 (Objective 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 4% decrease of modeled western burrowing owl habitat in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). With full implementation of the Yolo HCP/NCCP, an estimated 14% of the burrowing owl habitat in the Plan Area will be conserved on Categories 1 and 2 Public and Easement Lands (Table 5-7, *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 679 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. At least [To be determined] occupied western burrowing owl occurrences will be protected and managed in the reserve system (Objective WBO1.3). 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 4,642 acres of modeled least Bell's vireo habitat (Table 5-3b, *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 *Federal Resister* [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 (see Appendix A, *Species Accounts*). Breeding has not yet been confirmed for least Bell's vireo in the Plan Area. 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 110 acres (2%) of modeled least Bell's vireo habitat in the Plan Area (Table 5-3B). No least Bell's vireo habitat will be temporarily lost as a result of covered activities.

An estimated 42% (six 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 5-6).

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 sites 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 non-native 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* (Section 4.3, *Conditions on Covered Activities*) 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% 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 occurrences have been recorded, however, including 2010 and 2011 observations of two singing (therefore potentially nesting) least Bell's vireo males in the southern portion of the Yolo Bypass Wildlife Area (California Department of Fish and Wildlife 2013), suggesting that the species range has expanded towards the northern extent of its historical breeding range. This recent occurrence in the Plan Area represents 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 4,642 acres of potentially suitable nesting and migratory habitat. Of this, covered activities will permanently remove up to 110 acres (2%) (Table 5-3B, *Take Limits, 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 additional acres to achieve no net loss of this natural community (Objective NC-VFR1.3) (Table 5-7, *Covered Species Benefits and Net Effects*). Within this acreage, the Yolo HCP/NCCP will protect and restore 1,242 acres of least Bell's vireo habitat if all habitat loss occurs (Objectives LBV1.1, LBV1.2). 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% net increase of least Bell's vireo habitat in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). With full implementation of the HCP/NCCP, an estimated 63% of least Bell's vireo habitat in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands, including baseline and newly protected lands. Of these Categories 1 and 2 Public and Easement Lands, at least 1,242 acres (600 protected and 642 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 will be 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 5-3B, *Take Limits, 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 Cache Creek. 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), although there is no modeled habitat for bank swallow in this area [To be resolved for public review draft.].

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. Stream maintenance

and enhancement activities implemented under the Cache Creek Resources Management Plan in the Lower Cache Creek planning unit (planning unit 7) will result in temporary removal up to 37 acres (1%) of bank swallow habitat in the Plan Area. All other covered however, will avoid nesting colonies as described in *AMM19 Minimize Take and Adverse Effects on Habitat of Bank Swallow* (Section 4.3, *Conditions on Covered Activities*).

[**note to reader**: we need further coordination with Cache Creek Resources Management Plan to better understand the nature of potential effects on bank swallow habitat. To be resolved for public review draft.]

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 *AMM19 Minimize Take and Adverse Effects on Habitat of Bank Swallow* (Section 4.3, *Conditions on Covered Activities*), 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 JPA, 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 *AMM19*, 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 temporarily removed by covered activities. 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 (4%) 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 L1.5), 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 5-7, *Covered Species Benefits and Net Effects*). Additionally, The JPA 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 net change in bank swallow habitat in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). With full HCP/NCCP implementation, an estimated 6% of the bank swallow habitat in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-7, *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 265,713 acres of tricolored blackbird habitat, with 4,669 acres of nesting habitat and 261,044 acres of foraging habitat (Table 5-3B, *Take Limits, 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 8 miles of nesting habitat. Foraging habitat generally consists of grasslands 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*.

While comprehensive surveys of the Plan Area have not been conducted, species locality databases document fourteen 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.

[**Note to reader:** We are looking into the most recent data on nesting colonies and habitat mapping, and will update the data based on our investigations.]

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 9,299 acres of modeled tricolored blackbird habitat, including 86 acres of nesting habitat and 9,213 acres of foraging habitat (Table 5-3B, *Take Limits, Covered Species*). This loss represents 1% of the total tricolored blackbird modeled habitat in the Plan Area. Additionally, covered activities will temporarily remove up to 20 acres of foraging habitat (Table 5-3B, *Take Limits, Covered Species*).

An estimated 52% 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 5-6, *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 10% (980 acres) of tricolored blackbird habitat loss will result from habitat restoration (Table 5-6, *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.

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* 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 *AMM20*.

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 *AMM20*.

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% 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. While 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 265,713 acres of modeled tricolored blackbird habitat: 4,669 acres of nesting habitat and 261,044 acres of foraging habitat. Covered activities will remove 9,299 acres (1%) of the modeled habitat in the Plan Area, 9,213 acres of which is foraging habitat and 86 acres of which is nesting habitat for tricolored blackbirds (Table 5-3B, *Take Limits, 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 (1% 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 grasslands and cultivated lands seminatural community (Objectives NC-CL1.1, NC-CL1.2, and NC1.1) is expected to contribute an estimated 16,310 acres of tricolored blackbird foraging habitat to the reserve system (Table 5-7, *Covered Species Benefits and Net Effects*). The Yolo HCP/NCCP will also protect 300 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 5-7, *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 4,629 acres of existing protected tricolored blackbird habitat on pre-permit reserve lands will be enrolled into the reserve system, including 4,608 acres of foraging habitat and 21 acres of nesting habitat (Objective TRBL1.2). The reserve system will include at least one tricolored blackbird colony, which will be managed to maintain the colony (Objective TRBL1.3).

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 3% decrease in tricolored blackbird foraging habitat in the Plan Area (Table 5-7, *Covered Species Benefits and Net Effects*). With full implementation, an estimated 65% of nesting habitat (2,973 acres) and 18% of foraging habitat (48,818 acres) for tricolored blackbird in the Plan Area will be conserved in Categories 1 and 2 Public and Easement Lands (Table 5-7, *Covered Species Benefits and Net Effects*), including baseline and newly protected lands. Of these Categories 1 and 2 Public and Easement Lands, at least 16,510 acres will be newly protected lands in the reserve system, and an additional 4,629 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 JPA provides one here to support the federal biological opinion for the USFWS Section 7 internal consultation process (see Chapter 1, *Introduction*, for 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 environmental impact statement/environmental impact report (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 (placeholder for EIS/EIR citation).

[**Note to agencies** – we will include a list of federal actions that we are not including in this cumulative analysis but that will be included in the EIS/EIR, such as BDCP implementation. This list will be developed when the EIS/EIR is underway.]

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[13] 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 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.

[**note to reader:** ICF is looking into which levees in the Plan Area have Army Corps involvement and which may require federal actions for O&M – these will not be included in the Section 7 cumulative effects analysis.]

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

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

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

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 energy development and operation is not a covered activity under the Yolo HCP/NCCP.

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.

[**note to agencies:** we will do further research on wind turbines and expand on the above paragraph for the public review draft.]

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 Utilities Infrastructure

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. Activities associated with their utility infrastructure would be covered

by PG&E's HCP and are not covered by the Yolo HCP/NCCP, except as necessary for development identified in the General Plans.

5.8.5 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. 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). Estep (Appendix H) compared alfalfa acreage in Yolo County with the number of active nesting territories between 1991 and 2000. During this 10-year period there was not a clear correlation between alfalfa acreage and the nesting population within the study area. This pattern continued through 2012 as alfalfa acreage increased during some years and returned to approximately 1991 levels while the nesting population within the study area remained relatively stable.

5.8.6 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) 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.

5.8.7 Tribal Lands Management

The Yocha Dehe Wintun Nation is the only federally recognized tribe with trust landholdings in the Plan Area. Deganawidah-Quetzalcoatl University, a private 2-year college that is part of a federal trust for tribal colleges, is also 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.

5.8.8 Climate Change

Climate change is likely to affect covered species during the HCP/NCCP permit term. 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, such as Swainson's hawk, least Bell's vireo, and western yellow-billed cuckoo (Parmesan 2006; Parmesan and Yohe 2003; Penuelas and Filella 2001; Forest and Miller-Rushing 2010; 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 reductions in greenhouse gas emissions (i.e., climate change mitigation) are made now (Solomon et al. 2009).

5.8.9 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. 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:

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 not required for an HCP, the USFWS must evaluate whether the federal action will adversely modify designated critical habitat in their Section 7 Biological Opinion prepared to issue the federal Section 10(a)(1)(B) ITP for this Plan. This assessment is provided to support that analysis.

Critical habitat is present in the Plan Area for only one of the covered species: California tiger salamander (Figure 5-5, *Critical Habitat*).[14] 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. Consistent with the definition of critical habitat, only the modeled habitat for California tiger salamander is considered critical habitat within Unit 1.

AMM13 (Chapter 4, *Conditions on Covered Activities*) 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.

[14] 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).

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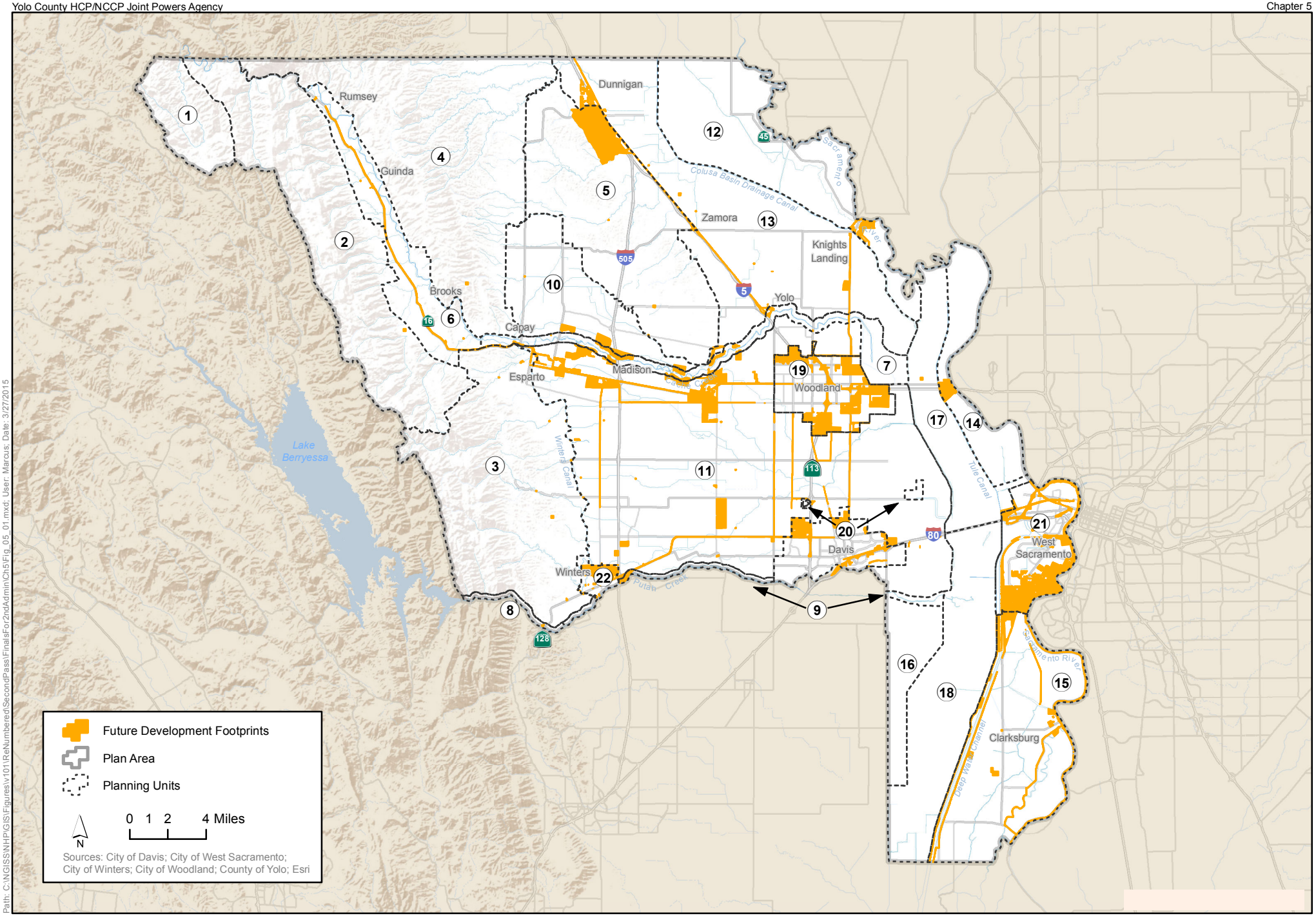

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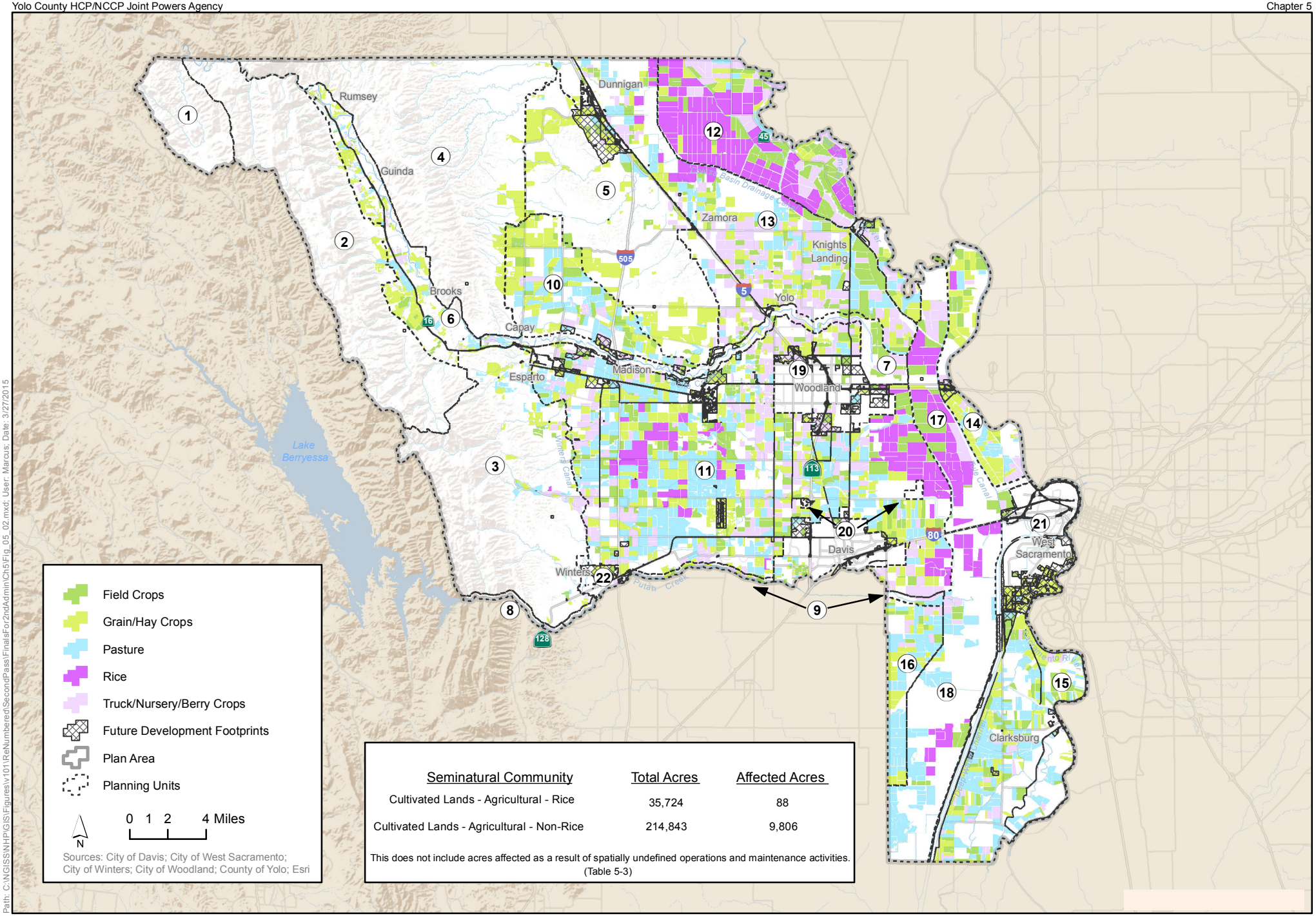
Figure 5-1
Future Development Footprints



Seminatural Community	Total Acres	Affected Acres
Cultivated Lands - Agricultural - Rice	35,724	88
Cultivated Lands - Agricultural - Non-Rice	214,843	9,806

This does not include acres affected as a result of spatially undefined operations and maintenance activities. (Table 5-3)

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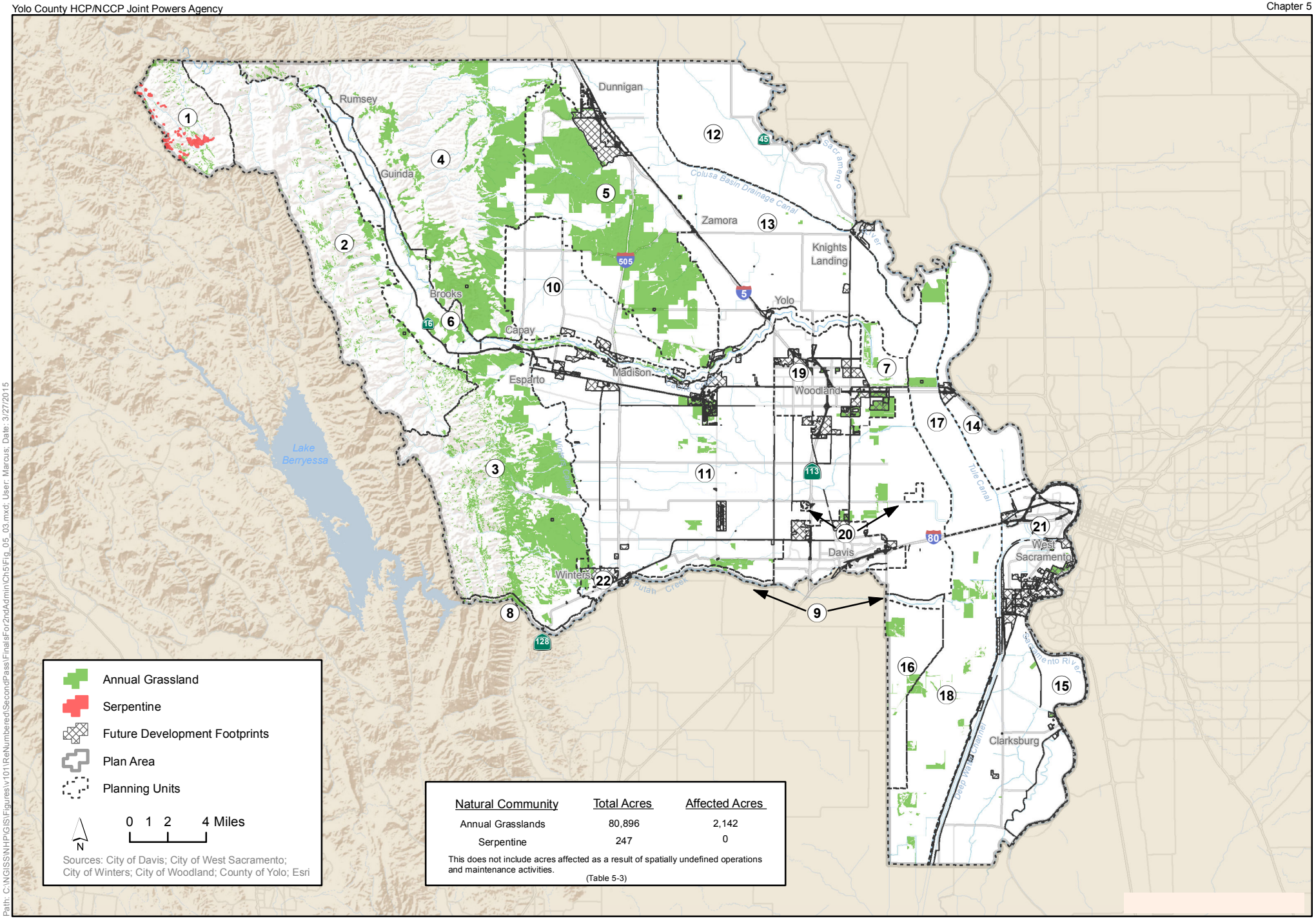
Figure 5-2
Cultivated Lands Seminatural Community and Future Development Footprints



Natural Community	Total Acres	Affected Acres
Annual Grasslands	80,896	2,142
Serpentine	247	0

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

(Table 5-3)

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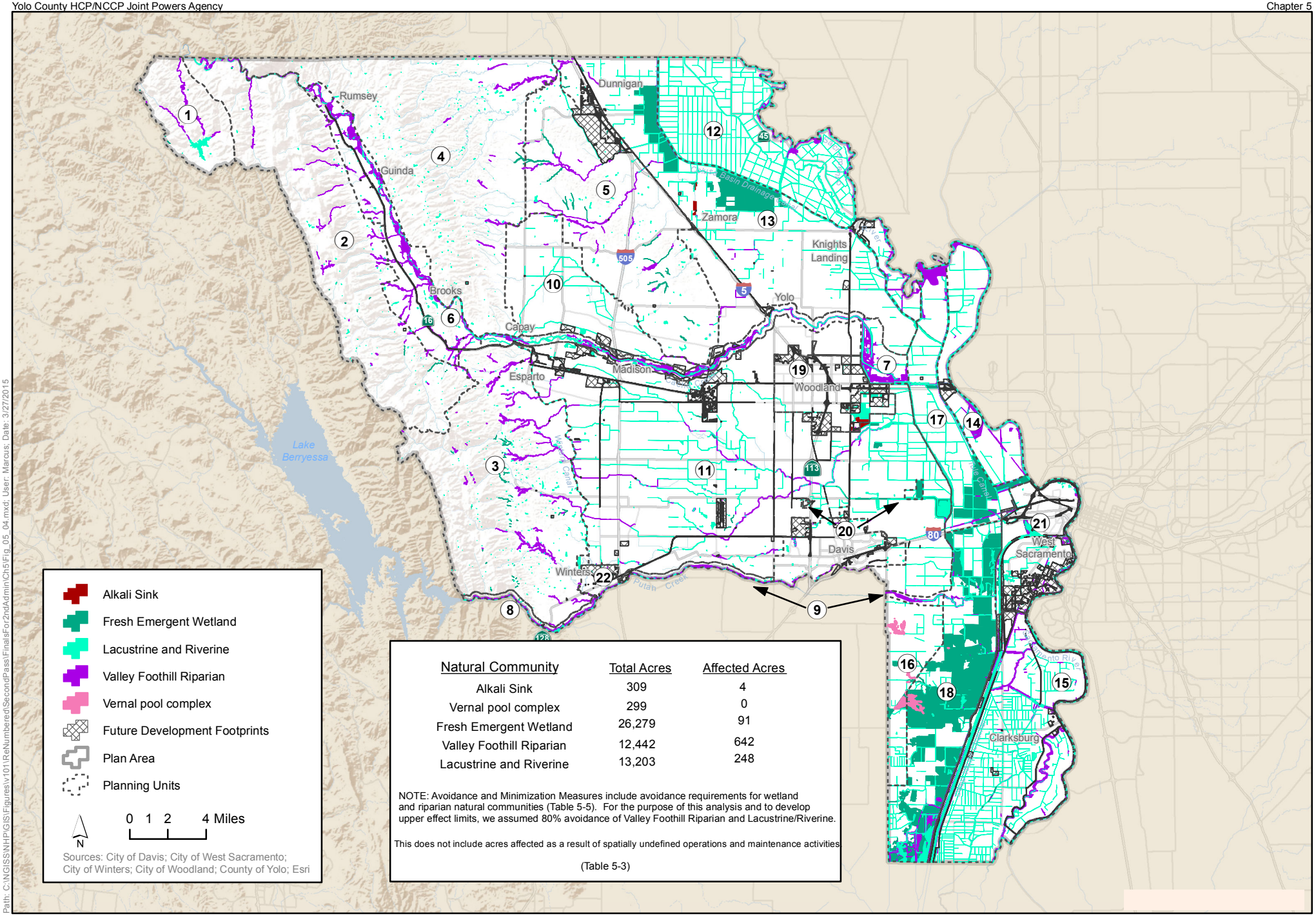
Figure 5-3
Grasslands and Future Development Footprints



Natural Community	Total Acres	Affected Acres
Alkali Sink	309	4
Vernal pool complex	299	0
Fresh Emergent Wetland	26,279	91
Valley Foothill Riparian	12,442	642
Lacustrine and Riverine	13,203	248

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 and Lacustrine/Riverine.

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

(Table 5-3)

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Figure 5-4
Riparian and Wetlands and Future Development Footprints

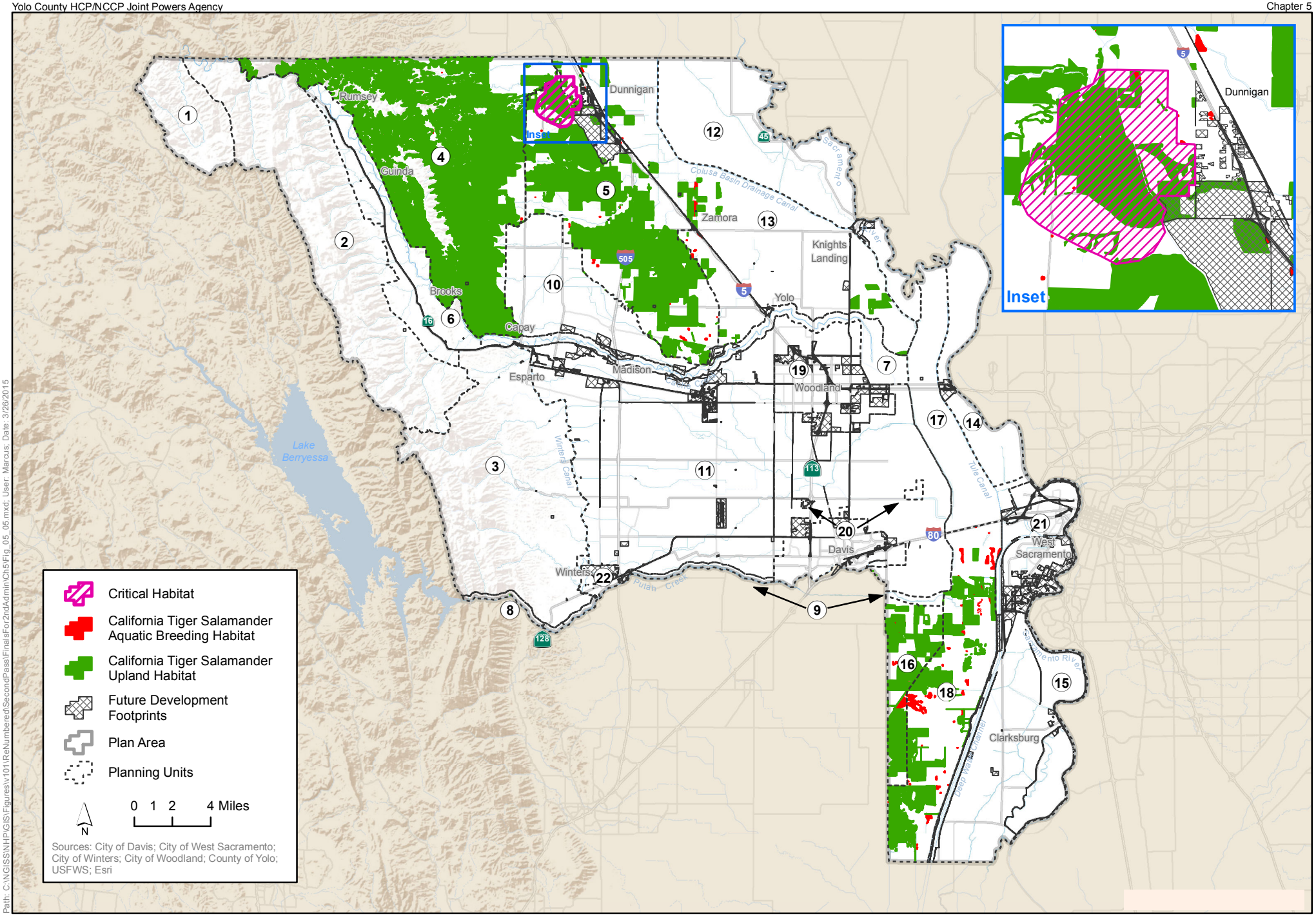

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Figure 5-5
Critical Habitat