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CHAPTER 5. CONSERVATION STRATEGY

[Note to Reviewer: This Chapter represents prior direction of the JPA staff for conservation and mitigation targets and strategy, and has not yet been subject to important public, agency, and JPA/member agency review and negotiation.]

5.1 INTRODUCTION

This chapter presents the Yolo Natural Heritage Program’s (NHP) Conservation Strategy, which consists of multiple components that are designed collectively to achieve the NHP planning goals and conservation objectives described in Chapter 1, Introduction, and the Planning Agreement (Appendix J, Yolo NHP Planning Agreement). The Conservation Strategy includes both the minimization and mitigation of impacts necessary under section 10 of the federal Endangered Species Act¹ to allow covered activities in Yolo County to move forward, as well as providing for the conservation of covered species and natural communities necessary to meet the requirements of the state Natural Community Conservation Planning Act (NCCPA). As such, the Conservation Strategy also provides for the habitat needs of non-covered native species associated with each of the natural communities, the establishment of ecological corridors to support the movement and genetic exchange among populations of covered and other native wildlife, and the protection of environmental gradients to accommodate potential future shifts in species distributions (e.g., in response to climate change). The Conservation Strategy will serve as the blueprint for conservation planning in Yolo County in the future. It will guide efforts to conserve covered species and the natural communities on which they depend, reduce or avoid impacts to existing natural communities, and replace the current piecemeal approach to conservation planning. Implementation of the NHP will result in the protection and restoration of 76,008 acres of natural communities and species habitat in addition to the 66,838 acres of existing protected natural communities and habitat or 27.1 percent of the acreage of these resources in the Plan Area.²

The Conservation Strategy identifies the intended biological outcomes of NHP implementation and describes the means by which these outcomes will be achieved. The Conservation Strategy includes specific and measurable biological goals and objectives and comprehensive conservation measures designed to avoid, minimize, and compensate for the impacts of the covered activities (Chapter 3, Covered Activities) and to conserve covered species and the natural communities upon which they depend.

The elements of the Conservation Strategy are as follows:

¹ The NHP also provides the necessary information for the USFWS intra-agency consultation under section 7 of the ESA to support the permit issuance decision.
² See Tables 5-9 and 5-22.
• Methods and approach to achieving conservation, including a framework and assembly principles for the development of the system of conservation lands based on the principles of conservation biology (Section 5.2, Methods and Approach).

• Biological goals and objectives for landscape, natural community, and species-specific scales that represent the intended biological outcomes of Plan implementation (Section 5.3, Biological Goals and Objectives).

• Conservation measures (Section 5.4, Conservation Measures) to achieve the biological goals and objectives, including measures to avoid and minimize impacts of the covered activities, the implementation of which provides the means for achieving the intended biological outcomes.

• A description of how implementation of the conservation measures is expected to conserve each of the natural communities, covered species, and Yolo NHP local concern species (described in Section 5.5, Conservation Provided for Natural Communities, Section 5.6, Conservation Provided for Covered Species, and Section 5.7, Conservation Provided for Local Concern Species, respectively).

• As described in Section 1.1, Introduction, the NHP also provides for implementation of the Local Conservation Strategy (Section 5.9) that provides for implementation of local conservation measures to address local conservation goals.

• The process and mechanisms through which implementation of the Conservation Strategy can be adjusted to improve its effectiveness in achieving the biological goals and objectives based on the analysis of monitoring and research results is described in Chapter 6, Adaptive Management and Monitoring Plan.

While there are several specific parcels identified for the acquisition\(^3\) of NHP conservation lands, the Conservation Strategy is primarily process-based such that the NHP conservation lands system, comprised of interconnected conservation lands and corridors, will be built over the term of the NHP. The NHP conservation lands system will be assembled through application of geographically-based quantified conservation targets and assembly principles that require acquisition of lands with the ecological characteristics and spatial distribution necessary to achieve the biological goals and objectives. This process-based implementation is commonly used in HCPs and NCCPs and allows for achievement of conservation goals and objectives using a willing-seller approach and with the benefits of the free market in land acquisition.

5.2 METHODS AND APPROACH

The methods and approach to developing the Conservation Strategy are described in this section, including the framework of the Conservation Strategy and the development of the terrestrial and aquatic components of the Conservation Strategy.

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\(^3\) Acquisition of land as used in the NHP means the placement of conservation easements on or the fee title purchase of land parcels to protect natural communities and covered species habitat under the NHP.
5.2.1 Framework for the Conservation Strategy

To meet the NCCPA permit standards, the Conservation Strategy provides for the conservation of covered species by protecting, enhancing, restoring, and managing natural communities, habitats, and occurrences of covered species. The Conservation Strategy also achieves the objectives listed below, pursuant to the NCCPA (section 2820).

- Conserve, restore, and provide for the management of representative natural and semi-natural landscapes.
- Establish reserves that provide for the conservation of covered species within the NHP geographic area and linkages to adjacent habitat outside the NHP Plan Area.
- Protect and maintain habitat areas that are large enough to support sustainable populations of covered species.
- Incorporate in the reserves (NHP conservation lands) a range of environmental gradients and high habitat diversity to provide for shifting species distributions in response to changing circumstances.
- Sustain the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the reserve system (NHP conservation lands and ecological corridors).

The Conservation Strategy is based on the best scientific data available (Chapter 2, Existing Ecological Conditions, Appendix A, Covered Species Accounts, and Appendix I, Independent Science Advisors Report) and was designed using a multi-scale ecological approach in accordance with principles of conservation biology (Noss 1987).

At the largest (i.e., Plan Area-wide) ecological scale, biological goals and objectives were developed to encompass ecological processes, environmental gradients, biological diversity, and regional landscape connectivity. Conservation measures were developed to achieve these large scale, or “landscape-level,” goals and objectives. At the middle (i.e., biological communities) ecological scale, goals, objectives, and conservation measures were developed to address natural communities primarily through the protection, enhancement, restoration, and management of physical habitat. The smallest ecological scale goals, objectives, and conservation measures address additional specific needs (additional to the landscape-level and natural community-level conservation) of covered species to protect individuals and populations and to protect and enhance specific areas of species habitat. Landscape and natural community conservation measures address ecological conditions and processes on which species depend, while species-specific conservation measures address mainly ecological stressors specific to the species. These species-level conservation measures were developed to supplement and focus the measures that

---

4 A semi-natural landscape is defined as one that is disturbed by human activity, but still provides important habitat for a variety of native species. In the context of the NHP, the large working agricultural landscape of Yolo County not “natural” but provides important habitat for a number of covered species.
address landscape-level and natural community-level conservation of covered species and to ensure that all needs of each covered species are addressed.

The biological goals and objectives and the conservation measures were developed first at the landscape level to address the needs of the broadest array of covered natural communities and covered species as possible. Next, each natural community was examined to determine additional conservation measures needed at the natural community level to achieve the biological goals and objectives for each community. Lastly, the expected benefits of achieving the landscape and natural community biological objectives for each covered species was evaluated to determine if additional species-specific measures were necessary to conserve the species in addition to the landscape-level and natural community-level conservation measures. Using this hierarchical approach, the conservation needs of many covered species are met through the landscape and natural community-level measures, with additional conservation needs met by species-specific measures for covered species whose conservation needs could not be fully addressed at the landscape and natural community levels.

The conservation measures are described with sufficient detail and specificity to allow for their implementation. As a result of the large scale and long timeframe over which the NHP will be implemented, the conservation measures are also designed to be flexible to allow for adaptive management with ever increasing knowledge over time. For example, natural community-level actions provide broad management guidelines and principles so future land managers can implement specific techniques on the grounds that are best suited to site conditions. Preserving this flexibility is an important component of the Conservation Strategy.

5.2.1.1 Landscape and Planning Units

To facilitate the development of a spatially explicit conservation strategy, and to ensure that biological goals and objectives are addressed consistently throughout the Plan Area, the Plan Area is divided into two Landscape Units that are comprised of 22 Planning Units (Figure 5-1, Yolo NHP Landscape Units and Planning Units). The Landscape Units were established to reflect the elevation break and associated ecological differences between the hills and ridges in the western Plan Area and the valley floor and floodplains dominating the remainder of the Plan Area. The Hill and Ridge Landscape Unit encompasses Planning Units 1–6 and 8 and is characterized by the dominant woodlands and forest, grassland, and shrubs and shrublands natural communities. The Valley Landscape Unit encompasses Planning Units 7 and 9–22 and is dominated by farmed lands. The Plan Area’s urbanized areas within incorporated cities are located within the Valley Landscape Unit in Planning Units 19–22 (Figure 5-1 and Figure 2-8).
Figure 5-1. Yolo NHP Landscape Units and Planning Units
The acreage of each natural community and habitat type in each Landscape and Planning Unit is presented in Table 5-1. The Planning Units were delineated to capture lands that support similar ecological, topographical, natural community and land use conditions. The primary purpose of these Planning Units is to identify the specific areas in which conservation actions (such as land acquisition and habitat restoration) will occur without identifying individual parcels for the actions. The Planning Units are sufficiently large such that only a portion of the land within each is necessary to meet natural community conservation objectives. In this way, a willing seller and free market approach can be taken.

For each of these Planning Units, specific goals and criteria are identified for the acreage of protection of natural communities and species habitats so that the Implementing Entity can conduct and track an organized assembly of the conservation lands system. While Planning Units were generally identified for major natural geomorphic and ecological features, the specific Planning Unit boundaries were delineated using clearly recognizable features, such as roads and parcel boundaries that best approximated natural geomorphic and ecological boundaries. Using readily identifiable existing features as boundaries facilitates clear recognition of boundaries for planning and implementing the NHP by the Implementing Entity, wildlife agencies, and the public.

This approach using the Planning Units identifies conservation actions in a spatially explicit manner while maintaining the flexibility to implement NHP actions on different parcels to meet the same conservation objectives (i.e., to respond to willing sellers where they arise).

5.2.1.1.1 Hill and Ridge Landscape Unit – Planning Unit Descriptions

Planning Unit 1 – Little Blue Ridge. The Little Blue Ridge Planning Unit incorporates unique geomorphic, geologic and soils conditions that support specialized vegetation types. Boundaries are defined as the County lines with Napa, Lake, and Colusa Counties on the north, south, and west, and by Lang’s Peak Road on the east. The 11,832-acre area (Table 5-1) is dominated by chamise and mixed shrub habitats, with lesser amounts of oak woodland and grassland. Little Blue Ridge also supports the only occurrences of serpentine grassland, closed-cone cypress woodland and juniper woodland habitats in the Plan Area.

Planning Unit 2 – North Blue Ridge. The North Blue Ridge Planning Unit encompasses 52,853 acres (Table 5-1) of mostly steep, rugged terrain. The Planning Unit is bounded on the north by State Highway 16 and the Colusa County line, on the west by flatter lands that are used predominantly for agriculture in the Capay Valley, on the south by lower Cache Creek watershed boundary, and on the west by Napa County. The Planning Unit supports abundant chamise and mixed chaparral scrub types and blue oak-dominated woodland, with lesser amounts of grassland. The North Blue Ridge Planning Unit includes nearly two-thirds of the montane hardwood habitat in the NHP Plan Area and a substantial proportion of the small amount of closed-cone pine-cypress habitat in the county.
Table 5-1. Existing Extent of Natural Communities and Land Cover Types within NHP Landscape and Planning Units
Planning Unit 3 – South Blue Ridge. The South Blue Ridge Planning Unit supports topography, geology, and vegetation similar to the North Blue Ridge Planning Unit. It was separately recognized to subdivide the 31-mile-long extent of the Blue Ridge formation in Yolo County to similar sized units. South Blue Ridge includes 56,259 acres (Table 5-1) of mostly steep, rugged terrain dominated by chaparral, oak woodland, and grassland. The Planning Unit is bounded on the north by lower Cache Creek watershed boundary, on the east by the Winters Canal and the flatter lands that are used predominantly for agriculture. To the south, the Planning Unit is bounded by upper Putah Creek with its separately recognized 400-meter-wide buffer zone that forms the Upper Putah Creek Planning Unit (Planning Unit 8). The Napa County line forms the western boundary. The South Blue Ridge Planning Unit supports abundant grassland and oak woodland, with lesser amounts of chamise and mixed chaparral scrub types and riparian woodland. The Planning Unit includes nearly one-third of the montane hardwood habitat in the NHP Plan Area.

Planning Unit 4 – Capay Hills. The Capay Hills Planning Unit encompasses the hills formation that separates Capay Valley from Hungry Hollow and the Dunnigan Hills. The area includes 66,934 acres (Table 5-1) of mostly steep land. The Planning Unit extends north to the Colusa County line with its eastern boundary demarcated by the lowlands adjacent to the Dunnigan Hills, County Road 85, the south fork of Buckeye Creek, the Tehama-Colusa Canal, and flat terrain of the Hungry Hollow Basin (Planning Unit 10). The southern and western boundaries are the Hungry Hollow Canal and the valley floor of Capay Valley, respectively. Oak woodland and grasslands are the dominant habitats, with substantial amounts of chaparral, and small amounts of lands farmed to grain.

Planning Unit 5 – Dunnigan Hills. The Dunnigan Hills Planning Unit is delineated to recognize this separated topographic area of the hills. The Planning Unit is demarked on the north by South Fork Buckeye Creek and flatter farmed land associated with it, on the northeast by the Union Pacific railroad and on the southeast and south by the Acacia and West Adams canals. County Road 85 and a lowland area separate the northeast boundary of the Dunnigan Hills from the Capay Hills. The 48,038-acre Planning Unit (Table 5-1) is dominated by grassland and agricultural lands, including dryland farmed grains and vineyards.

Planning Unit 6 – Upper Cache Creek. The Upper Cache Creek Planning Unit consists of the narrow (0.5- to 3-mile-wide) Capay Valley bottomland area located between North Blue Ridge and the Capay Hills and northwest of the town of Capay. The 17,919-acre area (Table 5-1) supports a wide variety of habitats, including Cache Creek and its associated riparian woodland and scrub, numerous small farms, and areas of grasslands and oak woodland typical of adjacent Planning Units, and some developed areas.

Planning Unit 8 – Upper Putah Creek. The Upper Putah Creek Planning Unit consists of 1,023 acres of the creek, the adjacent floodplain, and associated lands in the steeper upland portion of Putah Creek (Table 5-1). The narrow Planning Unit is bounded on the south by Putah Creek (which forms the Solano County boundary) and on the north by steep topography, generally
delimited by Highway 128. The Planning Unit supports riparian woodland and scrub and aquatic habitat, but also includes substantial areas of upland oak woodland, grassland, and farmland.

5.2.1.1.2 Valley Landscape Unit – Planning Unit Descriptions

Planning Unit 7 – Lower Cache Creek. The 11,361-acre Lower Cache Creek Planning Unit (Table 5-1) consists of Cache Creek and its adjacent riparian corridor downstream of the town of Capay to its terminus in the Cache Creek Settling Basin. The area supports abundant riparian and aquatic habitat and encompasses some adjacent agricultural lands and aggregate mining areas.

Planning Unit 9 – Lower Putah Creek. The 2,612-acre Lower Putah Creek Planning Unit includes Putah Creek and its floodplain and adjacent lands in the lower gradient lowland portion of Putah Creek (Table 5-1). The narrow east-west unit is bounded on the north by farmed areas and on the south by the creek, which is the boundary with Solano County. On its east side, both sides of the creek are within Yolo County and this Planning Unit, where they are bordered by agricultural lands. Riparian woodland is a dominant habitat in this Planning Unit, with most habitat consisting of older mature woodland, but over half of the lands included are adjacent agricultural lands, predominantly in orchards and various field crops.

Planning Unit 10 – Hungry Hollow Basin. The Hungry Hollow Basin Planning Unit comprises 21,069 acres (Table 5-1) of mostly agricultural lands between the Capay Hills and Dunnigan Hills and north of Cache Creek. The south boundary of this Planning Unit is the Cache Creek corridor, the north boundary follows the South Fork Oak Creek, and the east boundary is the Hungry Hollow Canal. Approximately 93 percent of the lands in the Hungry Hollow Basin Planning Unit are in agricultural use, with pasture and grain comprising over half of agricultural crops.

Planning Unit 11 – Willow Slough Basin. The Willow Slough Basin Planning Unit is the largest Planning Unit, comprising 118,060 acres in the central portion of the county between Cache and Putah Creeks (Table 5-1). The planning unit is bounded by Cache Creek corridor and Cache Creek Settling Basin and Woodland on the north; the Yolo Bypass on the east; Davis and Putah Creek on the south; and Winters Canal on the west. Agriculture occupies 90 percent (approximately 106,000 acres) of the Planning Unit, with a wide variety of crop types grown. Urban and grassland habitats together comprise most of the remaining land area, with smaller but important amounts of riparian, alkali sink, wetlands, and open water habitats.

Planning Unit 12 – Colusa Basin. The Colusa Basin Planning Unit encompasses 35,091 acres in the northeast portion of the Plan Area (Table 5-1). The Planning Unit boundaries consist of the Colusa County line on the north, the Sacramento River on the northeast, the Yolo Bypass on the southeast, and the Knights Landing Ridge Cut and Colusa Basin Drainage Canal on the southwest. Approximately 92 percent of the lands are used for agriculture and supporting water management, with rice as the predominant crop. Riparian woodland is concentrated along the Sacramento River.
Planning Unit 13 – Colusa Basin Plains. The Colusa Basin Plains Planning Unit consists of 56,381 acres dominated by agricultural uses (Table 5-1). The Planning Unit is defined by Knights Landing Ridge Cut and the Colusa Basin Drainage Canal on the northeast, the Yolo Bypass on the southeast, the Cache Creek corridor and settling basin on the south, and the Dunnigan Hills and the Union Pacific railroad on the southwest. Approximately 84 percent of the Planning Unit is in agricultural uses, with a wide variety of crops grown. The remaining lands consist primarily of managed wetlands, grassland, and urban areas.

Planning Unit 14 – North Yolo Basin. The North Yolo Basin Planning Unit designates lands between the Sacramento River and the Yolo Bypass. The Planning Unit consists of 13,293 acres of land located west of the Yolo Bypass, south and east of the Sacramento River, and north of the Sacramento Weir (Table 5-1). Over 87 percent of lands are in agricultural use, including large areas of field crops, grain and hay crops, orchards, and pasture. The remaining lands consist primarily of grassland, riparian woodland, and open water, mainly along the Sacramento River.

Planning Unit 15 – South Yolo Basin. The South Yolo Basin Planning Unit comprises 38,929 acres (Table 5-1). The area is bounded in the north by a line from Garcia Bend west to the Sacramento Ship Channel. Other boundaries are the Sacramento River on the east, the Solano County line on the south, and the Yolo Bypass on the west. Agriculture is the primary land use (approximately 85 percent), with pasture, vineyard, and field crops the dominant crop types. Other major habitats include grassland and urban areas. Substantial riparian and open water habitats occur along the Sacramento River, Elk Slough, and other waterways.

Planning Unit 16 – Yolo Basin Plains. The Yolo Basin Plains Planning Unit is relatively small (10,284 acres; Table 5-1) bounded by the lower Putah Creek corridor on the north, the Yolo Bypass on the east and south, and the Solano County line on the west. While these lands are subject to flooding from the Yolo Bypass, the planning unit encompasses land above areas that flood frequently. Approximately 83 percent of the land is used for agriculture, primarily pasture, field crops, and grain and hay. Other major habitats include grassland and managed emergent wetlands. This Planning Unit supports some of the last remnants of natural vernal pool habitat in the Plan Area.

Planning Unit 17 – North Yolo Bypass. The 17,776-acre North Yolo Bypass Planning Unit consists of lands within the northern portion of the constructed flood bypass for the Sacramento River (Table 5-1). The northern boundary is formed by the Sacramento River at the Fremont Weir. The southern boundary is Interstate 80. The east and west boundaries are formed by the flood control levees of the bypass. Approximately 64 of the lands within the North Yolo Bypass Planning Unit are agricultural, farmed primarily in rice and field crops. Most remaining lands consist of riparian scrub, grassland, and managed wetlands.

Planning Unit 18 – South Yolo Bypass. The South Yolo Bypass Planning Unit consists of 32,301 acres within the southern portion of the Yolo Bypass. The northern boundary is formed by Interstate 80 (Table 5-1). The southern boundary and part of the western boundary consist of
the Solano County line. East and west boundaries are the flood control levees of the Yolo Bypass and designated flood areas, as well as county roads and the boundary with Solano County. Managed and natural wetlands, open water, and riparian habitat comprise nearly 40 percent of the lands within the Planning Unit. Agricultural uses, primarily pasture, field crops, and rice, also occupy 33 percent of the lands. Remaining lands primarily consist of grassland and associated vernal pools and alkali sink habitats.

**Planning Unit 19 – Woodland.** The Woodland Planning Unit includes 12,765 acres of land within the City of Woodland’s Urban Limit Line as defined in the City’s 2002 General Plan and updated in 2006 (Table 5-1). The Planning Unit includes the existing urbanized area within the Woodland city limits and lands projected for growth under the city’s General Plan. Approximately 66 percent of the Planning Unit is developed and over 25 percent of the land is currently farmed in various agricultural crops. This Planning Unit supports important regionally rare alkali sink habitat.

**Planning Unit 20 – Davis.** The 10,804-acre Davis Planning Unit is includes lands within the City of Davis’ sphere of influence as updated in the 2008 Davis General Plan (Table 5-1). Urban uses are supported on approximately 76 percent of land in this unit and agriculture on approximately 19 percent of the area. Natural areas include riparian habitat along the North Fork of Putah Creek and grassland habitats on the city’s outskirts.

**Planning Unit 21 – West Sacramento.** The 14,682-acre West Sacramento Planning Unit includes the city’s existing developed areas and lands within its jurisdiction that are projected for urban growth under the West Sacramento General Plan (Table 5-1). The Planning Unit is bounded by the Sacramento Bypass on the north, the Yolo Bypass on the west, the Sacramento River on the east and southeast, and the City limits on the south. Existing urban areas comprise about 73 percent of the Planning Unit. Other major habitats include grassland, agriculture, riparian woodland, and open water (mostly within the Sacramento River and Sacramento deepwater ship channel and associated Port of Sacramento).

**Planning Unit 22 – Winters.** The 1,978-acre Winters Planning Unit includes the city’s existing developed and undeveloped areas within its urban limit line (Table 5-1). Urban uses occur on 39 percent of land and agriculture occupies approximately 32 percent of land in this unit. Natural areas include riparian habitat along Putah Creek and grassland habitats in the city’s northern outskirts.

### 5.2.1.2 Existing Public and Easement Habitat Lands (PEHL)

Yolo County and the cities of Davis, Woodland, West Sacramento, and Woodland have worked to preserve agricultural land and natural communities outside of the NHP process for over 60 years, most significantly by directing growth to cities through adopted land use planning policies. As a result, over 88 percent of Yolo County’s population lives within the incorporated cities. As shown in Figure 3-1, this land use planning has resulted in the preservation of extensive agricultural lands on the valley floor and large areas of woodlands and forest.
Figure 2-1; shown as agriculture land use in Figure 3-1) of the Plan Area that support natural communities, as well as the preservation of other important habitats. While it is not possible to recreate the natural communities that existed in the Plan Area prior to the introduction of anthropogenic activities, Yolo County and the cities have minimized the impact of these activities by designing and implementing compact development patterns.

In addition to the implementation of progressive land use planning practices, Yolo County jurisdictions and non-profit organizations have worked for decades to preserve important land through voluntary conservation easements. These conservation efforts include:

- **Cache Creek Resource Management Plan.** In 1996, Yolo County reached an agreement with aggregate mining companies on Cache Creek to move mining out of the creek channel and to work together to restore the creek. As part of this process, the aggregate mining companies will provide land along the creek to the County to create an open space and habitat corridor.

- **City of Davis Open Space Protection Program.** City of Davis residents passed a tax in 2000 fund acquisition of open space and agricultural easements around the City’s borders.

- **Yolo Land Trust.** Since 1988, the Yolo Land Trust has been working with willing landowners to purchase agricultural conservation easements, many of which have significant ecological value.

- **California Rangeland Trust.** The California Rangeland Trust has worked with willing landowners to acquire rangeland conservation easements in Yolo County that have significant ecological value.

These past conservation efforts are an important consideration in the assembly of NHP conservation lands is the acreage and distribution of lands that are in public ownership or under conservation or agricultural easements that serve to conserve natural communities and covered species habitats. These lands are referred to as Public and Easement Habitat Lands (PEHL). A PEHL GIS dataset was developed to identify existing PEHL within the NHP Plan Area. It was compiled from various public sources from different time periods. Ownership information was collected and organized into attributes which include County, County Assessor’s Parcel Number (APN), Management Level, Management Agency, Alias (if known), Type (type of ownership), and Data Source. Although the boundaries depicted within the data do not represent legal boundaries, they represent the best available information and were considered to be sufficient to guide development of the Conservation Strategy at a landscape level. The Implementing Entity will acquire more detailed information necessary for land acquisition and other decisions during Plan implementation.

The public dataset sources used to generate the PEHL GIS data layer included the following:

- DFG Lands GIS data layer 2006;
• City of Davis General Plan;
• Yolo County General Plan;
• Yolo County Protected Lands; and
• Yolo County Assessor’s Tax Parcel data.

The data layer was created by overlaying source data on County parcel boundary data. Parcels identified as PEHL via source datasets were then attributed with the appropriate information. Based on the ownership information derived from the above sources, the data was evaluated and grouped into two resource protection-level categories defined as follows:

**Category 1 PEHL**: Primary management goal is related to ecological protection. Parcel is predominantly natural habitat and is covered by irrevocable conservation mandate (e.g., state or federal mandate, perpetual conservation easement) that precludes changes in land use that could result in degradation or loss of ecological functions. This category of PEHL is considered to meet the definition of “protected” under the NHP and is also referred to as “existing protected lands.”

**Category 2 PEHL**: Primary management goal is related to ecological protection. Parcel is predominantly natural habitat or in an agricultural use that supports covered species habitat; however, land is not covered by irrevocable conservation mandate (e.g., public land without a conservation mandate or private conservation areas without permanent easements).

While Category 2 PEHL were used to inform the development of the NHP, these lands are not considered to meet the definition of “protected” under the NHP Conservation Strategy. Where the NHP acquires Category 2 lands, these lands would be brought under full protection (i.e., elevated to Category 1 with permanent conservation easements) within the NHP conservation lands system and thus contribute toward achieving NHP natural community and species habitat targets. Properties not included as PEHL are those lands owned by the Department of Defense, city parks, designated open space lands, and lands with short-term or agricultural easements that are not specifically managed to maintain ecological functions for covered species and NHP natural communities (e.g., require cultivation of crop types that provide high wildlife habitat values). The distributions of Category 1 and 2 PEHL are presented in Figure 5-2, *Public and Easement Habitat Lands in the Plan Area*. The acreage of the natural communities and covered species habitats in PEHL by Landscape Unit and by Planning Unit is presented in Tables 5-2a–5-2d and Tables 5-3a–5-3d, respectively. A total of 66,838 acres of natural communities and agricultural lands are currently protected on Category 1 PEHL, representing 12.7 percent of the natural communities in the Plan Area (Table 5-2a).
Figure 5-2. Public and Easement Habitat Lands in the Plan Area
Table 5-2a. Extent of Natural Communities present in Existing Protected Category 1
Public and Easement Habitat Lands
Table 5-2b. Extent of Natural Communities present in Existing Protected Category 1

Public and Easement Habitat Lands in the Hill and Ridge Landscape Unit
Table 5-2c. Extent of Natural Communities present in Existing Protected Category 1
Public and Easement Habitat Lands in Valley Landscape Planning Units 7 and 9–15
Table 5-2d. Extent of Natural Communities present in Existing Protected Category 1
Public and Easement Habitat Lands in Valley Landscape Planning Units 16–22
Table 5-3a. Extent of Covered Species Modeled and Mapped Habitat Types present in
Existing Protected Category 1 Public and Easement Habitat Lands
Table 5-3b. Extent of Covered Species Modeled and Mapped Habitat Types present in Existing Protected Category 1 Public and Easement Habitat Lands in the Hill and Ridge Landscape Unit

| Table 5-3b | Extent of Covered Species Modeled and Mapped Habitat Types present in Existing Protected Category 1 Public and Easement Habitat Lands in the Hill and Ridge Landscape Unit |
Table 5-3c. Extent of Covered Species Modeled and Mapped Habitat Types present in Existing Protected Category 1 Public and Easement Habitat Lands in Valley Landscape Unit Planning Units 7 and 9–15
Table 5-3d. Extent of Covered Species Modeled and Mapped Habitat Types present in
Existing Protected Category 1 Public and Easement Habitat Lands in Valley Landscape
Unit Planning Units 16–22
5.2.2 Information Sources and Models

5.2.2.1 Primary Sources of Information

Primary sources of information used to develop the Conservation Strategy include the following:

- Ecological information presented in Chapter 2, *Existing Ecological Conditions*;
- Covered species life history and status information presented in Appendix A, *Covered Species Accounts*;
- Land use planning and land ownership information (see Section 5.2.1.2, *Existing Public and Easement Habitat Lands (PEHL)*);
- Recommendations provided by the NHP Independent Science Advisors (see Appendix I, *Independent Science Advisors Reports*);
- Relevant USFWS and NMFS biological opinions issued under ESA;
- The Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005a);
- Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*) (USFWS 1999);
- Previously prepared species conservation and management plans applicable to the Plan Area;
- Information provided by technical experts familiar with the ecological resources of and conservation opportunities in the Plan Area; and
- Information provided by USFWS and DFW resource experts.

5.2.2.2 Species Habitat Mapping and Models

Covered plant and vernal pool shrimp species alkali sink and vernal pool habitat was mapped directly from aerial imagery. Habitat models were developed for the remaining covered species, including covered plant species that occur in non-alkali and vernal pool habitats, based on the known or expected distribution of each species within the Plan Area and the land cover types and physical features (e.g., soil types) that are known to support habitats used by each of the species. The mapped habitat and habitat models for each covered species are presented in Appendix A, *Covered Species Accounts*, and the acreage of mapped and modeled covered species habitat types by Planning Unit are presented in Table 5-4. Mapped species habitat and species habitat models were used in combination with other information (e.g., the distribution of existing protected lands) to develop the habitat conservation targets for each of the Planning Units (Section 5.2.3.3, *Establishing Conservation Targets*) and to conduct the impact assessment presented in Chapter 4, *Impact Assessment and Estimated Level of Take*.
Table 5-4. Existing Extent of Modeled and Mapped Covered Species Habitat Types within NHP Landscape and Planning Units
5.2.3 Requirements for Conservation Lands

5.2.3.1 Regulatory Context

A major aspect of an NCCP is to describe the proposed design of a preserve system\(^5\) within the plan area. The NCCPA requires that a preserve system (referred to as a “system of habitat reserves”) or equivalent conservation be described in the plan:

The plan provides for the protection of habitat, natural communities, and species diversity on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the plan area. [section 2820(3)].

The preserve system does not need to be specifically described with demarcated boundaries on a map in the approved conservation plan; rather, it can be described based on a defined process driven by a set of design criteria and quantitative targets that is applied during plan implementation.\(^6\) Such design criteria for the NHP are addressed through the NHP conservation land assembly principles described in Section 5.2.3.4, Spatial Criteria for Conservation Lands Assembly. The preserve system under the NHP is referred to as the “NHP conservation lands.”

The NHP Conservation Strategy includes a few specifically mapped locations for NHP conservation lands as per a map-based plan, but mainly relies on a defined process with specific conservation acreage targets to build the bulk of the NHP conservation land system during plan implementation as per a process-based plan.

5.2.3.2 Addressing Ecological Conditions and Processes

In addition to conserving covered species within the Plan Area, the NCCPA requires that the plan address the conservation of ecosystem functions, environmental gradients, biological diversity, and shifting species distributions. A HCP under the ESA also addresses these issues, though there is no specific regulatory requirement to do so under the ESA. As a joint HCP/NCCP the NHP addresses the species, habitat, and natural community conservation requirements of both ESA and NCCPA. Conservation of biological diversity and other ecological conditions and processes in the Plan Area are addressed through a number of conservation measures and application of the following elements of the Conservation Strategy:

The Conservation Strategy includes conservation land assembly principles and habitat management measures that relate to ecological processes. The configuration of NHP conservation lands (e.g., size, shape, and proximity to developed land) can have a profound

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\(^5\) The terms “preserve” and “reserve” refer to any area of land or water used in implementing the HCP/NCCP to achieve the conservation goals of the plan. These areas may be acquired and protected through fee title or conservation easement and may include existing, restored, created, or enhanced habitat. The “preserve system” refers to the complete assemblage of preserves within the Plan Area. The NHP refers to this preserve system as the “NHP conservation lands.”

\(^6\) Usage here is as per Cylinder et al. (2004) for “map-based plans” vs. “process-based plans” and the less obvious terminology sometimes used by USFWS “hard-line preserves” versus “soft-line preserves.”
effect on the type and effectiveness of habitat management techniques (e.g., managed grazing, controlled fire, and weed management). Habitat management measures to create disturbance regimes and a mosaic of successional ecological conditions also serve to maintain biodiversity.

Landscape-level goals take into account the spatial distribution of natural communities on major geomorphic surfaces or landforms (e.g., valley landscape and ridges and hills landscape) and specialized features (e.g., serpentine soils and alkali sinks) in the Plan Area. This approach conserves the natural communities and biodiversity associated with each of the geomorphic landforms.

Measures to protect environmental gradients also protect biodiversity. Environmental gradients are important to biodiversity, movement and migration of individuals and populations, and shifting distributions of species. The landscape-level goals and objectives are designed to direct the resulting distribution of and spatial relationships among NHP conservation lands so that natural environmental gradients present in the Plan Area will be protected. Regional climate change resulting from factors causing global climate change is anticipated to lead to shifting species distributions within the Plan Area. Based on predicted changes in local climate, it is anticipated that species will shift their distributions to higher altitudes and higher latitudes. Protecting natural environmental gradients across elevations in the Plan Area will provide an appropriate range of conditions to accommodate these distributional shifts.

Conservation land assembly principles addressing minimum patch sizes and connectivity for each natural community also support conservation of biodiversity. Species with the largest range and movement requirements, as well as species that are most sensitive to movement barriers, were used to set minimum thresholds for protection of natural communities, based on the presumption that they would serve as appropriate parameters for addressing these requirements for other covered species.

5.2.3.3 Establishing Conservation Targets

Conservation targets were established for the natural communities and the covered species habitats they support. Conservation targets are the required total acreage and distribution of acreage of natural communities and covered species habitats that will be protected and restored under the NHP to conserve each of the covered species and mitigate impacts of the covered activities in the Plan Area as required under the ESA and the NCCPA. Natural community and species habitat distribution targets are addressed through the subdivision of the Plan Area into the two Landscape Units and 22 Planning Units. The conservation targets serve as the basis for establishing the natural community and species habitat protection and restoration biological objectives described in Section 5.3, Biological Goals and Objectives. Conservation targets encompass the establishment of a system of conservation lands under the NHP of sufficient size and configuration to achieve the following purposes:

- Protection of habitat, natural communities, and species diversity on a landscape and ecosystem level through the assembly and long-term management of conservation lands;
• Conserve, restore, and manage representative natural and semi-natural landscapes to maintain the ecological integrity of large habitat blocks, ecosystem functions, and biological diversity;

• Establish a conservation lands system that provides for the conservation of covered species within the Plan Area including linkages among the conservation lands and between adjacent habitat areas outside of the Plan Area;

• Protecting and maintaining habitat areas that are large enough to support sustainable populations of covered species;

• Incorporating a range of environmental gradients (such as slope, elevation, aspect, and latitude) and high habitat diversity (including habitat mosaics) to provide for shifting species distributions due to changed circumstances such as the effects of climate change on temperature and precipitation;

• Sustaining the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the habitat areas within the Plan Area;

• Support ecosystem processes such as production, decomposition, food webs, watersheds,

• Allow for dynamic natural/semi-natural disturbance patterns (e.g., dynamic stream systems, grazing, controlled fire) and habitat/community recovery processes through ecological succession.

Note that conservation acreage targets are only a component of the Conservation Strategy and that a full implementation of all avoidance and minimization measures, conservation measures, monitoring, and adaptive management and following the conservation lands assembly principles (described in Section 5.2.3.4.2, Conservation Land Assembly Principles) comprises the Conservation Strategy under the NHP.

Information used to develop conservation targets for natural communities and covered species (see also Section 5.2.2.1, Primary Sources of Information) included the following:

• Existing distribution and acreage of each natural community, habitat, and vegetation type (i.e., GIS land cover types) within the Plan Area (Figures 2-8 through 2-11, 2-14, and 2-15; Table 5-1);

• Existing distribution and acreage of each covered species’ modeled and mapped habitat within the Plan Area, including habitat important to different life stages such as breeding, nesting, foraging, and dispersal habitat (see Appendix A, Covered Species Accounts; Table 5-4);

• Primary threats and stressors for each of the covered species (see Appendix A, Covered Species Accounts);
• Location of habitat areas known to be occupied by each of the covered species (see Appendix A, Covered Species Accounts);

• The distribution and acreage of existing protected patches of each natural community and covered species habitat (Tables 5-2a-d and 5-3a-d, Figure 5-2);

• Potential for increasing connectivity with conserved habitat areas adjacent to the Plan Area using information from documents of HCP and NCCPs approved or under development for lands that are adjacent to the Plan Area;⁷ and

• Information provided by experts with species-specific knowledge for the NHP Plan Area.

To establish the conservation targets, the above information was evaluated by SAIC and advising biologists for each of the following variables.

• The patch size and connectivity of each natural community with other natural community patches. The conservation targets were formulated to provide for the establishment of large patches of connected natural communities rather than small fragmented patches with the exception of species that are limited to small and isolated habitat and distributions (e.g., vernal pool and alkali wetland dependent species) for which small conservation areas may be necessary to conserve species.

• The proportion of each natural community type currently in PEHL status within each of the Planning Units. The conservation targets for each Planning Unit were formulated considering the extent and location of natural communities and covered species habitats within existing PEHL and within lands that are unlikely to be threatened by development or major changes in land uses (e.g., areas with steep slopes) that are present in each of the Planning Units.

• The acreage of modeled and mapped habitat for covered species that is supported by each natural community within each of the Planning Units. The conservation targets were formulated to include the portions of natural communities that support modeled habitat for multiple species and species of limited distribution, and exclude land cover types that support no or a relatively little modeled habitat and a small number of covered species, except where patches are important to the conservation of a particular species, necessary to establish ecological corridors to provide for the movement and migration of species, or conserve environmental gradients.

• The patch size and connectivity of each covered species modeled habitat to other patches of protected and unprotected modeled species habitat within the Plan Area. The conservation targets were formulated to provide for large patches of connected modeled habitat for each of the covered species and to exclude small fragmented patches, except where small patches are important to specific species conservation.

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⁷ Adjacent plans include the Solano Multispecies HCP, Natomas Basin HCP, and Bay Delta Conservation Plan.
• **Location of important known covered wildlife species population centers and covered plant species occurrences.** The conservation targets were formulated to protect a proportion of these habitat areas such that wildlife species population centers and covered plant species occurrences are conserved.

• **Proximity of covered species modeled habitats to known occupied habitat.** The conservation targets were formulated to ensure the protection of occupied habitats, as well as unoccupied habitat connected to known occupied habitat such that unoccupied habitat is likely to be occupied in the future through natural processes or with implementation of habitat enhancement measures.

5.2.3.3.1 Development of Natural Community Conservation Targets

The conservation targets for protecting each of the natural communities are presented in Tables 5-5a-d and the natural community restoration targets are presented in Table 5-6, *Land Cover Types and Covered Species Habitat Restoration Targets*. Section 5.5, *Conservation Provided for Natural Communities*, provides a description of how achieving the natural community targets presented in Tables 5-5a–5-5d and Table 5-6 will conserve each of the natural communities. A description of how achieving the natural community conservation targets are expected to benefit local concern species is presented in Section 5.7, *Conservation Provided for Local Concern Species*. 
Table 5-5a. Summary of Natural Community Protection Targets
Table 5-5b. Natural Community Protection Targets for the Hill and Ridge Landscape Unit Planning Units
Table 5-5c. Natural Community Protection Targets for Planning Units 7 and 9–15 in the Valley Landscape Unit
Table 5-5d. Natural Community Protection Targets for Planning Units 16–22 in the Valley Landscape Unit
Table 5-6. Land Cover Type and Covered Species Habitat Restoration Targets
Early in the process of developing natural community conservation acreage targets, the three preliminary conservation lands alternatives were developed for the Hill and Ridge Landscape Unit that differed in the extent of grasslands, shrublands and scrub, woodlands and forest, and riparian natural community land cover types. Conservation of natural communities and agricultural habitats in the Valley Landscape Unit did not vary among the alternatives. These alternatives were designed to achieve a preliminary set of conservation lands assembly principles (e.g., minimum protected land unit sizes, connectivity with existing protected lands). Based on preliminary habitat conservation goals that were established for covered species, three alternative conservation land designs were generated using Marxan, and the results evaluated for the acreage of conservation they would provide for each of the covered species relative to the preliminary input goals (see Section 5.2.3.3.2, Development of Covered Species Conservation Targets). Results of this Marxan evaluation were used as an initial step in the development of natural community acreage targets which were iteratively developed through review of covered species habitat targets, ecological connectivity requirements, and natural community functions. For example, results of the alternatives evaluation indicated that the covered species habitat conservation goals could be achieved with a reduction in the acreage proposed for protection of woodlands and forest and shrublands and scrub land cover types and that the acreage of annual grassland to be protected would need to be increased to address conservation needs of specific species such as California tiger salamander, Swainson’s hawk (natural foraging habitat, i.e., non-cropland) and grasshopper sparrow. The final natural community conservation targets were based on best professional judgment of biologists on the consultant team in communication with species experts and USFWS and DWF biologists using the principles of conservation biology to ensure that all the purposes identified at the top this section for the conservation targets could be achieved and would meet ESA section 10 and NCCPA requirements.

The following describes the considerations used to establish conservation targets for each of the natural communities.

**Grasslands Natural Community.** The overarching considerations for establishing the grasslands natural community conservation acreage target and spatial distribution requirements (see Tables 5-5a–5-5d) included providing protection for all currently unprotected serpentine grassland (a rare and sensitive natural community statewide and of very limited extent in the Plan Area); protecting a sufficient amount of grassland to establish ecological corridors within the Hill and Ridge Landscape Unit in combination with other natural communities (see Figure 5-3); protecting environmental gradients of the Plan Area to accommodate shifting species distributions with large-scale changes in environmental conditions (e.g., effects of climate change), and protecting sufficient annual grassland to conserve California tiger salamander (through protection of its grassland upland habitat in combination with its aquatic breeding habitat), Swainson’s hawk (through protection of its natural grassland foraging habitat in combination with protection of its nesting habitat), and grasshopper sparrow. Based on these considerations, the conservation target for the grassland natural community is the protection of

8 A computer program that identifies lands that could be protected in accordance with specified criteria for the least cost.
32,245 acres of primarily annual grassland distributed among the Planning Units as indicated in Tables 5-5a–5-5d. NHP protection of 32,160 acres of the grassland natural community in combination with the 5,266 acres of grassland protected on existing Category 1 PEHL will result in protection of over 48 percent of the grassland natural community in the Plan Area and will conserve, in conjunction with achieving conservation targets for other natural communities, all of the covered species for which grassland supports all or a portion of habitat.

**Shrublands and Scrub Natural Community.** The overarching considerations for establishing the shrublands and scrub natural community conservation acreage target and spatial distribution requirements (see Tables 5-5a–5-5d) included protecting a sufficient amount of mixed chaparral and chamise to establish ecological corridors within the Hill and Ridge Landscape Unit in combination with other natural communities (see Figure 5-3); protecting biodiversity of the Plan Area; protecting natural ecological processes (including watersheds and stream systems); and protecting environmental gradients of the Plan Area to accommodate shifting species distributions with large-scale changes in environmental conditions (e.g., effects of climate change). This natural community does not support primary habitat for any of the covered species, but does support secondary or transitional habitat for some covered wildlife species (e.g., western pond turtle) and local concern species (e.g., sage sparrow). Shrublands and scrub natural community is dominated by native species and supports much higher native biodiversity and natural ecological processes (e.g., watershed services) than highly modified habitats in the Valley Landscape Unit. Based on these considerations, the conservation target for the shrublands and scrub natural community is the protection of 6,030 acres of mixed chaparral and chamise distributed among the Planning Units as indicated in Tables 5-5a–5-5d. NHP protection of 6,030 acres of the shrublands and scrub natural community in combination with the 24,316 acres of shrublands and scrub protected on existing Category 1 PEHL will result in protection of 68 percent of the this natural community in the Plan Area.
Figure 5-3. Locations of Ecological Corridors
Woodlands and Forest Natural Community. The overarching considerations for establishing the woodlands and forest natural community conservation acreage target and spatial distribution requirements (see Tables 5-5a-d) included providing protection for all currently unprotected closed-cone pine-cypress (a rare and sensitive vegetation type statewide and of limited extent in the Plan Area – 212 acres) and juniper woodland (a rare vegetation type in the North Coast Ranges and of very limited extent in the Plan Area, 2 acres); protecting all the remaining valley oak woodland in the Plan Area (a rare and sensitive vegetation type statewide and of limited extent in the Plan Area – 180 acres); protecting a sufficient amount of woodlands and forest natural community land cover types to establish ecological corridors within the Hill and Ridge Landscape Unit in combination with other natural communities (see Figure 5-3); protecting the biodiversity of the Plan Area associated with the range of species habitats supported by the woodlands and forest natural community; protecting natural ecological processes (including watersheds and stream systems); and protecting environmental gradients of the Plan Area to accommodate shifting species distributions with large-scale changes in environmental conditions (e.g., effects of climate change). This natural community in the Plan Area does not support primary habitat for any of the covered species, but does support secondary or transitional habitat for some covered wildlife species (e.g., foothill yellow-legged frog, western pond turtle, white-tailed kite, and Townsend’s big-eared bat) and local concern species (e.g., oak titmouse, purple martin). Woodlands and forest natural community is dominated by native species and supports much higher native biodiversity and natural ecological processes (e.g., watershed services) than highly modified habitats in the Valley Landscape Unit.

Based on these considerations, the conservation target for the woodlands and forest natural community is the protection of 14,362 acres of woodlands and forest natural community land cover types distributed among the Planning Units as indicated in Tables 5-5a-d. NHP protection of 14,362 acres of the woodlands and forest in combination with the 9,499 acres of woodlands and forest protected on existing Category 1 PEHL will result in protection of over 28 percent of the this natural community in the Plan Area.

Riparian and Wetlands Natural Community. The overarching considerations for establishing the riparian and wetlands natural community conservation acreage target and spatial distribution requirements (see Tables 5-5a-d) included protecting all of the remaining high functioning vernal pool complex and alkali sink habitats in the Plan Area; protecting a sufficient amount of valley foothill riparian habitat, in conjunction with restoration of valley foothill riparian, to preserve and expand riparian corridors along Putah and Cache Creeks (see Figure 5-3); protecting sufficient valley foothill riparian necessary to encourage the establishment in the Plan Area breeding populations of western yellow-billed cuckoo and least Bell’s vireo; protecting a sufficient number of ponds supporting California tiger salamander and western spadefoot toad aquatic breeding habitat, in conjunction with their grassland upland habitats, to conserve these species in the Plan Area; and restoring a sufficient mosaic of fresh emergent wetland, open water, and upland designed specifically as giant garter snake habitat in combination with protection of its rice land habitat to conserve giant garter snake in the Plan Area. Based on these considerations, the conservation target for the riparian and wetlands natural community is the
protection and restoration of 5,611 acres of riparian and wetlands, including 200 ponds, distributed among the Planning Units as indicated in Tables 5-5a–5-5d. NHP protection and restoration of 5,611 acres of the riparian and wetlands natural community in combination with the 21,944 acres of riparian and wetlands, including 398 ponds, protected on existing Category 1 PEHL will result in protection of over 52 percent of the riparian and wetlands natural community, including 27 percent of the ponds, in the Plan Area and will conserve, in conjunction with achieving conservation targets for other natural communities, all of the covered species for which they support their habitat.

**Agricultural Habitats.** The overarching considerations for establishing the agricultural habitat conservation acreage target and spatial distribution requirements (see Tables 5-5a–5-5d) included protecting and maintaining sufficient moderate to high value foraging habitat located near occupied nesting habitat to mitigate impacts of the covered activities on Swainson’s hawk foraging habitat and conserving, in combination with protection and restoration of its riparian nesting and natural grassland foraging habitats, Swainson’s hawk in the Plan Area and protecting and maintaining sufficient rice land to conserve, in conjunction with restoration of its natural aquatic and upland habitats, to conserve giant garter snake. Based on these considerations, the conservation target for the agricultural habitat is the protection of 17,660 acres of agricultural habitat distributed among the Planning Units as indicated in Tables 5-5a-5-5d. NHP protection of 17,660 acres of agricultural habitat in combination with the 5,651 acres of agricultural habitat protected on existing Category 1 PEHL will result in protection of over 9 percent of the agricultural habitat in the Plan Area and will conserve, in conjunction with achieving conservation targets for other natural communities, all of the covered species for which cultivated lands support their habitat.

### 5.2.3.3.2 Development of Covered Species Conservation Targets

The conservation targets for protecting covered species modeled and mapped habitats and known occurrences are presented in Table 5-7, *Covered Species Habitat and Occurrence protection Targets*, and targets for restoring land cover types that support covered species habitats are presented in Table 5-6. The rationale for each of the covered species conservation targets are provided with the biological objectives in Section 5.3.2.3, *Species-Level Goals and Objectives*. Section 5.6, *Conservation Provided for Covered Species*, gives a description of how achieving the conservation targets presented in Tables 5-6 and 5-7 will contribute to the conservation of each covered species. The acreage targets for species habitat are encompassed within the natural community conservation acreage targets (Table 5-5a) and do not require the protection of additional species habitat acreage beyond that necessary to achieve the natural community conservation targets.

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9 See also limits to impacts on and take amounts of covered species allowable under the NHP in Table 4-4, such that any additionally impacts are not authorized under the NHP Permits.
Table 5-7. Covered Species Habitat and Occurrence Protection Targets
Covered species habitat protection conservation targets were established through an iterative process that used several criteria to evaluate the conservation status of each covered species and the need for conserving its habitat. With the participation of the Biological Working Group of the NHP Advisory Committee, initial habitat conservation goals were developed and expressed as a percentage of each covered species total modeled habitat in the Plan Area needed to be protected to conserve the species. The habitat conservation goals were developed based on application of the following biological criteria:

- Listing status,
- Population and habitat trends,
- Importance of Plan Area habitats to regional and statewide populations,
- Degree to which the availability of Plan Area habitat is limiting to local populations, and
- Rarity of habitat in the Plan Area.

Preliminary covered species habitat conservation goals (as a percentage of existing habitat) were applied to generate three initial conservation land system alternatives using the Marxan model, as described in Section 5.2.3.3.2, Development of Natural Community Conservation Targets. Using the five biological criteria listed above and the output of the Marxan evaluation, acreage targets were established for conserving each of the covered species based on best professional judgment of consultant team biologists, in communication with species experts and USFWS and DWF biologists, using the principles of conservation biology (see Table 5-8). The final covered species conservation targets were also established to ensure that implementation of the Conservation Strategy would meet ESA Section 10 and NCCPA requirements to minimize and mitigate impacts of the covered activities on covered species to the maximum extent practicable and to provide for the conservation of each of the covered species within the Plan Area.
Table 5-8. Approaches to Conserving Covered Species
5.2.3.3 Mitigation Component of Conservation Targets

The NHP provides for the mitigation for the impacts of NHP covered activities on covered species and natural communities, in addition to impact avoidance and minimization measures, to address permit issuance requirements of section 10 of the ESA\(^{10}\) and the NCCPA.\(^{11}\) The acreage of habitat required to mitigate impacts of the covered activities are included in the total conservation target acreage for each natural community and covered species (Tables 5-5a–5-5d, 5-6, and 5-7) as the overall conservation targets are designed to conserve the species within the Plan Area. The implementation of habitat mitigation is only required for natural community land cover types and covered species habitat types that are actually impacted by covered activities during implementation of the NHP and are calculated at the time activities are proposed. The mitigation and conservation components of each of the natural community and covered species conservation targets are presented in Tables 5-9, Natural Community Conservation and Mitigation Targets for Protection and Restoration and 5-10, Covered Species Habitat Conservation and Mitigation Targets for Protection and Restoration, respectively.

Table 5-11, Natural Community Mitigation Requirements for Permanent Direct Effects, presents the mitigation requirements for the removal of natural communities and Table 5-12, Covered Species Mitigation Requirements for Permanent Direct Effects, presents the mitigation requirements for removal of covered species habitat. Habitat mitigation is provided through the acquisition, protection, and long-term management of existing natural communities and covered species habitats and, for some resources, the restoration of natural communities and covered species habitats. Protected and restored natural communities and habitat must be of equal or greater function than the affected natural communities and covered species habitats.

5.2.3.4 Spatial Criteria for Conservation Lands Assembly

This section describes the ecological principles that will be used by the Implementing Entity in assembling the system of NHP conservation lands over the duration of NHP implementation. Applying the assembly principles described here in conjunction with meeting the acreage targets and other spatial criteria for each natural community and covered species identified in Section 5.4.1.1, CM1: Protect Landscapes and Natural Communities will ensure a high functioning system of ecological connected conservation lands will result at full build-out of the system. See Tables 5-5a–5-5d, 5-6, and 5-7 for natural community and covered species habitat targets and Tables 5-13 and 5-14 for patch size, configuration, and habitat connectivity considerations for natural community acquisition based on planning species.

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\(^{10}\) Section 10 of the ESA requires that permit applicants identify the steps to be taken that “minimize and mitigate” the impacts on covered species. 16 USC § 1539(a).

\(^{11}\) The NCCPA requires that the timing and extent of mitigation actions be roughly proportional to the impacts. Section 2801(d) states that: “Natural community conservation planning... provides one option for identifying and ensuring appropriate mitigation that is roughly proportional to impacts on fish and wildlife...”
Table 5-9. Natural Community Conservation and Mitigation Targets for Protection and Restoration
Table 5-10. Covered Species Habitat Conservation and Mitigation Targets for Protection and Restoration
Table 5-11. Natural Community Mitigation Requirements for Permanent Direct Effects

<table>
<thead>
<tr>
<th>Natural Community</th>
<th>Mitigation Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater Pond</td>
<td>1 acre</td>
</tr>
<tr>
<td>California Poppy</td>
<td>100 plants/ha</td>
</tr>
<tr>
<td>California Buckeye</td>
<td>50 trees/ha</td>
</tr>
<tr>
<td>Red-Barked Oak</td>
<td>20 trees/ha</td>
</tr>
<tr>
<td>California Fuchsia</td>
<td>500 plants/ha</td>
</tr>
<tr>
<td>Western Sycamore</td>
<td>10 trees/ha</td>
</tr>
<tr>
<td>California Tulip</td>
<td>500 plants/ha</td>
</tr>
<tr>
<td>Red-Legged Sheep</td>
<td>Plant food</td>
</tr>
<tr>
<td>Western Kangaroo</td>
<td>Plant food</td>
</tr>
<tr>
<td>Western Borderbeach</td>
<td>Plant food</td>
</tr>
</tbody>
</table>
Table 5-12. Covered Species Mitigation Requirements for Permanent Direct Effects
Table 5-13. Natural Community Acreage Protection and Minimum Patch Size Objectives
Table 5-14. Natural Community Acquisition Patch Size, Configuration, and Habitat Connectivity Considerations Based on Planning Species
5.2.3.4.1 Ecological Background

Spatial considerations are important in the design of the conservation lands system. The development of a conservation lands system for covered species is intricately linked to dynamic landscape processes (e.g., dispersal, seasonal distribution, migration, and metapopulation structure). The NHP conservation lands design tenets are based on numerous studies and theoretical components of the discipline of conservation biology (Kirkpatrick 1983; Margules et al. 1988; Vane-Wright et al. 1991; Nicholls and Margules 1993; Pressey et al. 1993, 1996, 1997; Church et al. 1996; Ando et al. 1998; Polasky et al. 2001).

Typically, diversity, rarity, naturalness, size and representativeness are the most widely used design criteria for preserve systems (Margules et al. 1988). Other considerations include island biogeography design principles (MacArthur and Wilson 1963, 1967). These principles are as follows:

1. Area effect – the larger the preserve, the greater the species richness (i.e., species/area relationship) and the greater the chances of long-term viability of populations (more individuals);
2. Isolation or distance effect – the lesser the distance between reserve units, the greater the opportunity for gene flow, colonization, and rescue effect (e.g., also see Brown and Kodric-Brown 1977);
3. Species equilibrium – the number of species an area can support is determined by a balance between colonization and extinction; and
4. Edge effect – the larger the ratio of reserve area to reserve perimeter, the lesser the edge effect. An edge effect is defined as a change in the “conditions or species composition within an otherwise uniform habitat as one approaches a boundary with a different habitat” (Ricklefs 1993). Edge effects at the boundary between natural lands and human-occupied lands (“urban edge effects” at the “wildland-urban interface”) arise due to human-related intrusions such as destructive and harassing recreational activities, invasive species, feral predators (e.g., dogs and cats), lighting, noise, off-road vehicles, contaminants, and other disturbances. Although some species may be unaffected by edges or even show preferences for them, human-induced edge effects are generally unfavorable to native species and particularly those native species that are threatened and endangered.

Patch size is related to the concept of ecological thresholds (i.e., a point or zone at which a relatively rapid change occurs from one condition to another) (Huggett 2005). For example, some species are limited by the maximum distance they will cross between patches of habitat and some are limited by the minimum habitat patch required to fulfill its reproductive needs. Most special-status wildlife species are area-sensitive and breed or forage only in patches exceeding a certain minimum size. In addition, rates of predation or nest parasitism may increase as patch size declines (Donovan et al. 1995; Robinson et al. 1995; Tewksbury et al. 1998).
2006). Patch configuration is an important parameter for various factors. If patches are spatially aggregated, they are prone to suffer simultaneously from large-scale disturbances, such as fires or floods.

Another particularly important spatial requirement is the connectivity of landscapes, which has been shown to influence the persistence of metapopulations (a group of spatially separated populations of the same species which interact at some level). Landscape connectivity is a measure of “the degree to which the landscape facilitates or impedes movement among resource patches” (Taylor et al. 1993). Impaired or reduced connectivity within a landscape increases habitat fragmentation and isolation, which in turn can lead to lower species diversity (Bolger et al. 1997; Bolger et al. 2000) or extinction of local populations (Hanski 1994; Gu et al. 2002; Nabe-Nielsen et al. 2010). If patches are too distant from each other or separated by an inhospitable “matrix,” species may not re-colonize patches or may suffer from genetic isolation. Populations are thus more likely to persist in larger, better-connected habitat fragments. It is the challenge of an effective preserve strategy to relate the structural connectivity (i.e., linkage among map or landscape elements) to the functional connectivity (i.e., the behavioral response of individual species to the landscape’s structure).

Delineation of wildlife movement corridors are increasingly considered to be an important management tool that can aid in the enhancement of landscape connectivity (Price et al. 1994; Beier and Noss 1998). Movement corridors are often linear and facilitate efficient movement by providing adequate cover and lack of physical obstacles to movement (Beier and Loe 1992), but generally do not provide a full complement of life history requirements. Linkages in the landscape, in contrast, provide resources that meet the life history requirements for the species as well as movement habitat for a particular species. Landscape linkages are capable of sustaining a full range of community-level ecosystem processes, such as seed dispersal and animal movement over a period of generations (USFWS 1999a). Because habitat connections may function only as movement corridors for some species, but provide a linkage for others, the focus is on identifying linkages, assuming that they do not constrain movement for the majority of covered species. Linkages, therefore, serve to ameliorate habitat fragmentation and isolation. Linkages are also important in allowing for shifting species distributions, particularly from the effects of regional climate changes as a result of global climate change. In general, warming temperatures are expected to result in shifts in species distributions upslope and northward and habitat linkages will be critical to allow such shifts in range.

5.2.3.4.2 Conservation Land Assembly Principles

The term “assembly principles” refers to a rules and concepts used in regional conservation planning to describe desired land and habitat characteristics and to guide selection of high-value conservation lands during plan implementation and the expansion of the conservation lands system over time with each property acquisition until completely assembled to its full size. Spatial considerations that address landscape-level needs of the covered species (e.g., dispersal, seasonal distribution, migration, metapopulation structure) are important to ensure an assembly
of conservation lands that achieve the NHP’s biological goals and objectives. The NCCPA describes the following findings related to the assembly of conservation lands that must be made by DFW before approving an NCCP:

(3) The plan provides for the protection of habitat, natural communities, and species diversity on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the plan area.

(4) The development of reserve systems and conservation measures in the plan area provides all of the following:

   (A) Conserving, restoring, and managing representative natural and semi-natural landscapes to maintain the ecological integrity of large habitat blocks, ecosystem function, and biological diversity.

   (B) Establishing one or more reserves or other measures that provide equivalent conservation of covered species within the plan area and linkages between them and adjacent habitat areas outside of the plan area.

   (C) Protecting and maintaining habitat areas which are large enough to support sustainable populations of covered species.

   (D) Incorporating a range of environmental gradients (such as slope, elevation, aspect, and coastal or inland characteristics) and promoting high habitat diversity to provide for shifting species distributions due to changed circumstances.

   (E) Sustaining the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the habitat areas within the plan area.\(^\text{12}\)

The NHP conservation land assembly principles in conjunction with the conservation measures in Section 5.4, Conservation Measures, are consistent with and designed to achieve these required NCCPA findings. The Implementing Entity will systematically apply the conservation land assembly principles described in this section when evaluating each parcel of land under consideration for acquisition in seeking to achieve that the NHP biological goals and objectives. The assembly principles include emphasis on ecosystem process and habitat functions, habitat-related requirements for associated covered species, and broad ecological and land management characteristics. The Implementing Entity will identify potential conservation lands based on the extent to which those lands meet the assembly principles. Because it is highly unlikely any specific parcel evaluated for protection will meet all of the assembly principles, the principles are placed in two priority categories. Lands that meet all or most of the First Priority Assembly Principles will be accorded the highest priority for protection by the Implementing Entity, however, lands in Second Priority Assembly Principles category are also important lands for inclusion in the NHP conservation lands system, but are of lower priority for protection.

\(^{12}\) California Fish and Game Code § 2820(a).
especially early in Plan implementation. Lands meeting the Second Priority Assembly Principles are, however, important to a fully functioning NHP conservation lands system that meets all NHP biological goals and objectives.

**First Priority Assembly Principles:** Lands with the following characteristics are the most important lands for inclusion in the NHP conservation lands system and will be the highest priority for protection by the Implementing Entity, especially early in NHP implementation.

- Select lands known to be occupied by covered species or that support suitable habitat that is contiguous with occupied habitat (lands currently known to be occupied by covered species are described in Appendix A, *Covered Species Accounts*). The NHP land acquisition process and monitoring program provide for the discovery of occurrences of covered species not currently known.
- Select patches of natural communities that support the highest functioning habitat for covered species, taking into consideration the NHP implementation schedule. Habitat requirements for each of the covered species are described in Appendix A, *Covered Species Accounts*.
- Select lands with ecological functions that will serve to achieve multiple biological objectives (e.g., lands that support habitat for multiple covered species; see Section 5.3, *Biological Goals and Objectives*).
- Select lands with high connectivity to other habitat areas that support life history functions of the target covered species that are not supported by the habitats that would be protected (e.g., acquire Swainson’s hawk riparian nesting habitat that is located within the foraging flight distance of Swainson’s hawk to foraging habitat areas).
- Select lands that support the most reliable hydrology for maintaining protected natural communities and habitats into the future (i.e., lands that protect wetlands, ponds, and streams and their supporting intact and relatively undisturbed watersheds).
- Select patches of natural communities that provide the highest potential for protecting and/or enhancing and restoring ecological processes at a landscape scale in the NHP Plan Area.

**Second Priority Assembly Principles:** Lands with the characteristics described in this section are the also important lands for inclusion in the NHP conservation lands system, but are of lower priority for protection especially early in Plan implementation. Lands with these characteristics are important to a fully functioning NHP conservation lands system that meets all NHP biological goals and objectives.

- Select lands for conservation that are of sufficient size and configuration to ensure that they can be effectively managed to maintain or enhance ecological processes and habitat function given site constraints.
• Select lands that maximize connections to conservation lands within and outside of the Plan Area to provide connectivity to covered species and other native species populations and occurrences within and outside the Plan Area, allowing the movement of genes, individuals, and populations at all time-scales.

• Select lands that provide habitat mosaics (e.g., grassland/oak woodland) as opposed to lands with only single vegetation communities represented.

• Select lands that support smaller patches of remnant habitats that are important for maintaining the abundance and distribution of dependent native species and that are self-sustaining or could be sustained with appropriate management.

• Select lands that support natural disturbance regimes or are suitable for reestablishing disturbance regimes.

• Select lands that support seeps and springs. Select lands that include confluences of riverine/riparian systems (i.e., junctions of tributaries with larger streams), as riparian junctions can serve as biodiversity hotspots.

Over the course of implementing the NHP, the Implementing Entity may revise these assembly priority principles, consistent with new scientific information and in coordination with USFWS and DFW, to improve their effectiveness in achieving the NHP biological goals and objectives.

The following subsections describe conservation land assembly concepts contained within the assembly principles applicable to the acquisition of conservation lands.

Conserve Lands of Highest Value to Covered Species and Natural Communities

Efforts to conserve lands in the Plan Area should emphasize those areas with greatest overall value to covered species and natural communities. Protection of high value lands should provide the highest densities and productivities for covered and other native species, and is therefore most likely to contribute to long-term conservation. This principle encompasses lands with (1) the highest current habitat value for covered species and/or (2) the highest potential for enhancement and restoration of habitat values for the covered and other native species associated with the natural communities.

Lands with highest values for covered species, based on known species occupancy and modeled distribution of each species’ habitat, are identified in the species habitat models (Appendix A, Covered Species Accounts). These models were used to help develop the NHP Conservation Strategy and will be used, along with other tools that may be developed by the Implementing Entity, to help identify potential conservation lands during plan implementation. Selection of conservation lands for acquisition, however, will be based on site-specific ecological evaluations (see Section 5.4.1.1.1, Pre-Acquisition Surveys and Evaluations, and Section 5.4.1.1.2, Site Selection Criteria) to ensure that the lands under consideration are suitable for achieving the NHP biological goals and objectives. Areas identified as priority conservation lands should include those that support the rarest covered species, combined occurrences of covered species,
or larger areas of relatively high quality habitat. Information on known occurrences is particularly important in selecting conservation lands for species whose occupied habitats are not easily predicted by existing habitat suitability models, such as the western burrowing owl, California tiger salamander, western spadefoot toad, and foothill yellow-legged frog.

Over the term of the NHP, new information on species occurrences will guide land conservation decisions, emphasizing protection of areas of known species occurrence (rather than relying solely on predicted occurrence based on habitat). Surveys of covered species may be required in some instances to apply this assembly principle because the availability of information on species occurrence is limited in many areas (see Section 5.4.1.1.1, *Pre-Acquisition Surveys and Evaluations*).

Habitat-based valuation of suitability, which is based on known habitat relationships and the presence of key habitat attributes, will also guide land conservation decisions. Predicted occurrences and habitat suitability for covered and other native species and the potential to restore suitable conditions that support covered species will guide selection of high value lands. Natural community and ecosystem values also will influence selection of conservation lands. These values are determined by specific characteristics of lands, including the presence and conditions of vegetation and other habitat resources, as well as ecosystem characteristics embodied in the other assembly principles. These considerations include giving priority to selection of lands that support the following:

- The highest native species richness in each of the natural communities;
- The highest densities of native species; and
- Ecological processes (e.g., disturbance regimes) on a landscape basis.

### Protect Large Land Units

Protecting land in large units contributes to achieving a variety of conservation goals and objectives. Larger land areas provide for species with more extensive home range sizes (tens to hundreds of acres, depending on the species), such as large mammals and raptors, and also tend to protect a diverse array of habitats at varied elevations. Selection of larger land areas also provides more interior land area that protects conservation resources from potential detrimental effects of adjacent land uses, minimizing potential conflicts between conservation management activities and other uses on adjacent lands.

Desired minimum patch sizes that will be used to guide the Implementing Entity in its acquisition of each natural community are presented in Table 5-13. These minimum patch sizes are based on the habitat requirements of the “planning species”\(^\text{13}\) listed in Table 5-14 that were selected for this purpose. These species were selected as planning species for establishing

\(^\text{13}\) Planning species are species with habitat requirements or other needs that assist in developing plan goals and objectives. Such species may be area-, dispersal-, resource-, or process-limited (Lambeck 1997).
minimum patch size requirements because they currently or historically occurred in the Plan Area and because they are “area-limited species”\textsuperscript{14} and include two covered species (i.e., western yellow-billed cuckoo and yellow-breasted chat). They have the largest habitat patch size requirements among native species inhabiting each of the natural communities; thus, achieving the patch size requirements for these species fulfills achieving the patch size requirements of all the covered species and most other native species associated with each of the natural communities. It is also important to consider minimum patch size constraints within the context of the landscape and adjacent parcels. A medium-sized parcel connected to another medium-sized parcel may provide a combined patch size sufficient to provide ecological functions to covered species, while a larger parcel embedded in an inhospitable land cover matrix may not. Thus, minimum desired patch sizes may be attained by acquiring smaller patches of the natural community that adjoin other existing protected patches of a size sufficient to achieve the overall patch size objective. To achieve the habitat acquisition targets for some covered species, it may not be possible to acquire natural communities in the recommended patch sizes; in these instances, the minimum covered species habitat patch size requirements for covered species listed in Table 5-15 will be used to guide acquisition of conservation lands.

Within the Hill and Ridge Landscape Unit, larger blocks of conserved lands can be achieved by focusing conservation efforts on selecting larger lands adjacent to and connected with existing PEHL. For example, in the Dunnigan Hills (Planning Unit 5), NHP conservation lands will expand on and connect previously preserved habitats.

Natural communities within the Valley Landscape Unit are remnants of natural communities that existed before large-scale agricultural conversion altered the landscape. Protecting the largest examples of these remnant habitats is important to maximize species diversity and the population sizes of species. Larger land units in this landscape unit may retain more varied ecological conditions and associated diversity, including enhanced ecological functions such as pollination, than smaller areas. Large units are often more buffered from adjacent land use disturbance (for example, agricultural and developed uses) and can be managed more efficiently and effectively. Notwithstanding the importance of protecting larger units, many key natural communities and habitats in the Valley Landscape Unit consist mainly of smaller units, such as remnant vernal pool and alkali sink habitats that support listed plant and invertebrate species populations, and remnant patches of valley oak woodlands.

\textsuperscript{14} Area-limited species have large home ranges, occur at low densities, or otherwise require large areas to maintain viable populations. Examples include large mammals (especially carnivores) and large raptors (Lambeck 1997).
Table 5-15. Covered Species Habitat Acquisition Patch Size, Configuration, and Habitat Connectivity Considerations
Conserve Environmental Gradients and Diversity

NCCPs are required to incorporate a range of environmental gradients (such as slope, elevation, aspect, and coastal or inland characteristics) and high habitat diversity to provide for shifting species distributions due to changed circumstances (California Fish and Game Code 2820(a)(4)(D)). To achieve this requirement, the NHP distributes conservation lands throughout the Plan Area to protect the range of environmental conditions and elevation gradients that are important for conserving covered and other native species and biodiversity.

Geographic Distribution. The Conservation Strategy provides for conserving lands throughout the Plan Area to accomplish the following: (1) maintain the geographic distribution and diversity of natural communities and native species; (2) increase the probability of conserving currently unknown occurrences of rare species; and (3) increase the likelihood for conserving genetic variation among native species populations, including adaptive characteristics (e.g., different microhabitat tolerances) that could be important to responding to long-term changes in climate and other physical conditions. Conserving lands in a variety of geographic areas is most important in the Hill and Ridge Landscape Unit because its greater topographic variation creates a wider range of conditions for covered and other native species and other important ecosystem elements, and thus more potential capability for adapting to changes in local conditions. Such varied adaptations may be important in species response to future climate and ecosystem changes. Meeting the natural community protection targets established for each of the Planning Units is expected to result in an appropriate distribution of conservation lands throughout the Plan Area.

Elevation Gradients. The Implementing Entity will assemble conservation lands to encompass lands with continuous connections across elevation ranges to capture the diversity of natural communities and habitats that result from differences in rainfall and temperature, as well as effects of topographic relief, soil conditions, and other factors. Ensuring a broad array of elevation ranges within conservation lands also is more likely to support future upslope migration of communities and species in response to climate change. The range of elevations is much greater in the topographically diverse Hill and Ridge Landscape Unit than in the relatively flat Valley Landscape Unit; however, protecting low elevation gradients is important for maintaining the habitat functions of natural communities associated with the Valley Landscape Unit (e.g., floodplains, vernal pools and their micro-watersheds).

Conservation of lands identified within the Hill and Ridge Landscape Unit will complement existing PEHL by extending the elevation range of existing protected lands and associated natural communities and habitats. In areas where existing protected lands are limited or absent (e.g., Dunnigan Hills in Planning Unit 5), NHP conservation lands will provide protection over a range of elevations.

Soil Conditions. The Implementing Entity will assemble conservation lands to encompass lands within and across geologic formations to capture the diversity of natural communities and habitats that result from differences in soil conditions. Many species are associated with specific
soil conditions that are geographically rare and highly localized in their distribution within the
Plan Area (e.g., serpentine and alkali soil-associated plant species), or that contain hydrologic
conditions that provide habitat for covered and other native species (e.g., vernal pool shrimp and
plant species). As with elevation gradients, protecting a broad array of soil conditions within
conservation lands is more likely to support future migration of communities and species in
response to climate change.

**Protect a Diversity of Habitats to Support Covered and Other Native Species.** Protection of
natural habitat diversity contributes to maintaining the abundance and distribution of associated
covered and other native species. Actively selecting conservation lands that protect, or
contribute to the protection of a high diversity of natural communities, habitats, vegetation types,
and species confers the conservation benefit of a diverse mosaic of physical and vegetative
structure and composition that protects biodiversity. Representation of diversity within
conservation lands should consider the following:

- The ecological processes that support natural habitat conditions,
- The quality of habitat conditions for associated covered and other native species,
- Natural ecological dynamic processes in the Plan Area,
- Historical and current abundance,
- Amounts of various habitats already in protected status, and
- The dependency of covered and other native species on the conditions.

For example, the presence of riparian and wetland habitats (either existing or sites suitable for
restoration), which enhance the value of adjacent uplands for many species and contribute to
overall habitat diversity, should be given high consideration in selecting conservation lands.

**Protect Lands that Accommodate Natural Disturbance Regimes**

Natural disturbances (e.g., erosion, deposition, flooding, fire, drought, high winds that uproot
trees, and herbivory) are important ecosystem processes that have formed and continue to
maintain the diversity of the natural communities in the Plan Area. The ability to maintain,
reestablish, or mimic natural disturbance, as well as other ecosystem processes, is important to
maintaining biological diversity and habitat conditions for specific species. Fire, in particular, is
a source of natural disturbance in the Hill and Ridge Landscape Unit, although disagreement
exists regarding the importance of fire as an ecosystem process in maintaining natural
communities. Disagreement over the natural role and frequency of fire is the main impediment
to the application of natural fire regimes. The use of prescribed fire for ecosystem management
also is constrained by the presence of human assets that increase risk of loss and the cost of
protection during fire use, including the presence of adjacent development, low density
homesteads, and agricultural development. The relevance of herbivory as a disturbance factor
has changed since pre-colonial conditions. Increased intensity and duration of grazing by
domestic livestock contributed to a higher proportion of grazing-adapted nonnative species in
grassland communities. When properly managed, grazing can be a useful tool to control undesirable nonnative species.

Flood control activities have dramatically altered historical flood frequency, extent, and duration in lowland areas of the Valley Landscape Unit, resulting in reductions and modification of riparian, wetland, and aquatic communities. Nonetheless, fluvial processes still play an important role in creating and maintaining existing habitat conditions and in determining potential for enhancement and restoration of these communities.

The degree to which hydrologic and other physical disturbance processes maintain natural community dynamics and ecological conditions will influence which lands are identified for protection, particularly in the Hill and Ridge Landscape Unit where the historical landscape remains largely intact. Therefore, lands with modified hydrology, due to agricultural or other water use improvements, are lower priority for conservation than watersheds with little evidence of hydrological modification.

**Adjacent Sources of Disturbance**

Conservation land selection will incorporate consideration of potential effects of adjacent land uses on habitat functions of protected lands for covered and other native species and, conversely, the potential effects of conservation land management activities on adjacent land uses. Adjacent developed and disturbed areas, including roads, towns and agricultural lands, have the potential to introduce a variety of factors that may disrupt natural processes and degrade resource values, including noxious weeds, pesticide drift, free-ranging pets and nonnative wildlife, unplanned fire events, noise, poaching, ground disturbance from trespass, and other disturbances. Considering and managing for the effect of adjacent disturbances on conserved lands reduces potential conflicts from external disturbance. Considering and addressing the effects of conservation land management activities on adjacent developed areas is important for gaining support and cooperation with adjacent landowners.

**Acquire Lands with Potential for Enhancement or Restoration of Ecological Functions**

Some covered and other native species are limited more by the quality of habitat in the Plan Area than by areal extent of habitat. Therefore, land selection needs to consider both the ability of lands to sustain existing high value ecosystem functions and the potential to restore these functions.

Past and current land uses degraded many of the natural communities within the Plan Area. Therefore, enhancement of ecological conditions is an important part of the Conservation Strategy. For example, while grasslands remain relatively abundant in the Plan Area, especially in the lower elevation areas of the Hill and Ridge Landscape Unit, past and present management practices in many areas may not produce suitable conditions for grassland-dependent covered species (e.g., California tiger salamander, and western burrowing owl). Much of these existing grasslands could be enhanced to increase native plant and wildlife diversity and acquisition of
such lands into the NHP conservation lands would be followed by management for such enhancement.

Riparian vegetation has been removed from areas that once supported it and invasive giant reed and tamarisk have reduced habitat values in many vegetated riparian areas along Cache Creek in Planning Units 6 and 7. These types of sites provide the opportunity through restoration and enhancement (e.g., weed management) to increase riparian habitat functions within NHP conservation lands.

Many remnant natural communities in the Valley Landscape Unit are located in areas where enhancement may be difficult or impossible because of ongoing land use. Lands selected for conservation should focus on sites with natural communities in less disturbed settings, or where reversing the effects of land use practices through enhancement and restoration is practical. Many patches of valley oak woodlands are degraded remnants retained as shade trees on farmsteads, in agricultural equipment yards and processing areas, or on roadside utility corridors. Such remnants should be evaluated to determine if they are capable of persisting through replacement by younger trees over the long term.

Select Lands to Complement and Enhance Existing PEHL

Proximity to existing PEHL, especially those classified as existing protected lands (PEHL Category 1), is an important criterion for conservation land protection. For example, land managed by the Bureau of Land Management (BLM), the University of California Natural Reserve System, California Audubon, and local land trusts and conservancies comprise a large area of existing protected lands in the Hill and Ridge Landscape Unit. Selecting lands adjacent to existing protected lands efficiently produces protected lands of large size (see Protect Large Land Units above). Augmenting existing protected lands also supports other assembly principles, including protection of greater elevation range and habitat diversity.

Conservation lands will be selected to augment the conservation benefits of existing PEHL by adding habitat to increase the range of elevations represented within conserved lands, increasing the diversity of protected habitats, providing habitat corridors to connect existing preserves, and maintaining rarer natural communities and habitats (e.g., serpentine grassland, juniper woodland). Decisions regarding selection of future conserved lands during NHP implementation will be based in part on the configuration of conservation lands in place at that time.

5.3 BIOLOGICAL GOALS AND OBJECTIVES

This section describes the biological goals and objectives for the NHP. The NHP biological goals and objectives are consistent with the guidance provided in the federal Five-Point Policy for Habitat Conservation Plans\(^1\) and with the NHP Planning Agreement conservation goals and

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\(^1\) 65 FR No. 106 at 35242.
objectives (Appendix J, *Yolo NHP Planning Agreement*). Biological goals\(^{16}\) are defined as broad guiding principles for development of a conservation strategy. These biological goals are intended to guide the conservation strategy to meet the statutory criteria of the NCCPA and the ESA. The biological objectives,\(^{17}\) in turn, include measurable metrics\(^{18}\) by which to assess progress in meeting the goals and to help inform the adaptive management process (see Section 6.2, *Adaptive Management Plan*). Monitoring metrics that may be used to measure progress towards achieving the biological objectives are presented in Section 6.3, *Monitoring Program*. The biological goals and objectives were used to develop the conservation measures described in Section 5.4, *Conservation Measures*, and will be used by the Implementing Entity to guide NHP implementation.

Achievement of the NHP biological goals and objectives will meet the following ESA and NCCPA regulatory compliance requirements for all of the covered species.

- Avoid, minimize, and mitigate effects of the covered activities on all of the covered species to the maximum extent practicable. This is the overall biological permit issuance requirement for ESA section 10. The NHP landscape-, natural community-, species-level objectives, in combination with the avoidance and minimization measures described in Section 5.4.4, *Avoidance and Minimization Measures*, serve to meet this requirement. In addition, achieving the NHP biological goals and objectives will avoid jeopardizing the continued existence and not preclude recovery of covered species as required under ESA.
- Conserve each of the covered species within the Plan Area. This is the overall biological requirement under NCCPA for covered species. The NHP landscape-, natural community–, and species-level objectives serve to meet this requirement.

### 5.3.1 Development of Biological Goals and Objectives

Development of the biological goals and objectives was based on the data and information described in Section 5.2.2.1, *Primary Sources of Information*.

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\(^{16}\) For biological goals the Five-Point Policy states, “In the context of HCPs, biological goals are the broad, guiding principles for the operating conservation program of the HCP….Multiple species HCPs may categorize goals by species or by habitat, depending on the structure of the operating conservation program.”

\(^{17}\) For biological objectives the Five-Point Policy states, “For more complex HCPs, biological objectives can be used to step down the biological goals into manageable, and, therefore, more understandable units….If the operating conservation program is relatively complex, the biological goal is divided into manageable and measurable objectives. Biological objectives are the different components needed to achieve the biological goal such as preserving sufficient habitat, managing the habitat to meet certain criteria, or ensuring the persistence of a specific minimum number of individuals….Biological objectives should include the following: species or habitat indicator, location, action, quantity/state, and timeframe needed to meet the objective.”

\(^{18}\) Metrics are measurements or characteristics of species, natural communities, and ecological systems that are used to track progress toward the achievement of biological goals and objectives. The metric value is the quantity of the specific unit of measurement; for example, the metric may be *acres of protected habitat* and the metric value may be a *target of protecting 100 acres of habitat*.
Biological goals and objectives were developed at three spatial scales:

- **Landscape-level goals and objectives** are designed to provide for ecosystem functions, sufficient habitat distribution for covered species, and to maintain the biological diversity of the natural communities of the Plan Area. Landscape-level goals and objectives provide for the maintenance of habitat linkages and ecological connectivity, maintenance of ecological (including elevation) gradients, protection of intact watersheds, protection and restoration of habitat mosaics, appropriate disturbance regimes and successional patterns, and establishment of conservation lands units of appropriate size and shape. Landscape-level goals and objectives address the conservation requirements of species that have large ranges or that migrate between various distinct seasonal habitats (e.g., summer and winter range) as well as specialist species restricted to small patches of unique habitat (e.g., seeps, large vernal pools, and alkali habitats).

- **Natural community-level goals and objectives** are designed to provide for the appropriate amounts, distribution, configuration, and management of natural communities to conserve covered species and biodiversity in the Plan Area. Goals and objectives were established based on the broad needs of biological communities as determined through application of the conservation land assembly principles (see Section 7.4.2, *Conservation Land Assembly Principles*) and the conservation needs for the covered species and their habitats provided by each of the natural communities. Natural community protection objectives were established as described in Section 5.2.3.3, *Establishing Conservation Targets*, and are expressed as the acreage of habitat conservation for each land cover type comprising the natural communities by land cover type by Planning Unit. The target amount of unprotected natural communities to be protected and restored is provided in Tables 5-5a–5-5d and Table 5-6, respectively.

- **Species-level goals and objectives** are designed to address individual species requirements. Species-specific habitat objectives were established as described in Section 5.2.3.3, *Establishing Conservation Targets*, and are expressed as the acreage of habitat to be protected for each covered species by Planning Unit or groups of Planning Units. The target amount of unprotected habitat to be conserved (both habitat protection and restoration) for each covered species is provided in Table 5-10. Achieving the natural community-level objectives also achieves the habitat protection, enhancement, and restoration objectives established for each of the covered species.

### 5.3.2 Goal and Objective Statements

This section presents the landscape-level, natural community-level, and covered species-level biological goals and objectives. Many of the conservation measures address multiple goals and objectives within and among the scale levels, reflecting both the hierarchy of these goals and objectives and the interrelationships among them. The relationships among conservation measures and the biological objectives they are designed to achieve are presented in Table 5-16.
| Table 5-16. Conservation Measures that Contribute Towards Achieving the NHP Biological Goals and Objectives |
Classification and descriptions of natural communities and covered species habitats referred to in the biological goals and objectives are presented in Chapter 2, *Existing Ecological Conditions*, and in Appendix A, *Covered Species Accounts*. The biological objectives for the protection and restoration of natural communities and covered species habitats are based on the conservation targets described in Section 5.2.3.3, *Establishing Conservation Targets*, and presented in Tables 5-5a–5-5d, 5-6, and 5-7. The objectives are measurable and the schedule for implementing conservation measures to achieve the objectives is presented in Section 7.3, *NHP Implementation Schedule*.

### 5.3.2.1 Landscape-Level Goals and Objectives

This section presents the NHP landscape-level biological goals and objectives and the rationale for each landscape-level objective. The landscape-level goals and objectives are focused on establishing the NHP conservation lands system and the establishment of ecological corridors that provide for the movement of covered and other native wildlife across the Plan Area and to habitats adjacent to the Plan Area.

**Goal LAND1**: Sustain large interconnected landscapes within the range of physical and biological attributes (e.g., slope, soils, hydrology, climate, and plant associations) in the Plan Area to support the distribution and abundance of covered species and their habitats, provide for the movement and genetic interchange among populations of covered species, and preserve native biodiversity.

**Objective LAND1.1**: Establish a system of protected lands in the Plan Area consistent with the quantity and patch size of each natural community indicated in Tables 5-5a–5-5d and 5-13 within 45 years in accordance with the schedule in Section 7.3, *NHP Implementation Schedule*. Protected lands will be spatially distributed to provide a mosaic of geographically and ecologically diverse natural communities, habitat for covered and other native species, and to facilitate elevational and latitudinal movement of natural communities and species in response to changes in environmental conditions.

**Rationale**: Habitat loss, fragmentation, and degradation within and outside of the Plan Area have disrupted the ecosystem function and large-scale habitat connectivity necessary for sustaining metapopulations of covered and other native species and maintaining biodiversity. Protecting large patches of connected habitat will enhance ecosystem processes and connectivity and help increase the abundance, distribution, and diversity of covered and other native species. The rationale for the acreage, distribution, and minimum patch size protection requirements for the natural communities and the covered species habitat they support is described in Section 7.4, *Spatial Criteria for Conservation Lands Assembly*, and Tables 5-6, 5-14, and 5-15.

**Objective LAND1.2**: Establish a habitat corridor comprised of contiguous patches of primarily woodlands and forest, shrublands and scrub, grassland, and riparian natural communities along the entire length of the western boundary of the Plan Area (i.e., the
boundary with Napa and Lake Counties, Figure 5-3) within 45 years. Where physically feasible and necessary to meet the needs of targeted species, the corridor should be at least 1.2 miles wide.\textsuperscript{19}

**Rationale:** Wildlife and habitat corridors provide essential linkages between patches of suitable habitat across elevation and moisture gradients. The removal of habitat over time has both reduced the extent of habitat and fragmented formerly extensive areas of habitat into isolated patches. This loss of connectivity of wildlife movement corridors has disrupted the historical movement and dispersal patterns of individuals and genes and threatened the health and survival of the affected species. Protecting or reestablishing habitat corridors allows covered species to move between habitat fragments and unused patches, thereby increasing the viability of a population by providing connectivity within metapopulations. Corridors also provide access to alternate or ‘escape’ habitat, in case of large-scale disturbances (e.g., fire, floods) that temporarily reduce habitat functions or where vegetation zones shift in response to climate and landscape change. Species that would benefit from the corridor are generally mobile species (e.g., large mammals) that would use the corridor for seasonal or migratory movements. In addition, species with limited ability to shift their geographical distribution due to low mobility (e.g., amphibians, arthropods, reptiles, plants) would benefit from corridors which would allow them to gradually adapt to changing landscapes and vegetation zones. The habitat corridor along the western boundary of the Plan Area is designed to provide an effective linkage facilitating distributional shifts and genetic exchange of covered and other native species in the western Plan Area with other parts of the Central Coast Range to the west.

Establishment of the Blue Ridge Corridor along the western boundary of the Plan Area (Figure 5-3) is designed to provide a north-south corridor that will support movement and genetic exchange of native species, including wide-ranging species such as deer, mountain lion, and neotropical migrant birds, along the Blue Ridge and to support biodiversity by maintaining the elevational east-west gradient of habitats along the west slope of Blue Ridge.

**Objective LAND1.3:** Establish a habitat corridor along the east slope of the Central Coast Range comprised of contiguous patches of primarily woodlands and forest, shrublands and scrub, grassland, and riparian natural communities extending from the southern to northern Plan Area boundaries encompassing the elevation gradient between the west slope of the Blue Ridge and Capay Hills foothills and the valley floor (Figure 5-3) within 45 years. Where physically feasible and necessary to meet the needs of targeted species, the corridor should be at least 1.2 miles wide (Spencer et. al 2010).

\textsuperscript{19}Recommended corridor width in *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (Spencer et al. 2010) for meeting the movement needs of large wildlife species such as mountain lion and mule deer, which will also meet the needs of smaller wildlife species (e.g., reptiles, rodents).
Rationale: As described in the rationale for Objective LAND1.2, the protected habitat corridor along the east slope of the Central Coast Range in the Plan Area is designed to provide an effective linkage facilitating distributional shifts and genetic exchange of covered species with the central portion of the Plan Area. This corridor will connect the Central Coast Range foothill habitats to the habitats of the Central Valley ecoregion. The primary native species benefitting from this corridor are those that are expected to find the lower elevations increasingly hostile environments due to climate and landscape change. A corridor connecting the valley floor with foothill habitats will allow species to move elevationally and maintain genetic diversity by shifting their distributions. Predominantly, insect pollinators and plants will benefit from such an elevational corridor.

Establishment of the Foothill Corridor (Figure 5-3) is designed to provide a north-south corridor that will support movement and genetic exchange of native species, including wide-ranging species such as deer, mountain lion, American badger, and neotropical migrant birds along the east slope of the Central Coast Range and to support biodiversity by maintaining the elevational east-west gradient of habitats extending from higher elevation foothills to the valley floor. Establishment of this corridor will provide connectivity among patches of several covered species habitats, including California tiger salamander, western spadefoot toad, and western pond turtle, and will support their movement.

Objective LAND1.4: Establish a habitat corridor along the Dunnigan Hills, comprised of primarily the grassland and agricultural habitats extending the length of the Dunnigan Hills connecting to the corridor established under Objective LAND1.3 encompassing the elevation gradient between the west slope of the Dunnigan Hills and the valley floor (Figure 5-3) within 45 years. Where physically feasible and necessary to meet the needs of targeted species, the corridor should be at least 1.2 miles wide (Spencer et. al, 2010).

Rationale: As described in the rationale for Objective LAND1.2, the protected habitat corridor along the Dunnigan Hills is designed to provide an effective linkage facilitating distributional shifts and genetic exchange of covered species in the Plan Area. This corridor will connect the Dunnigan Hills and valley habitats to the habitats of the Central Coast Range. Establishment of the Dunnigan Hills Corridor (Figure 5-3) is designed to provide a northwest-southwest corridor that will support movement and genetic exchange of native species, including wide-ranging species such as deer, mountain lion, American badger, and neotropical migrant birds and to support biodiversity by maintaining the elevational east-west gradient of habitats extending from the Dunnigan Hills to the valley floor. Establishment of this corridor will provide connectivity among patches of several covered species habitats, including California tiger salamander, western spadefoot toad, and western pond turtle, and will support their movement.
Objective LAND1.5: Establish a habitat corridor comprised of patches of woody and herbaceous riparian vegetation within the Cache Creek floodplain and extending the length of Cache Creek from the west boundary of Planning Unit 7 to the Cache Creek Settling Basin exclusive of existing and potential aggregate mining areas (see Figures 5–3 and 3–6) within 45 years. The corridor may include gaps of non-riparian land cover where site conditions are unsuitable for the establishment of riparian vegetation (e.g., unsuitable hydrologic conditions). Where site conditions are suitable for supporting riparian vegetation, gaps separating patches of riparian vegetation will be no more than 300 feet to accommodate movement of native riparian obligate wildlife species.

Rationale: The Cache Creek Corridor (Figure 5-3) is designed to provide connectivity between valley communities and the upland communities protected in the Foothills Corridor and provide a corridor for movement of native wildlife extending across most of the Valley Landscape Unit to its terminus with the Cache Creek Settling Basin and the Yolo Bypass. The Cache Creek Corridor is not necessarily continuous or of a uniform width; it will provide a well-placed linear sequence of “stepping stones” or a traversable mosaic of protected habitat patches. The corridor will contain non-riparian habitats (e.g., small interspersed grassland gaps not wider than 300 feet). Unlike the corridors described under Objectives LAND1.2–LAND1.4, the width of the Cache Creek riparian corridor is limited by the width of the active floodplain and thus will vary and will be substantially less than 1.2 miles in width. This corridor will effectively reduce habitat fragmentation and the isolation of metapopulation elements. Covered and other native wildlife species that will benefit are those using primarily riparian habitats or that prefer to move through canopied habitats (e.g., yellow breasted chat, ringtail, deer, songbirds, and riparian-associated native snakes and amphibians) and small and medium sized native mammals (e.g., raccoon, ringtail, various small rodents).

Objective LAND1.6: Establish a habitat corridor comprised of patches of woody and herbaceous riparian vegetation within the Putah Creek floodplain extending the length of Putah Creek in Planning Units 8, 22, and 9 (Figure 5-3) within 45 years. The corridor may include gaps of non-riparian land cover separating patches of riparian vegetation of no more than 300 feet to accommodate movement of native riparian obligate wildlife species.

Rationale: The Putah Creek Corridor (Figure 5-3) is designed to provide connectivity between valley communities and the upland communities protected in the Blue Ridge and Foothills Corridors and to provide a corridor for movement of native wildlife extending

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20 The distance between patches is an important factor affecting corridor effectiveness. If patches are spaced too widely, the likelihood of moving animals to reach these patches is reduced, and dispersal along the corridor is curtailed. Using allometric relationships between body size, movements and home range (Bowman et al. 2002), and median and maximum dispersal distance for small mammals (Sutherland et al. 2000), a maximum inter-patch distance within ecological corridors was determined to be 100 meters (328 feet). This inter-patch distance includes the predicted median dispersal distance of small mammals weighing 45 grams (1.6 ounces) or more. This threshold value corresponds to dispersal distances reported for small mammals (Bowman et al. 2002).
to the City of Davis, where Putah Creek enters Solano County. The rationale for
establishing the Putah Creek Corridor and covered and other native species that will
benefit from the corridor are the same as described for Objective LAND1.5.

### 5.3.2.2 Natural Community-Level Goals and Objectives

This section presents the NHP natural community-level biological goals and objectives and the
rationale for each natural community-level objective. The process and considerations used to
establish the acreage and distribution protection requirements for land cover types that comprise
each of the natural communities are described in Section 5.2.3, *Requirements for Conservation
Lands*. The collective expected outcome of achieving all of the objectives established for each of
the natural communities is presented in Section 5.5, *Conservation Provided for Natural
Communities*.

**Goal NACO1**: Protect and enhance large contiguous patches of grassland in the Hill and Ridge
Landscape Unit and remnant patches of high value grassland in the Valley Landscape Unit to
sustain and enhance the distribution and abundance of associated covered and other native
species in the Plan Area.

**Objective NACO1.1**: Protect 32,160 acres of unprotected annual grassland distributed
among the Planning Units as indicated in Tables 5–5b-d. Of the total 32,160 acres,
protect 29,705 acres of unprotected annual grassland distributed within the Plan Area as
indicated in Tables 5–5b-d in accordance with the NHP implementation schedule (see
Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*). Of the total 32,160
acres, protect 2,455 acres of unprotected annual grassland to mitigate impacts of the
covered activities based on the distribution requirements indicated in Table 5-11 and
prior to or concurrent with the timing of implementation of covered activities as
described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale**: Grasslands are important habitat elements for a variety of covered species and
contribute to the region’s biodiversity by providing food and cover for wildlife and habitat
for native grasses and forbs. Large protected patches of grassland will provide for the
maintenance of the diversity of ecosystem functions supported by grassland in the Plan
Area (e.g., production of seeds that serve as food for birds and rodents; production of
insects, rodents, and other small species that serve as prey for snakes, songbirds, and
raptors; and capture of surface water and groundwater that support watersheds and flow in
perennial, intermittent, and ephemeral streams). Protecting grassland will also protect
habitat for covered species that are dependent on grassland for part or all of their lifecycle,
including California tiger salamander, western spadefoot toad, Swainson’s hawk,
grasshopper sparrow. Protected grassland will also protect habitat for other native wildlife
species (e.g., savanna sparrow, western meadowlark, grey fox, American badger, small
rodents).
Objective NACO1.2: Protect 85 acres of unprotected serpentine grassland distributed among the Planning Units as indicated in Table 5–5b in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*.

**Rationale:** Serpentine grasslands serve as refuges for native grassland plant species and as habitat for endemic plants that have evolved on serpentine soils and are adapted to serpentine soils’ low levels of nutrients, including the local concern species drymaria-like western flax, Colusa layia, Hall’s harmonia, and Morrison’s jewelflower. No covered wildlife or plant species are specifically associated with serpentine habitats but many grassland-associated covered wildlife species may make use of it. Protecting serpentine grassland will help ensure population viability and community composition in these specialized habitats.

Objective NACO1.3: Maintain and enhance the functions of NHP protected grassland as habitat for covered and other native species by increasing the abundance of native rodents and reducing the relative cover of nonnative grasses and forbs that reduce habitat value for covered and other native species in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*.

**Rationale:** Habitat functions of grassland communities include providing food, thermal and predator cover, and nesting/seasonal habitat for a variety of vertebrate covered and other native wildlife species (e.g., California tiger salamander, rodents, grasshopper sparrow, western meadowlark, horned lark, Swainson’s hawk, northern harrier, and insects, including native pollinator species). Enhancing these functions will support the use of grassland habitats by these species and increase their reproduction rate and survival, and reduce limiting factors and adverse effects of stressors present prior to the implementation of habitat enhancement activities. Increasingly, serpentine grassland habitats are threatened by invasion of nonnative species. Controlling invasive plant species in these habitats is expected to ensure the population viability and community composition in these specialized habitats.

Goal NACO2: Protect shrubland and scrub to provide connectivity with NHP protected grassland and woodland and forest and to sustain and enhance the distribution and abundance of associated covered and other native species in the Plan Area.

Objective NACO2.1: Protect 4,700 acres of unprotected chamise alliance distributed among the Planning Units as indicated in Table 5–5b in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*.

**Rationale:** Shrubland communities provide habitat and migratory linkages for a diverse assemblage of wildlife species. California yerba santa, pitcher sage, and deerweed are commonly found within the chamise alliance habitat, including the local concern plant...
species Colusa layia and drymaria-like western flax. This habitat type supports common
wildlife species, such as western scrub-jay, wrentit, California thrasher, sage sparrow,
and California towhee, but no covered wildlife or plant species use Chamise Alliance
habitat in the Plan Area as their primary habitat. The objective is expected to contribute
to providing a network of habitat patches that adequately represents the diversity of
ecosystem functions across the landscape and contribute to achieving the landscape-level
habitat corridor objectives.

**Objective NACO2.2:** Protect 1,330 acres of unprotected mixed chaparral distributed
among the Planning Units as indicated in Table 5–5b. Of the total 1,330 acres, protect
1,328 acres of unprotected mixed chaparral distributed within the Plan Area as indicated
in Table 5–5b in accordance with the NHP implementation schedule (see Section 7.3.2,
*Timing of Non-Mitigation Conservation Actions*). Of the total 1,330 acres, protect 2 acres
of unprotected mixed chaparral to mitigate impacts of the covered activities based on the
distribution requirements indicated in Table 5-11 and prior to or concurrent with the
timing of implementation of covered activities as described in Section 7.3.1, *Timing of
Mitigation Actions and “Rough Proportionality.”*

**Rationale:** The rationale for this objective is the same as described for chamise alliance
under Objective NACO2.1. Mixed chaparral supports several common wildlife species
(e.g., western fence lizard, western skink, gopher snake, common kingsnake, mule deer,
coyote, gray fox, California and mountain quail, mourning dove, Anna’s hummingbird,
western scrub-jay, oak titmouse, Bewick’s wren, California thrasher, wrentit, California
towhee, rufous-crowned sparrow, sage sparrow, and lesser goldfinch). There are no
covered species that use mixed chaparral as their primary habitat.

**Goal NACO3:** Protect and enhance large contiguous patches of woodland and forest in the Hill
and Ridge Landscape Unit and remnant patches of valley oak woodland in the Valley Landscape
Unit to sustain and enhance the distribution and abundance of associated covered and other
native species in the Plan Area.

**Objective NACO3.1:** Protect 7,170 acres of unprotected blue oak-foothill pine woodland
distributed among the Planning Units as indicated in Table 5–5b. Of the total 7,170
acres, protect 7,158 acres of unprotected blue oak-foothill pine woodland distributed
within the Plan Area as indicated in Table 5–5b in accordance with the NHP
implementation schedule (see Section 7.3.2, *Timing of Non-Mitigation Conservation
Actions*). Of the total 7,170 acres, protect 12 acres of unprotected blue oak-foothill pine
woodland to mitigate impacts of the covered activities based on the distribution
requirements indicated in Table 5-11 and prior to or concurrent with the timing of
implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation
Actions and “Rough Proportionality.”*
Rationale: Blue oak-foothill pine woodland provides habitat and migratory linkages for a diverse assemblage of common native wildlife species (e.g., band-tailed pigeon, hairy woodpecker, acorn woodpecker, western wood pewee, oak titmouse, Hutton’s vireo, mule deer, bobcat, and striped skunk), local concern species (e.g., purple martin, Colusa layia), and the NHP covered Townsend’s big-eared bat. The objective is expected to contribute to providing a network of habitat patches that adequately represents the diversity of woodland ecosystem functions across the landscape (e.g., watershed hydrology, wildlife movements, and habitat for native species).

Objective NACO3.2: Protect 6,320 acres of unprotected blue oak woodland distributed among the Planning Units as indicated in Table 5–5b. Of the total 6,320 acres, protect 6,308 acres of unprotected blue oak woodland distributed within the Plan Area as indicated in Table 5–5b in accordance with the NHP implementation schedule (see Section 7.3.2, Timing of Non-Mitigation Conservation Actions). Of the total 6,320 acres, protect 12 acres of unprotected blue oak woodland to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-11 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: The rationale for this objective is the same as described for Objective NACO3.1. Achieving this objective will benefit a number of covered and other native wildlife species including loggerhead shrike, purple martin, white-tailed kite, acorn woodpecker, white-breasted nuthatch, Townsend’s big-eared bat, American badger, and mule deer.

Objective NACO3.3: Protect 3 acres of unprotected closed-cone pine-cypress woodland distributed among the Planning Units as indicated in Table 5–5b in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions.

Rationale: The extent of closed-cone pine-cypress woodland in the Plan Area is limited (212 acres). Achieving this objective will protect all of the remaining unprotected closed-cone pine-cypress woodland in the Plan Area, thus helping to ensure the continued existence of this community in the Plan Area.

Objective NACO3.4: Protect 2 acres of unprotected juniper woodland distributed among the Planning Units as indicated in 5–5b in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions.

Rationale: The extent of juniper woodland in the Plan Area is limited (2 acres). Achieving this objective will protect all of juniper woodland in the Plan Area, thus helping to ensure the continued existence of this community in the Plan Area.
**Objective NACO3.5:** Protect 765 acres of unprotected montane hardwood forest distributed among the Planning Units as indicated in Table 5–5b in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*

**Rationale:** The rationale for this objective is the same as described for Objective NACO3.1. This habitat type supports local concern plant species Colusa layia and drymaria-like western flax, but is not known to support any covered plant species. Montane hardwood provides habitat for the local concern species purple martin and the covered species Townsend’s big-eared bat, and is commonly used by a variety of native wildlife species, including western skink, northern alligator lizard, California quail, mourning dove, great horned owl Anna’s hummingbird, acorn woodpecker, oak titmouse, white-breasted nuthatch, black-headed grosbeak, lazuli bunting, spotted towhee, deer mouse, western gray squirrel, striped skunk, bobcat, and mule deer.

**Objective NACO3.6:** Protect 102 acres of unprotected valley oak woodland distributed among the Planning Units as indicated in Tables 5–5b-c in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*

**Rationale:** The extent of valley oak woodland in the Plan Area is limited (180 acres), having declined substantially from its historical extent. Only remnant stands remain in the Valley Landscape Unit. Achieving this objective will protect almost half of the valley oak woodland in the Plan Area, thus helping to ensure the continued existence of this community in the Plan Area. Valley oak woodland habitats support several common wildlife species, including Nuttall’s woodpecker, western scrub-jay, oak titmouse, white-breasted nuthatch, western bluebird, striped skunk, and mule deer. Valley oak woodland habitats support habitat for the bent-flowered fiddleneck, a local concern plant species, but no covered plant species. Several covered wildlife species, including valley elderberry longhorn beetle, white-tailed kite, Swainson’s hawk and loggerhead shrike have been recorded for valley oak woodlands, including, where the elderberry host plant species is present.

**Objective NACO3.7:** Maintain and enhance the functions of NHP protected woodlands and forest communities as habitat for covered and other native species by reducing the relative cover of nonnative plant species and improving native plant diversity and vegetative structure in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*

**Rationale:** Habitat functions of woodlands and forest communities include providing food, thermal and predator cover, and nesting/seasonal habitat for a variety of vertebrate and invertebrate covered and native wildlife species, including native pollinators. Removing nonnative invasive plants can reduce competition for space, light, water, nutrients with
native plants and provides opportunity for native vegetation to replace nonnative vegetation with concomitant improvement in native wildlife habitat. This objective is expected to increase the diversity and abundance of native plant species, many of which have unique value to covered and other wildlife species as food or cover. Maintaining and enhancing these functions will support populations of associated native wildlife species.

Objective NACO3.8: Restore 100 acres of valley oak woodland that trends towards achieving a California Wildlife Habitat Relationships (CWHR) habitat stage designation of 5M-D\(^{21}\) distributed among the Landscape Units as indicated in Table 5-6 and in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*.

**Rationale:** Valley oak woodland habitats provide essential foraging and breeding habitat for black-tailed deer, raptors, owls, small mammals and Townsend’s big-eared bat. Restoring valley oak woodland provides a spatial and temporal framework for ensuring that life history requisites for associated covered and other native species are maintained and that connectivity among patches of valley oak woodland habitat is improved. The existing extent of valley oak woodland in the Plan Area is limited (Table 5-1) and restoration will increase the availability of valley oak woodland habitats for associated covered and other native wildlife species.

Goal NACO4: Protect and enhance riparian and wetland communities to provide connectivity with NHP protected upland natural communities, sustain and enhance the distribution and abundance of associated covered and other native species in the Plan Area, and maintain habitat diversity in the Valley Landscape Unit.

Objective NACO4.1: Incorporate the existing protected (PEHL Category 1) alkali sink habitat at Woodland Park and Spring Lake Alkali Sink properties into the NHP conservation lands system within the first 5 years of NHP implementation.

**Rationale:** The small proportion of the historical extent of alkali sink remaining in the Plan Area has all been substantially degraded in its ecological function as habitat for native species and covered species adapted to alkali conditions. Remaining alkali sink with the highest ecological function is found within the Woodland Park and Spring Lake Alkali Sink properties and supports habitat for NHP covered Heckard’s peppergrass, palmate-bracted bird’s-beak, brittlescale, San Joaquin spearscale, alkali milk-vetch, and vernal pool shrimp species. The Alkali sink mapped in Planning Unit 13 Colusa Basin Plains supports little ecological function and is not proposed for protection, but could be used to achieve other NHP objectives (e.g., restoration of habitat for covered plant species). Achieving this objective will ensure in-perpetuity management (see Objective

\(^{21}\) Under the WHR: 5 = medium/large tree, canopy diameter greater than 45 feet, diameter at breast height (dbh) greater than 24 inches; M = moderate cover, canopy closure 40-59 percent; D = Dense cover, canopy closure 60-100 percent (Mayer and Laudenslayer 1988).
NHCO4.2) of all of the highest functioning remaining alkali sink in the Plan Area, thus helping to ensure the continued existence of this community in the Plan Area.

**Objective NACO4.2:** Enhance the functions of alkali sink within NHP conservation lands as habitat for covered and other native species by improving hydrologic conditions and reducing the adverse effects of nonnative plants and human activities on habitat conditions in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*

**Rationale:** Existing protected alkali sink at Woodland Park and Spring Lake Alkali Sink properties will be enhanced and managed under the NHP. Alkali sink supports habitat for NHP covered Heckard’s peppergrass, palmate-bracted bird’s-beak, brittlescale, San Joaquin spear scale, alkali milk-vetch, and vernal pool shrimp species. Enhancement of habitat for these species will benefit the long-term survival of their populations in the Plan Area. Landscape-level processes such as the construction of Monticello Dam and flood protection channels have permanently altered the hydrological regimes that once supported the alkali sink natural community. Development immediately adjacent to sites where remaining alkali sink is found, such as storm water detention ponds, have negatively impacted local hydrological processes that support alkali sink. Additionally, all of the sites where alkali sink currently exists have been altered by agricultural development to some degree. Alkali sink is found in areas of alkaline clays that pond water because localized soils are almost impermeable. An important management action for these alkali sink is the control of invasive plant species such as Italian ryegrass and perennial pepperweed. Management of these invasive species will significantly improve the function and quality of protected alkali sink as habitat for covered and other native species.

**Objective NACO4.3:** Protect up to 2 acres of unprotected alkali sink to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-11 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Alkali sink provides habitat for covered plant species alkali milk-vetch, brittlescale, San Joaquin spear scale, palmate-bracted birds-beak, and Heckard’s peppergrass; and covered invertebrate species Conservancy fairy shrimp, midvalley fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp. Thus, protecting alkali sink provides a spatial and temporal framework for ensuring that life history requisites for these covered and other native species are maintained.

**Objective NACO4.4:** Enhance the functions of NHP protected fresh emergent wetland as habitat for covered and other native species by improving hydrologic conditions in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*
Rationale: Habitat functions of fresh emergent wetland include providing food, thermal
and cover from predators and nesting/seasonal habitat for a variety of vertebrate and
invertebrate covered and native wildlife species (e.g., waterfowl, herons, rails, marsh
wren, song sparrow, red-winged blackbird). The vegetation composition and functions of
fresh emergent wetland are maintained by hydrologic conditions that support saturated
soil and ponded water conditions. Maintaining hydrologic conditions that support
protected fresh emergent wetland will ensure that their functions as habitat for covered
and other native species will be maintained. Fresh emergent wetland provides essential
foraging and breeding habitat for covered species, including black tern, northern harrier,
tricolored blackbird, western pond turtle, and giant garter snake.

Objective NACO4.5: Restore 210 acres of fresh emergent wetland that achieves a WHR
habitat stage designation of 2D22 within 10 years of initial restoration actions to mitigate
impacts of the covered activities based on the distribution requirements indicated in
Tables 5-7 and 5-12, prior to or concurrent with the timing of implementation of covered
activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough
Proportionality.”

Rationale: Fresh emergent wetlands provide essential foraging and breeding habitat for
black tern, tricolored blackbird, western pond turtle, giant garter snake, and other covered
and native wildlife species. Thus, restoring fresh emergent wetland to replace fresh
e emergent wetland removed by the covered activities will ensure that sufficient habitat is
present in the Plan Area to maintain the life history requisites for these covered and other
native species.

Objective NACO4.6: Protect 4,530 acres of unprotected valley foothill riparian
distributed among the Planning Units as indicated in Tables 5–5b-d. Of the total 4,530
acres, protect 3,878 acres of unprotected valley foothill riparian distributed within the
Plan Area as indicated in Tables 5–5b-d in accordance with the NHP implementation
schedule (see Section 7.3.2, Timing of Non-Mitigation Conservation Actions). Of the
total 4,530 acres, protect 652 acres of unprotected valley foothill riparian to mitigate
impacts of the covered activities based on the distribution requirements indicated in Table
5-11 and prior to or concurrent with the timing of implementation of covered activities as
described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Valley foothill riparian habitats support a number of common wildlife species,
including the red-shouldered hawk, great horned owl, black-chinned hummingbird,
western scrub-jay, Nuttall’s woodpecker, downy woodpecker, American crow, bushtit,
oak titmouse, white-breasted nuthatch, black-headed grosbeak, blue grosbeak, lazuli
bunting, Bullock’s oriole, house finch, American goldfinch, striped skunk, raccoon, and
various rodents. Valley foothill riparian provides essential foraging and breeding habitat

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22 Under WHR: 2 = emergent vegetation greater than 12 inches in height; and D = dense cover, canopy closure 60-100 percent
(Mayer and Laudenslayer 1988).
for covered yellow-breasted chat, western yellow-billed cuckoo, least Bell’s vireo,
Swainson’s hawk, white-tailed kite, and western pond turtle. Local concern species that
use valley foothill riparian include rose mallow, pallid bat, and yellow-billed magpie.

**Objective NACO4.7:** Enhance the functions of NHP protected valley foothill riparian
communities as habitat for covered and other native species by reducing the relative
extent of nonnative plants degrade habitat function and improving native plant diversity
and vegetation structure in accordance with the NHP implementation schedule in Section
7.3.2, *Timing of Non-Mitigation Conservation Actions*.

**Rationale:** Habitat functions of valley foothill riparian communities include providing
food, thermal and cover from predators, and nesting/seasonal habitat for a variety of
vertebrate and invertebrate covered and native wildlife species, including neotropical
migrant songbirds, aquatic and amphibious species (see the rationale for NACO4.5). Maintaining and enhancing these functions by controlling invasive nonnative plant
species and improving vegetative composition and structure will ensure that the function
of protected valley foothill riparian as habitat for covered and other native species will be
maintained and improved.

**Objective NACO4.8:** Restore 476 acres of valley foothill riparian, at least 404 acres of
which attains WHR habitat stage 3P\(^{23}\) and at least 48 acres that develops as Great Valley
willow scrub (mixed scrub series) within 10 years of initial restoration actions (Table 5-6).
Restore at least 75 acres of the 476 acres of restored valley foothill riparian along
Cache Creek and 75 acres along Putah Creek to improve connectivity among patches of
existing valley foothill riparian vegetation within the Cache Creek and Putah Creek
Corridors. Of the total 476 acres, restore 150 acres of valley foothill riparian within the
Plan Area as indicated in Table 5–6 in accordance with the NHP implementation
schedule (see Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*). Of the
total 476 acres, restore 326 acres of valley foothill riparian to mitigate impacts of the
covered activities based on the distribution requirements indicated in Table 5-11 and
prior to or concurrent with the timing of implementation of covered activities as
described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Valley foothill riparian provides essential foraging and breeding habitat for
many covered (e.g., yellow-breasted chat, western yellow-billed cuckoo, least Bell’s
vireo, Swainson’s hawk, white-tailed kite, and western pond turtle) species and other
native wildlife (e.g., neotropical migrant songbirds). Restoring valley foothill riparian
provides a spatial and temporal framework for ensuring that life history requisites for
associated covered and other native species are maintained and that connectivity among
patches of valley foothill riparian is improved. Restoration of valley foothill riparian

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\(^{23}\) Under WHR: 3 = pole tree, canopy diameter 15-30 feet, dbh 6-11 inches; and P = Open cover, canopy closure 25-39 percent
(Mayer and Laudenslayer 1988).
along Cache Creek and Putah Creek will also contribute towards achieving the establishment of habitat corridors under Objectives LAND1.5 and LAND1.6.

**Objective NACO4.9:** Protect the remaining 53 acres of unprotected mapped vernal pool complex in the Plan Area at Grassland Regional Park and the Davis Communications Facility (Planning Unit 16) within the first 10 years of NHP implementation.

**Rationale:** Vernal pool complex is a remnant landscape feature in the Valley Landscape Unit. The extent of mapped vernal pool complex in the Plan Area is limited to 297 acres (Table 5-1), having declined substantially from its historical extent. This natural community provides the last remaining habitat for covered species Solano grass and Colusa grass in the Plan Area. It also provides habitat for fairy and tadpole shrimp and alkali milk-vetch, Baker’s navarretia, brittlescale, Heckard’s peppergrass, and San Joaquin spearscale. Remaining vernal pool complex in Planning Unit 18 South Yolo Basin is all protected on DFW owned land. Protecting the vernal pool complex in Planning Unit 16 will address all remaining unprotected sites for this natural community. Achieving this objective will protect the all of remaining unprotected vernal pool complex in the Plan Area, thus helping to ensure the continued existence of this community and the continued existence of Solano and Colusa grasses and other covered species in the Plan Area.

**Objective NACO4.10:** Enhance the functions of NHP protected vernal pool complex as habitat for covered and other native species by reducing adverse effects of nonnative plants and human activities on habitat conditions in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*

**Rationale:** Control of nonnative invasive species and reducing adverse effects existing management practices on the ecological functions of protected vernal pool complex will reduce competition with native species including covered Solano and Colusa grasses, possibly allowing for larger populations of these species to be maintained in the same area of habitat.

### 5.3.2.3 Species-Level Goals and Objectives

This section presents the NHP species-level biological goals and objectives and the rationale for each species-level objective. The process and considerations used to establish the habitat acreage and distribution protection requirements are described in Section 5.2.3, *Requirements for Conservation Lands.* The collective expected outcome of achieving all of the objectives established for each of the covered species is presented in Section 5.6, *Conservation Provided for Covered Species.*

**Goal SPEC1.** Expand and maintain sustainable populations of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia.
**Objective SPEC1.1:** Protect the occurrences of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia at City of Woodland Regional Park/Mavis Henson Field and protect 55 acres of unprotected mapped habitat. Of the total 55 acres, protect the remaining 53 acres of unprotected alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia mapped habitat in Planning Unit 16 within the first 10 years of NHP implementation. Of the total 55 acres, protect 2 acres of unprotected alkali milk-vetch and Heckard’s pepper-grass habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Protecting all of the remaining unprotected mapped habitat of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia within Planning Unit 16 and occurrences at City of Woodland Regional Park/Mavis Henson Field will protect all of the highest function habitat for these species and important known occurrences. Protection of habitat will ensure that all significant patches of habitat in the Plan Area will be available to support existing occurrences and any future expansion of the occurrences.

**Objective SPEC1.2:** Increase the abundance of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia in NHP protected occurrences relative to the baseline range of abundance (see Appendix A, *Covered Species Accounts*) within 20 years of implementing initial population enhancement actions. Baseline mean annual abundance will be determined following protection of the habitat.

**Rationale:** Increasing the abundance of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia in protected habitat areas will help ensure their ongoing existence in the Plan Area with any future changes in environmental conditions (e.g., climate change) and decrease the likelihood for their extirpation as a result of catastrophic events.

**Objective SPEC1.3:** Establish a sufficient number of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia plants within NHP protected lands to replace the number of plants of these species in currently unknown occurrences that are removed by the covered activities. Plant establishment sites will be prepared (e.g., grading, weed control) within one year and the number of plants necessary to replace the number of impacted plants will be achieved within five years of when impacts are incurred.

**Rationale:** Currently unknown occurrences of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia may be present in areas where covered activities will be implemented. Expansion of existing or establishment of new occurrences of alkali milk-vetch, Heckard’s pepper-grass, and Baker’s navarretia within NHP protected lands to replace the removal of individual plants in currently unknown occurrences by covered activities will help ensure the continued existence of these species in the Plan Area.
Goal SPEC2: Maintain or increase the number of sustainable occurrences of brittlescale and San Joaquin spearscale.

Objective SPEC2.1: Protect the occurrences of brittlescale and San Joaquin spearscale at City of Woodland Regional Park/Mavis Henson Field and protect 55 acres of unprotected mapped habitat. Of the total 55 acres, protect the remaining 53 acres of unprotected mapped habitat in Planning Unit 16 within the first 10 years of NHP implementation as indicated in the implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 55 acres, protect 2 acres of unprotected habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting all mapped habitat in Planning Unit 16 of brittlescale and San Joaquin spearscale will protect all occurrences that may be present in the currently unprotected high function habitat. Protection of this habitat will ensure that all significant patches of habitat in the Plan Area will be available to support existing occurrences and any future expansion of these species populations. Protection of occurrences at City of Woodland Regional Park/Mavis Henson Field will ensure long-term management of these occurrences and the conditions that support them.

Objective SPEC2.2: Increase the abundance of brittlescale and San Joaquin spearscale in NHP protected occurrences relative to the baseline range of abundance (see Appendix A, Covered Species Accounts) within 20 years of implementing initial population enhancement actions. Baseline mean annual abundance for these species will be determined following protection of the habitat.

Rationale: Increasing the abundance of brittlescale and San Joaquin spearscale in protected habitat areas will help ensure their ongoing existence in the Plan Area with any future changes in environmental conditions (e.g., climate change) and decrease the likelihood for their extirpation as a result of stochastic events.

Objective SPEC2.3: Protect up to five currently unknown occurrences each of brittlescale and San Joaquin spearscale that may be discovered in modeled salt spring habitat within five years of being found over the term of the NHP.

Rationale: Unknown occurrences of brittlescale and San Joaquin spearscale may be present and discovered in modeled salt spring habitat (see Appendix A, Covered Species Accounts) over the term of the NHP. At least five occurrences, should they be discovered, will be protected under this objective through protection of lands necessary to meet the natural community protection objectives described in Section 5.3.2.2, Natural Community Goals and Objectives. New occurrences of these species discovered on NHP conservation lands after those lands are brought under protection would meet this
Objective SPEC2.4: Establish a sufficient number of brittlescale and San Joaquin spearscale plants within NHP protected lands to replace the number of plants of these species that are removed by the covered activities. Plant establishment sites will be prepared (e.g., grading, weed control) within one year and the number of plants necessary to replace the number of impacted plants will be achieved within five years of when impacts are incurred.

Rationale: Currently unknown occurrences of brittlescale and San Joaquin spearscale may be present in areas where covered activities will be implemented. Expansion of existing or establishment of new occurrences of brittlescale and San Joaquin spearscale within NHP protected lands to replace the removal of individual plants in currently unknown occurrences by covered activities will help ensure the continued existence of these species in the Plan Area.

Goal SPEC3: Maintain a sustainable palmate-bracted bird’s-beak population in the Plan Area through the protection of known occurrences and the enhancement of habitat.

Objective SPEC3.1: Protect the occurrences of palmate-bracted bird’s-beak at City of Woodland Regional Park/Mavis Henson Field in Planning Unit 16 within the first 10 years of NHP implementation.

Rationale: Protection of occurrences of palmate-bracted bird’s-beak at City of Woodland Regional Park/Mavis Henson Field will ensure long-term protection and management of these occurrences and the conditions that support them. The protection of these occurrences would complement and expand on the existing protected occurrences of palmate-bracted bird’s-beak in alkali sink habitat at Woodland Park and Spring Lake Alkali Sink properties. This complex of contiguous NHP protected lands, specifically managed for palmate-bracted bird’s-beak offers the best chance for long-term survival of the species in the Plan Area.

Objective SPEC3.2: Protect 2 acres of unprotected palmate-bracted bird’s-beak habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting currently unprotected palmate-bracted bird’s-beak habitat will ensure that sufficient habitat remains in the Plan Area to provide habitat necessary to maintain Plan Area populations with the removal of mapped habitat by the covered activities.
Objective SPEC3.3: Increase the abundance of palmate-bracted bird’s-beak in NHP protected occurrences relative to the baseline range of abundance (see Appendix A, Covered Species Accounts) within 20 years of implementing initial population enhancement actions. Baseline mean annual abundance for these species will be determined following protection of the habitat.

Rationale: Increasing the abundance of palmate-bracted bird’s-beak in protected habitat areas will help ensure the species ongoing existence in the Plan Area with any future changes in environmental conditions (e.g., climate change) and decrease the likelihood for their extirpation as a result of stochastic events.

Objective SPEC3.4: Establish a sufficient number of palmate-bracted bird’s-beak plants within NHP protected lands to replace plants removed by covered activities. Plant establishment sites will be prepared (e.g., grading, weed control) within one year and the number of plants necessary to replace the number of impacted plants will be achieved within five years of when impacts are incurred.

Rationale: Currently unknown occurrences of palmate-bracted bird’s-beak may be present in areas where covered activities will be implemented. Expansion of existing or establishment of new occurrences of palmate-bracted bird’s-beak within NHP protected lands to replace the removal of individual plants in currently unknown occurrences by covered activities will help ensure the continued existence of this species in the Plan Area.

Goal SPEC4: Maintain the abundance of Colusa and Solano grass across the range of variability in hydrologic and climate conditions among years in unprotected mapped habitat.

Objective SPEC4.1: Protect the remaining 1 acre of unprotected mapped Colusa grass and Solano grass habitat at Grasslands Regional Park and the Davis Communications Facility in Planning Unit 16 within the first 10 years of NHP implementation.

Rationale: Protecting all the mapped Colusa grass and Solano grass habitat within the Plan Area will protect all occurrences that may be present in the currently unprotected mapped habitat. Protection of all mapped habitat will ensure that all significant patches of habitat in the Plan Area will be available to support existing occurrences and any future expansion of these species populations.

Objective SPEC4.2: Avoid the direct removal or damage of Colusa grass and Solano grass plants associated with implementation of the covered activities.

Rationale: The range-wide distribution of Colusa grass and Solano grass is limited and disjunct and only one population is known from the Plan Area within the Davis Communications Facility (see Figure 5-4). Protecting this population from impacts of the covered activities will help ensure the continued existence of this Plan Area occurrence.
Figure 5-4. Planning Unit 16 Habitat Protection
Objective SPEC4.3: Increase the mean annual abundance of Colusa grass and Solano grass in NHP protected habitat within 20 years of protecting the habitat. Baseline mean annual abundance will be determined following protection of the habitat.

Rationale: Increasing the abundance of Colusa grass and Solano grass in protected habitat areas will help ensure their ongoing existence in the Plan Area with any future changes in environmental conditions (e.g., climate change) and decrease the likelihood for their extirpation as a result of stochastic events.

Goal SPEC5: Maintain the abundance of Conservancy fairy shrimp, vernal pool fairy shrimp, Midvalley fairy shrimp, California linderiella, and vernal pool tadpole shrimp, and across the range of variability in hydrologic and climate conditions among years in unprotected mapped habitat.

Objective SPEC5.1: Protect 55 acres of unprotected mapped vernal pool shrimp species habitat. Of the total 55 acres, protect the remaining 53 acres of unprotected mapped habitat in Planning Unit 16 for Conservancy fairy shrimp, vernal pool fairy shrimp, Midvalley fairy shrimp, California linderiella, and vernal pool tadpole shrimp within the first 10 years of NHP implementation. Of the total 55 acres, protect 2 acres of unprotected habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting all the mapped Conservancy fairy shrimp, vernal pool fairy shrimp, Midvalley fairy shrimp, California linderiella, and vernal pool tadpole shrimp habitat within the Planning Unit 16 will protect all occurrences of these species that may be present in the currently unprotected high function habitat. Protection of all high function habitat will ensure that all significant patches of habitat in the Plan Area will be available to support existing occurrences and any future expansion of these species populations.

Objective SPEC5.2: Establish a sufficient number of vernal pool fairy shrimp and vernal pool tadpole shrimp occurrences within NHP protected lands to replace occurrences removed by covered activities. The new occurrences will be established within one year and the number of occurrences necessary to replace the number of impacted occurrences will be achieved within five years of when impacts are incurred.

Rationale: Currently unknown occurrences of vernal pool fairy shrimp and vernal pool tadpole shrimp may be present in areas where covered activities will be implemented. Expansion of existing or establishment of new occurrences of vernal pool fairy shrimp and vernal pool tadpole shrimp within NHP protected lands to replace the removal of occurrences by covered activities will help ensure the continued existence of these species in the Plan Area.
Objective SPEC5.3: Avoid direct take of Conservancy fairy shrimp associated with implementation of the covered activities.

Rationale: The range-wide distribution of Conservancy fairy shrimp is limited and disjunct and only one population is known from the Plan Area within the Tule Ranch Unit of the DFW Yolo Bypass Wildlife Area (see Appendix A, Covered Species Accounts; Witham 2003; CNDDB 2011). Avoiding take of any newly discovered Conservancy fairy shrimp occurrences will help ensure the continued existence of Conservancy fairy shrimp in the Plan Area.

Goal SPEC6: Maintain the distribution and abundance of valley elderberry longhorn beetle Plan Area populations.

Objective SPEC6.1: Protect 2,665 acres of unprotected modeled valley elderberry longhorn beetle riparian habitat distributed among the landscape planning units as indicated in Table 5-7. Of the total 2,665 acres, protect 2,339 acres of unprotected habitat in accordance with the NHP implementation schedule (see Section 7.3.2, Timing of Non-Mitigation Conservation Actions). Of the total 2,665 acres, protect 326 acres of unprotected habitat to mitigate impacts of the covered activities based on the requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting existing valley elderberry longhorn beetle riparian habitat in accordance with the Conservation Land Assembly Principles described in Section 7.4, Spatial Criteria for Conservation Lands Assembly, will ensure that occupied or potentially occupied habitat is protected and that sufficient unoccupied habitat is protected to accommodate any future expansions in its Plan Area distribution and abundance.

Objective SPEC6.2: Within NHP valley foothill riparian restoration sites (see Objective NACO4.8), establish 3 elderberry shrubs for every elderberry shrub supporting valley elderberry longhorn beetle habitat that is removed by the covered activities to mitigate impacts based on the distribution requirements indicated in Table 5-12 prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Restoring valley foothill riparian forest with the beetle’s elderberry host plant will expand the availability of suitable habitat and will result in a net population increase in valley elderberry longhorn beetle and possibly a wider and less fragmented distribution of the species within the Plan Area. The rationale for the acreage of valley foothill riparian to be restored is described under Objective NACO4.8.
Goal SPEC7: Maintain the current distribution and abundance of California tiger salamander and western spadefoot toad within their Plan Area range.

Objective SPEC7.1: Protect 53 acres of modeled California tiger salamander aquatic vernal pool complex breeding habitat and 200 ponds distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. The protection of 53 acres and 134 ponds will be protected in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Up to an additional 66 ponds will be protected to provide mitigation for impacts of the covered activities as indicated in Table 5-12 prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protection of aquatic breeding habitat is necessary to ensure the ongoing reproduction of California tiger salamander in currently occupied habitat and that sufficient unoccupied aquatic breeding habitat is protected to accommodate any future expansions in its Plan Area distribution and abundance.

Objective SPEC7.2: Protect 26,680 acres of modeled California tiger salamander upland habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 26,680 acres, protect 23,845 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 26,680 acres, protect 2,835 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protection of upland habitat that is located adjacent to aquatic breeding habitat is necessary to meet California tiger salamander life history requirements outside of the breeding season (e.g., foraging, aestivation, and movement requirements).

Objective SPEC7.3: Of the modeled California tiger salamander aquatic and upland habitat to be protected under Objectives SPEC7.1 and 7.2, protect 800 acres of modeled aquatic and upland habitat within California tiger salamander designated critical habitat in Planning Units 5 and/or 13 in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions.

Rationale: Protecting USFWS designated critical habitat will contribute to the recovery of California tiger salamander habitat by protecting habitat areas identified by USFWS as being important for achieving recovery of California tiger salamander.

Objective SPEC7.4: Protect 600 acres of modeled western spadefoot toad aquatic breeding habitat and 84 ponds distributed among the Planning Units as indicated in Table
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5-7 for land cover types that comprise its modeled habitat. The protection of 593 acres
and 80 ponds will be protected in accordance with the NHP implementation schedule in
Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Up to an additional 7
acres of unprotected modeled western spadefoot toad aquatic breeding habitat and 4
ponds will be protected to provide mitigation for impacts of the covered activities as
indicated in Table 5-12 prior to or concurrent with the timing of implementation of
covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough
Proportionality.”

Rationale: An almost completely terrestrial species, western spadefoot toad enters water
only to breed. Breeding pools must last for at least 30 days to allow sufficient time for
the metamorphosis of young. Protection of breeding sites is essential because western
spadefoot toads do not disperse far from native breeding habitat and spend the majority of
the year underground in burrows. This objective ensures that sufficient unoccupied
aquatic breeding habitat is protected to accommodate future expansions of the species' distribution and abundance.

Objective SPEC7.5: Protect 17,720 acres of modeled western spadefoot toad upland
habitat distributed among the Planning Units as indicated in Table 5-7 for land cover
types that comprise its modeled habitat. Of the total 17,720 acres, protect 17,350 acres of
modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2,
Timing of Non-Mitigation Conservation Actions. Of the total 17,720 acres, protect 370
acres of modeled habitat to mitigate impacts of the covered activities based on the
distribution requirements indicated in Table 5-12 and prior to or concurrent with the
timing of implementation of covered activities as described in Section 7.3.1, Timing of
Mitigation Actions and “Rough Proportionality.”

Rationale: Western spadefoot toad uses predominantly upland habitats. Protection of
upland habitat adjacent to aquatic breeding habitat is necessary to meet western spadefoot
toad life history requirements outside of the breeding season (e.g., foraging, aestivation, and movement requirements).

Objective SPEC7.6 Enhance the functions of protected California tiger salamander upland
habitat to maintain or increase the abundance of native fossorial rodents that create burrow
habitat for California tiger salamander in accordance with the NHP implementation
schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions.

Rationale: During the non-breeding season, California tiger salamander live in burrows
excavated by native mammals (e.g., ground squirrels, gophers; see Appendix A, Covered
Species Accounts). Maintaining and increasing the abundance of burrowing rodents will
ensure the availability of burrow habitat on protected lands.

Objective SPEC7.7: Enhance the functions of protected California tiger salamander and
western spadefoot toad aquatic breeding habitat by controlling nonnative predator
populations in protected aquatic habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*

**Rationale:** An important stressor on populations of western spadefoot toad and California tiger salamander is predation of larvae by nonnative predators (e.g., bullfrogs, mosquito fish; see Appendix A, *Covered Species Accounts*). Controlling nonnative predators in aquatic breeding habitats within NHP conservation lands will increase the survival of western spadefoot toad and California tiger salamander and provide for future increases in their abundance.

**Objective SPEC7.8:** In achieving SPEC7.1, protect 5 California tiger salamander breeding pools that are found to support successful production of the species in at least one year during the term of the NHP. At least 3 of these California tiger salamander breeding pools will be protected and demonstrated to be occupied within 30 years of Plan implementation, with the remaining occupied pools protected within 45 years of Plan implementation.

**Rationale:** A primary stressor limiting the California tiger salamander population is the availability of suitable breeding pools free of nonnative predators that maintain a hydroperiod sufficiently long to support metamorphosis. Protecting occupied California tiger salamander breeding sites will help ensure the continued successful reproduction and existence of this species in the Plan Area. This objective may be achieved either by protecting existing unprotected occupied breeding pools or protecting unprotected and unoccupied breeding pool habitat that subsequently supporting California tiger salamander production. For protected unoccupied habitat, the Implementing Entity will undertake habitat enhancement actions designed to encourage use by breeding California tiger salamander (e.g., controlling nonnative predators, improving hydrologic conditions).

**Objective SPEC7.9:** In achieving SPEC7.4, protect up to 5 currently unknown occupied western spadefoot toad breeding pools discovered in the Plan Area within 5 years of their discovery over the term of the NHP.

**Rationale:** The rationale for this objective is the same as described for Objective SPEC7.9. A primary stressor limiting western spadefoot toad populations is the availability of suitable breeding pools free of nonnative predators that maintain a hydroperiod sufficiently long to support metamorphosis. No known breeding pools have been identified in the Plan Area. Protecting western spadefoot toad breeding sites that are discovered over the term of the NHP will help ensure the continued successful reproduction and existence of this species in the Plan Area. Less than 5 currently unknown breeding pools may be protected if less than 5 unknown and unprotected pools are found over the term of the NHP.

**Goal SPEC8:** Maintain the distribution and abundance of foothill yellow-legged frog within their range in the Plan Area.
**Objective SPEC8.1:** Protect 55 acres of modeled foothill yellow-legged frog aquatic breeding habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.*

**Rationale:** Protection of aquatic breeding habitat is necessary to ensure the ongoing reproduction of foothill yellow-legged frog in currently occupied habitat. By ensuring that sufficient unoccupied aquatic breeding habitat is protected, connectivity among breeding sites and potential population and distribution expansions in the Plan Area are facilitated.

**Objective SPEC8.2:** Protect 60 acres of modeled foothill yellow-legged frog upland habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 60 acres, protect 59 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.* Of the total 60 acres, protect 1 acre of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Protection of upland habitat that is located adjacent to aquatic breeding habitat is necessary to meet foothill yellow-legged frog life history requirements outside of the breeding season (e.g., hibernation and movement requirements).

**Goal SPEC9:** Maintain the distribution and abundance of western pond turtle within their range in the Plan Area.

**Objective SPEC9.1:** Protect 5,600 acres of modeled western pond turtle aquatic habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 5,600 acres, protect 2,301 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.* Of the total 5,600 acres, protect up to 3,299 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Protection of aquatic habitat that is located adjacent to nesting and overwintering habitat is necessary to meet foraging and basking habitat requirements of juvenile and adult western pond turtles and provides for production of its prey base.
Objective SPEC9.2: Protect 6,180 acres of modeled western pond turtle nesting and overwintering habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 6,180 acres, protect 3,233 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 6,180 acres, protect 2,947 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protection of nesting and overwintering habitat is necessary to ensure the ongoing reproduction of western pond turtle, provide for its terrestrial overwintering habitat requirements, and provide habitat for dispersal and movement between aquatic habitat areas.

Objective SPEC9.3: In achieving Objective SPEC9.1, protect 20 patches of habitat comprised of ponds, wetlands, and/or water conveyance channels that are occupied during at least during 1 year by western pond turtle (i.e., presence of basking turtles) over the term of the NHP. At least 10 of the sites will be protected and demonstrated to be occupied within 20 years, with the remaining sites being protected and demonstrated to be occupied within 45 years.

Rationale: Protecting occupied western pond turtle aquatic habitat will help ensure that habitat supporting breeding adults is maintained and thus help to ensure the continued reproduction and existence of the species in the Plan Area. This objective may be achieved either by protecting existing unprotected occupied aquatic habitat or protecting unprotected and unoccupied aquatic habitat that subsequently becomes occupied by western pond turtle. For protected unoccupied habitat, the Implementing Entity will undertake habitat enhancement actions designed to encourage use by western pond turtle (e.g., installing basking structures, improving hydrologic conditions) – see Objective NACO4.4.

Goal SPEC10: Sustain and increase the abundance of giant garter snake in the Willow Slough/Yolo Bypass subpopulation and segment of the Colusa Basin subpopulation in the Plan Area.

Objective SPEC10.1: Protect 3,440 acres of unprotected rice land maintained in rice production and fresh emergent habitat that supports giant garter snake aquatic and upland habitat in Planning Units 12 and/or 13 that is occupied or adjacent to habitat occupied by the Colusa Basin subpopulation as indicated in Table 5-7. Of the total 3,440 acres, protect 1,740 acres of modeled habitat in accordance with the NHP implementation

24 Includes other crop types that may be grown under typical crop rotation practices in the Plan Area that is necessary to maintain rice production over time.
schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.* Of the total
3440 acres, protect 1,700 acres of habitat to mitigate impacts of the covered activities
based on the distribution requirements indicated in Table 5-12 and prior to or concurrent
with the timing of implementation of covered activities as described in Section 7.3.1,
*Timing of Mitigation Actions and “Rough Proportionality.”* To achieve the protection
objectives, the NHP may choose to restore wetland with upland in or adjacent/connected
to occupied habitat that is designed and managed specifically as giant garter snake at a
ratio of 1:5 acres for each acre of rice habitat that otherwise would be protected. This
habitat type exchange ratio may be applied to no more than 320 acres of rice land that
would otherwise be protected (i.e., approximately 9 percent of habitat protection target
may be fulfilled with restoration of wetland/upland habitat mosaic).

**Rationale:** The giant garter snake currently occurs patchily in natural and restored
wetlands and in rice farmland, and its spatial distribution is believed to be related to
historical events (e.g., floods, land use changes). Protecting a network of well-connected
and productive habitat types is important to ensure a stable and productive garter snake
metapopulation in the Plan Area. Connectivity among patches ensures that individual
snakes can evade adverse habitat conditions (e.g., changing agricultural crops, dewatering
of canals, shifting predator populations) and can respond to shifting prey populations.
Rice land and maintenance of rice cultivation practices provides aquatic foraging and
movement habitat of giant garter snakes in and adjacent to habitat occupied by the Colusa
Basin subpopulation. Thus, conservation of rice agricultural practices will help ensure
the continued existence of the segment of the Colusa Basin subpopulation residing in the
Plan Area. The rationale for the habitat acreage and distribution protection requirements
is described in Section 5.2.3.3, *Establishing Conservation Targets,* and Section 7.4,
*Spatial Criteria for Conservation Lands Assembly.*

**Objective SPEC10.2:** Protect 2,960 acres of unprotected rice land maintained in rice
production\(^{25}\) and fresh emergent wetland habitat that supports giant garter snake aquatic
and upland habitat in Planning Unit 11 that is occupied or adjacent to habitat occupied by
the Willow Slough/Yolo Bypass subpopulation as indicated in Table 5-7. Of the total
2,960 acres, protect 2,002 acres of modeled habitat in accordance with the NHP
implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation
Actions.* Of the total 2,960 acres, protect 958 acres of habitat to mitigate impacts of the
covered activities based on the distribution requirements indicated in Table 5-12 and
prior to or concurrent with the timing of implementation of covered activities as
described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*
To achieve the habitat protection objectives, the NHP may choose to restore wetland with
upland in or adjacent/connected to occupied habitat that is designed and managed
specifically as giant garter snake at a ratio of 1:5 acres for each acre of rice habitat that

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\(^{25}\) Includes other crop types that may be grown under typical crop rotation practices in the Plan Area that is necessary to maintain
rice production over time.
otherwise would be protected. This habitat type exchange ratio may be applied to no
more than 280 acres of rice land that would otherwise be protected (i.e., approximately 9
percent of habitat protection target may be fulfilled with restoration of wetland/upland
habitat mosaic).

**Rationale:** The rationale for this objective is the same as described for Objective
SPEC10.1.

**Objective SPEC10.3:** Protect 192 acres of modeled giant garter snake active season
upland movement and 312 acres of overwintering habitat to mitigate impacts of the
covered activities based on the distribution requirements indicated in Tables 5-7 and 5-
12, prior to or concurrent with the timing of implementation of covered activities as
described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Protecting currently unprotected giant garter snake habitat will ensure that
sufficient habitat remains in the Plan Area to provide habitat necessary to maintain the
Plan Area subpopulations with the removal of modeled habitat by the covered activities.

**Objective SPEC10.4:** Restore 170 acres of fresh emergent wetland/upland habitat
mosaic designed and managed as high value giant garter snake habitat within the matrix
of existing protected and unprotected rice land habitat areas in Planning Units 12 and/or
13 as indicated in Table 5-6 in accordance with the NHP implementation schedule in
Section 7.3.2, *Timing of Non-Mitigation Conservation Actions,* such that connectivity
among habitat areas occupied by the Colusa Basin giant garter snake subpopulation is
protected and improved.

**Rationale:** Restoring high value giant garter snake aquatic habitat within the matrix of
existing lower value rice land habitat is expected to increase the abundance of the Colusa
Basin subpopulation by increasing the survival of giant garter snake (i.e., by increasing
the quality of escape cover, thereby reducing its susceptibility to predation, improving
connectivity among habitat areas, and increasing prey production and food availability).

**Objective SPEC10.5:** Restore 170 acres of fresh emergent wetland/upland habitat
mosaic fresh emergent wetland designed and managed as high value giant garter snake
habitat within the matrix of existing protected and unprotected rice land habitat areas in
Planning Unit 11 as indicated in Table 5-6 in accordance with the NHP implementation
schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions,* such that
connectivity among habitat areas occupied by the Willow Slough/Yolo Bypass giant
garter snake subpopulation subpopulation is protected and improved.

**Rationale:** The rationale for this objective is the same as described for Objective
SPEC10.3.
Goal SPEC11: Maintain the current distribution and abundance of Swainson’s hawk and white-tailed kite within their range in the Plan Area.

Objective SPEC11.1: Protect 11,260 acres of unprotected agricultural land maintained in crop types that support very high, high, and moderate value Swainson’s hawk and white-tailed kite foraging habitat that is located within 4 miles of Swainson’s hawk nest sites in Planning Units 11, 13, 15, and 16 to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting high value agricultural foraging habitat within the average home territory of nesting Swainson’s hawk will help maintain or increase Swainson’s hawk nesting success by maintaining prey availability necessary to rear and fledge young. Protection of this habitat will similarly benefit the white-tailed kite population in the Plan Area.

Objective SPEC11.2: Protect 17,620 acres of unprotected annual grassland supporting modeled Swainson’s hawk and white-tailed kite foraging habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise their modeled habitats. Of the total 17,620 acres, protect 14,082 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 17,620 acres, protect 3,538 acres of habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting annual grassland in these Planning Units will provide natural Swainson’s hawk and white-tailed kite foraging habitat in Planning Units that support known nesting sites, thus helping to ensure the current distribution and production of these species.

Objective SPEC11.3: Enhance the functions of protected Swainson’s hawk and white-tailed kite grassland foraging habitat to maintain or increase the abundance of their native rodent prey species in accordance with the NHP implementation schedule in Section 7.3, NHP Implementation Schedule.

26 Crop types that provide very high to moderate value Swainson’s hawk foraging habitat includes the DWR crop type categories of alfalfa, native pasture, undifferentiated pasture, mixed pasture, clover, miscellaneous grasses (grown for seed), sugar beets, tomatoes, and grain and hay (see Appendix F, Agricultural Habitat Valuation and Forecasting Model). Includes other crop types that may be grown under typical crop rotation practices in the Plan Area that is necessary to maintain the production of high value forage crop types over time.

27 Adult breeding Swainson’s hawks in the Central Valley routinely forage as far as 30 kilometers (km) (18.7 miles) from the nest (Estep 1989, Babcock 1995).
Rationale: Maintaining or increasing rodent populations in protected Swainson’s hawk and white-tailed kite grassland foraging habitat will help maintain and potentially increase production and survival of these species by increasing the availability of prey.

Objective SPEC11.4: Protect 6,740 acres of unprotected modeled Swainson’s hawk and white-tailed kite riparian nesting habitat distributed among the Planning Units as indicated in Table 5-7. Of the total 6,740 acres, protect 2,440 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 6,740 acres, protect 4,300 acres of habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting valley foothill riparian habitat and woodlands and forest habitat in these Planning Units will maintain occupied and suitable currently unoccupied Swainson’s hawk and white-tailed kite nesting trees, which are necessary to sustain the species’ ongoing production in the Plan Area. Ensuring the availability of unoccupied nesting habitat accommodates potential future expansions and shifting locations of the breeding population.

Objective SPEC11.5 Restore 326 acres of valley foothill riparian habitat distributed among the Planning Units as indicated in Table 5-12 that supports Swainson’s hawk nesting habitat in accordance with the NHP implementation schedule in Section 7.3, NHP Implementation Schedule.

Rationale: Swainson’s hawks usually nest in large native trees in riparian woodlands, trees along roadside, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. Remnant riparian forests along drainages contain the majority of known nests in the Central Valley (Estep 1984; Schlorff and Bloom 984; England et al. 1997). Loss of nesting habitat is a primary stressor for Swainson’s hawk. Protecting unprotected modeled Swainson’s hawk nesting habitat distributed across the Plan Area ensures the sustained availability of secure nest sites for Swainson’s hawks. Restoring valley foothill riparian habitat in these Planning Units will increase the availability of suitable Swainson’s hawk and white-tailed kite nesting trees to accommodate potential future expansions and shifting location of the breeding population.

Objective SPEC11.6: Protect 165 known unprotected Swainson’s hawk nest sites in accordance with the NHP implementation schedule in Section 7.3, NHP Implementation Schedule.

Rationale: Protecting known nest sites will ensure the availability of habitat necessary to support occupancy of established nesting territories in future years. Protection of 47
percent of Swainson’s hawk nest sites\textsuperscript{28} is expected to contribute to their conservation by maintaining a core population of the species in the Plan Area.

**Objective SPEC11.7:** Establish 500 trees suitable for Swainson’s hawk nesting on NHP conservation lands in accordance with the NHP implementation schedule in Section 7.3, *NHP Implementation Schedule*, in locations where foraging habitat is present but suitable nesting trees are lacking.

**Rationale:** Expanding the availability of nesting trees in locations where nesting trees may be limiting will provide conditions favorable for expanding the breeding population of Swainson’s hawk and white-tailed kite in these locations.

**Goal SPEC12:** Sustain sufficient habitat area to support population of northern harrier in the Plan Area.

**Objective SPEC12.1:** Protect 401 acres of unprotected modeled northern harrier primary nesting/foraging habitat distributed among the Planning Units as indicated in Table 5-7 to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Protecting agricultural nesting/foraging habitat will help maintain or increase northern harrier nesting success by maintaining nesting habitat and prey availability necessary to rear and fledge young.

**Objective SPEC12.2:** Protect 14,310 acres of unprotected modeled northern harrier secondary nesting/foraging habitat distributed among the Planning Units as indicated in Table 5-7. Of the total 14,310 acres, protect 5,869 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions.* Of the total 14,310 acres, protect 8,442 acres of habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Protecting modeled northern harrier nesting/foraging habitat will help maintain or increase northern harrier nesting success by maintaining nesting habitat and prey availability necessary to rear and fledge young.

\textsuperscript{28} Based on 290 nesting territories located during Swainson’s hawk surveys conducted within core nesting habitat areas (Estep 2008). The total number of Swainson’s hawk nest sites present in the Plan Area is likely greater than 290.
Goal SPEC13: Sustain sufficient habitat area to support black terns that migrate through the Plan Area and to support future reestablishment of a nesting population in the Plan Area.

Objective SPEC13.1: Protect 6,503 acres of unprotected modeled black tern freshwater marsh and rice field habitat types distributed among the Planning Units as indicated in Table 5-7. Of the total 6,503 acres, protect 5,390 acres of modeled rice field habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 6,503 acres, protect 1,113 acres of habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting nesting and foraging habitat will help ensure the availability of foraging habitat necessary to support migrant black terns using the Plan Area and maintain the availability of nesting habitat to accommodate the potential reestablishment of a breeding population in the Plan Area.

Goal SPEC14: Sustain sufficient habitat area to support western yellow-billed cuckoo and least Bell’s vireo that migrate through the Plan Area and to support potential future reestablishment of nesting populations in the Plan Area.

Objective SPEC14.1: Protect 790 acres of unprotected modeled western yellow-billed cuckoo nesting/foraging habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 790 acres, protect 638 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 790 acres, protect 152 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: The western yellow-billed cuckoo breeds in scattered locations where suitable habitat is available and is believed to have suffered a significant population decline due to habitat loss. Protecting western yellow-billed cuckoo nesting/foraging habitat will help ensure the availability of foraging habitat necessary to support migrant western yellow-billed cuckoo using the Plan Area and the availability of nesting habitat to accommodate the potential reestablishment of a Plan Area breeding population.

Objective SPEC14.2: Protect 2,420 acres of unprotected modeled least Bell’s vireo nesting/foraging habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 2,420 acres, protect 2,122 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 2,420 acres,
protect 298 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** The least Bell’s vireo is an obligate riparian breeder that typically inhabits structurally diverse woodlands containing dense cover within 3-6 feet of the ground for nesting, and a dense stratified canopy for foraging. The least Bell’s vireo has been extirpated from the Plan Area as a nesting species; however, it is expanding its nesting range northward and has recently been observed in the Plan Area during the breeding season. Protecting least Bell’s vireo habitat will help ensure the availability of foraging habitat necessary to support migrant least Bell’s vireo using the Plan Area and the availability of nesting habitat to accommodate the potential reestablishment of breeding in the Plan Area.

**Objective SPEC14.3:** Restore 76 acres of western yellow-billed cuckoo nesting/foraging habitat distributed among the Planning Units to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Restoring western yellow-billed cuckoo nesting/foraging habitat will increase the availability of foraging habitat for migrant western yellow-billed cuckoos using the Plan Area and will increase the availability of nesting habitat to accommodate the potential reestablishment of a Plan Area breeding population.

**Objective SPEC14.4:** Restore 149 acres of least Bell’s vireo nesting/foraging habitat distributed among the Planning Units as indicated in Table 5-12 for land cover types that comprise its modeled habitat, prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Restoring least Bell’s vireo habitat will increase the availability of foraging habitat for migrant least Bell’s vireos using the Plan Area and will increase the availability of nesting habitat to accommodate the potential reestablishment of breeding in the Plan Area.

**Objective SPEC14.5:** Protect up to 5 western yellow-billed cuckoo and 5 least Bell’s vireo nesting territories if they become established in the Plan Area within 5 years of discovering the nesting territories.

**Rationale:** Protecting occupied western yellow-billed cuckoo and least Bell’s vireo nesting territories that are established in the Plan Area will help ensure the reestablishment of a Plan Area breeding population of these species. Less than 5 western...
yellow-billed cuckoo and 5 least Bell’s vireo nest sites may be protected if less than 5
unprotected nest sites of each species are found over the term of the NHP.

Goal SPEC15: Sustain sufficient habitat area to support the population of western burrowing
owl in the Plan Area.

Objective SPEC15.1: Protect 14,500 acres of unprotected annual grassland supporting
modeled western burrowing owl primary habitat distributed among the Planning Units as
indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total
14,500 acres, protect 12,660 acres of modeled habitat in accordance with the NHP
implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation
Actions. Of the total 14,500 acres, protect 1,840 acres of modeled habitat to mitigate
impacts of the covered activities based on the distribution requirements indicated in Table
5-12 and prior to or concurrent with the timing of implementation of covered activities as
described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting modeled western burrowing owl primary habitat will help maintain
or increase western burrowing owl nesting success by maintaining nesting habitat and
prey availability necessary to rear and fledge young.

Objective SPEC15.2 Enhance the functions of protected western burrowing owl
grassland habitat to maintain or increase the abundance of native rodents that create its
burrow habitat in accordance with the NHP implementation schedule in Section 7.3, NHP
Implementation Schedule.

Rationale: Maintaining or increasing rodent populations in protected western burrowing
owl habitat will help maintain and potentially increase production and survival of western
burrowing owl by increasing the availability of nesting burrows and prey.

Objective SPEC15.3: Protect up to 10 western burrowing owl nesting burrows currently
occupied or that are discovered in the Plan Area over the term of the NHP within five
years of being located.

Rationale: Protecting occupied western burrowing owl nesting burrows will help ensure
continued production and survival of western burrowing owl in the Plan Area.

Goal SPEC16: Sustain sufficient habitat area to support the Plan Area population of loggerhead
shrike.

Objective SPEC16.1: Protect 3,000 acres of unprotected modeled loggerhead shrike
nesting/perching habitat distributed among the Planning Units as indicated in Table 5-7
for land cover types that comprise its modeled habitat. Of the total 3,000 acres, protect
1,364 acres of modeled habitat in accordance with the NHP implementation schedule for
acquisition of land cover types that support its habitat in Section 7.3.2, Timing of Non-
Mitigation Conservation Actions. Of the total 3,000 acres, protect 1,636 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Suitable loggerhead shrike nesting/perching habitat is generally a limiting factor in agricultural landscapes (e.g., croplands and grasslands). Protecting modeled loggerhead shrike nesting/perching habitat will help maintain or increase loggerhead shrike nesting success by maintaining nesting habitat and prey availability necessary to rear and fledge young.

Objective SPEC16.2: Protect 15,000 acres of unprotected modeled loggerhead shrike foraging habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 15,000 acres, protect 10,415 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 15,000 acres, protect 4,585 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting modeled loggerhead shrike foraging habitat will help maintain or increase loggerhead shrike survival and production by maintaining the production and availability of its insect prey species.

Goal SPEC17.1: Sustain the Plan Area breeding population of bank swallow.

Objective SPEC17.1: Protect 700 acres of unprotected modeled bank swallow nesting habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 700 acres, protect 694 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 700 acres, protect 6 acres of modeled habitat to mitigate impacts of the covered activities based on the requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Bank swallows depend on actively eroding, steep cut-bank habitats for nest cavity construction. Protecting channel banks from anthropogenic alterations (predominantly bank stabilization and rip-rapping) ensures that natural processes of bank habitat creation continue and bank swallow nesting habitat is maintained. Habitat formation and degradation is a natural process of stream bank cutting and channel erosion and deposition. Including channel banks that support suitable bank swallow nesting
substrate and channel banks that are actively eroding within NHP conservation lands will help ensure the continued availability of nesting habitat to support the existing breeding population and to accommodate potential future expansion of the population. This objective also contributes to the goals of the DFW bank swallow recovery plan (DFG 1992) to ensure that: 1) the remaining population of this species does not suffer further declines in either range or abundance, and 2) sufficient habitat is available to ensure that the species will be able to survive as a member of California’s avifauna.

Objective SPEC17.2: Protect up to 5 unprotected bank swallow nesting sites that are existing or are newly discovered along stream courses in the Plan Area, except the Sacramento River, over the term of the NHP.

Rationale: Protecting nesting sites will ensure the availability of habitat necessary to maintain occupancy of established nesting colonies in future years. Protection of bank swallow nesting sites is expected to contribute to their recovery by maintaining a core Plan Area breeding population. Protection of nesting colonies will be accomplished by focusing the applicable natural community protection requirements on protecting the colony at the time a new colony is located. Less than 5 nesting sites may be protected if less than 5 unprotected nest sites are found over the term of the NHP.

Objective SPEC17.3: Avoid direct impacts on occupied bank swallow nesting habitat.

Rationale: Avoiding impacts of covered activities on known bank swallow nesting colonies and the habitat that supports them will ensure that those colonies are given an opportunity to successfully produce offspring.

Goal SPEC18: Sustain and increase the distribution and abundance of yellow-breasted chat within their range in the Plan Area.

Objective SPEC18.1: Protect 1,180 acres of unprotected modeled yellow-breasted chat nesting/foraging habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 1,180 acres, protect 1,120 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, Timing of Non-Mitigation Conservation Actions. Of the total 1,180 acres, protect 60 acres of modeled habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, Timing of Mitigation Actions and “Rough Proportionality.”

Rationale: Protecting yellow-breasted chat nesting/foraging habitat will help ensure the availability of foraging habitat necessary to support dispersing and migrant yellow-breasted chat using the Plan Area and the availability of nesting habitat to accommodate the potential reestablishment of breeding in the Plan Area.
Objective SPEC18.2: Restore 30 acres of yellow-breasted chat nesting/foraging habitat distributed among the Planning Units as indicated in Table 5-12 in accordance with the NHP implementation schedule in Section 7.3, *NHP Implementation Schedule*, for land cover types that comprise its modeled habitat.

**Rationale:** Restoring yellow-breasted chat nesting/foraging habitat will increase the availability of habitat for dispersing and migrant yellow-breasted chat using the Plan Area and will increase the availability of nesting habitat to accommodate the potential reestablishment of a breeding population.

Goal SPEC19: Sustain the distribution and abundance of grasshopper sparrow within their Plan Area range.

Objective SPEC19.1: Protect 17,900 acres of unprotected modeled grasshopper sparrow habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 17,900 acres, protect 15,755 acres of modeled habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*. Of the total 17,900 acres, protect 2,145 acres of habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Protecting occupied and unoccupied grasshopper sparrow habitat will help maintain or increase grasshopper sparrow nesting success by maintaining nesting habitat and prey availability necessary to rear and fledge young and provide for the potential future expansion of the breeding population in the Plan Area.

Objective SPEC19.2: Maintain and enhance the habitat functions of NHP protected grasshopper sparrow habitat by reducing the areal extent of nonnative grasses and forbs that support low value habitat and managing livestock grazing to maintain cover conditions that support grasshopper sparrow nesting.

**Rationale:** Maintaining and enhancing vegetation composition and structure will increase the likelihood for occupancy of protected grassland by grasshopper sparrow and increase nesting success by providing cover conditions that reducing the likelihood of detection of nest sites by predators.

Goal SPEC20: Maintain or increase the population of wintering and breeding tricolored blackbirds in the Plan Area.

Objective SPEC20.1: Protect 26,600 acres of unprotected modeled tricolored blackbird foraging habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 26,600 acres, protect 20,386
acres of unprotected habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*. Of the total 26,600 acres, protect 6,214 acres of unprotected habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Tricolored blackbirds forage in areas that provide abundant insects, including pastures, dry seasonal pools, agricultural fields such as alfalfa and rice, feedlots, and dairies. Protecting suitable foraging habitat will help ensure the availability of foraging habitat necessary to support wintering and breeding tricolored blackbirds using the Plan Area.

**Objective SPEC20.2:** Protect 501 acres of unprotected modeled tricolored blackbird nesting habitat distributed among the Planning Units as indicated in Table 5-7 for land cover types that comprise its modeled habitat. Of the total 501 acres, protect 339 acres of unprotected habitat in accordance with the NHP implementation schedule in Section 7.3.2, *Timing of Non-Mitigation Conservation Actions*. Of the total 501 acres, protect 162 acres of unprotected habitat to mitigate impacts of the covered activities based on the distribution requirements indicated in Table 5-12 and prior to or concurrent with the timing of implementation of covered activities as described in Section 7.3.1, *Timing of Mitigation Actions and “Rough Proportionality.”*

**Rationale:** Tricolored blackbirds are well adapted to rapidly changing environments where the locations of secure nesting habitat and rich insect food supplies fluctuates (Orians 1961; Collier 1968; Payne 1969). The primary stressor for tricolored blackbirds is the loss of suitable breeding sites that provide the required combination of tall emergent vegetation above standing water connected to highly productive foraging areas with high densities of arthropods. Protecting sufficient acreage to support tricolored blackbird will ensure that nesting colonies and their surrounding foraging habitat will be protected across a wide portion of the Plan Area and across fluctuating foraging conditions from year to year.

**Objective SPEC20.3:** Protect up to five tricolored blackbird nesting sites that have been active within the previous 5 years over the term of the NHP within 5 years of being discovered.

**Rationale:** Protecting tricolored blackbird nesting colony sites will ensure the availability of habitat necessary to maintain occupancy of established nesting colonies in future years. The species shows annual site fidelity (Beedy and Hamilton 1997), which may be the result of adequate site availability or protected habitat resources. Thus protecting previously active nest sites ensures that high quality nesting habitat is protected and available, also in case an existing colony elsewhere is destroyed, as tricolor blackbirds
readily attempt re-nesting. Less than 5 nesting sites may be protected if less than 5 unprotected nest sites are found over the term of the NHP.

Objective SPEC20.4: Avoid the removal by covered activities of tricolored blackbird nesting sites that have been active within the previous five years.

Rationale: The greatest threats to tricolored blackbird is the direct loss and degradation of nesting and foraging habitat from human activities. Most native habitats that once supported nesting and foraging tricolored blackbirds in the Central Valley have been replaced by urbanization and agricultural croplands unsuited to their needs. Maintaining previously used nest sites ensures adequate site availability of protected habitat resources.

Goal SPEC21: Maintain a sustainable Plan Area breeding population of Townsend’s big-eared bat.

Objective SPEC21.1: Protect 14,500 acres of modeled Townsend’s big-eared bat foraging and roosting habitat distributed among the Planning Units as indicated in Table 5-7 in accordance with the NHP implementation schedule in Section 7.3, NHP Implementation Schedule, for land cover types that comprise its modeled habitat.

Rationale: Protecting Townsend’s big-eared bat foraging and roosting habitat will help maintain or increase Townsend’s big-eared bat survival by maintaining land cover types that support production of its insect prey and suitable roost sites.

Objective SPEC21.2: Protect up to 10 Townsend’s big-eared bat maternity/roosting colonies that are discovered in the Plan Area over the term of the NHP within five years of being located.

Rationale: The Townsend’s big-eared bat is vulnerable to human disturbance during roosting (especially maternity roosts) and during its daily and seasonal periods of hibernation to conserve energy when inactive. Roosting habitat is limited to caves, mines, tunnels, and other features that mimic caves, such as large tree hollows, abandoned buildings with cave-like attics, water diversion tunnels, and internal spaces in bridges. Until Townsend’s big-eared bat colonies are well protected, every maternal roost is important for maintaining the species in the Plan Area. Less than 10 maternal roost sites nesting sites may be protected if less than 10 unprotected nest sites are found over the term of the NHP.

5.4 Conservation Measures

This section presents the NHP conservation measures (CMs) that the NHP Implementing Entity will implement to protect, enhance, and restore natural communities and the covered species habitats they support; improve the ecological function of natural communities; avoid, minimize, and compensate for impacts on covered species associated with implementation of covered
activities; and provide for the conservation of covered species in the Plan Area. Implementation of the conservation measures will collectively achieve the NHP biological goals and objectives (Section 5.3, Biological Goals and Objectives). Conservation measures address the protection, enhancement, and restoration of physical habitats that support covered species and reduce the effect of environmental stressors on covered species. Conservation measures were developed to address the needs of covered and other native species at each of three ecological scales: landscape, natural community, and species-specific. In addition, avoidance and minimization measures will be implemented to ensure that the amount and intensity of impacts of covered activities on natural communities and species is minimized to the greatest extent practicable. Landscape-level conservation measures are presented in Section 5.4.1, natural community-level conservation measures are presented in Section 5.4.2, species-specific conservation measures are presented in Section 5.4.3, and avoidance and minimization measures (AMMs) for natural communities and covered species are presented in Section 5.4.4. The conservation measures are listed below and described in the following sections. A summary list of the NHP conservation measures and the biological objectives they address is provided in Table 5-16.

**Landscape-Level Conservation Measures**

- CM1, Protect Landscapes and Natural Communities
- CM2, Develop an Invasive Species Control Program
- CM3, Improve the Permeability of Linear Structures for Native Wildlife

**Natural Community-Level Conservation Measures**

- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities

**Species-Level Conservation Measures**

- CM6, Restore Covered Plant and Vernal Pool Shrimp Species Habitat and Establish Occurrences
- CM7, Increase the Abundance of Covered Plant Species in NHP Protected Occurrences
- CM8, Establish Nest Trees for Raptors
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
5.4.1 Landscape-Level Conservation Measures

5.4.1.1 CM1: Protect Landscapes and Natural Communities

The Implementing Entity will protect an acreage of natural communities and covered species habitat sufficient to achieve the biological goals and objectives described in Section 5.3 within the Plan Area the assembly of which will comprise the NHP conservation lands system. As used in the NHP, the placement of conservation easements on or the fee title purchase of land parcels to protect natural communities and covered species habitat. The required acreage of protection of existing natural communities within each Planning Unit and in total is provided in Tables 5-5a–5-5d. The required acreage of protection of covered species habitat types by Planning Unit is provided in Table 5-7. Within these protected lands or on additional protected lands, sufficient lands will be protected as is necessary to restore the acreage of the natural communities and habitats within the Planning Units indicated in Table 5-6. Habitat restoration requirements are described in CM4, Restore Natural Communities and Habitat.

The Implementing Entity will protect lands through their acquisition using the mechanisms described in Section 5.4.1.1.3, Approach to Land Acquisition, to establish the NHP conservation lands system. Conservation easements will be used more frequently than other acquisition methods in the working landscape of agricultural lands and rangelands to maintain lands in current land uses that benefit covered species. In general, lands that are acquired through fee title will be those that have known occurrences of highly restricted covered species (e.g., covered plant species) or that are intended for extensive changes in land use for habitat improvement such as habitat enhancement and restoration. Candidate lands for protection under voluntary agricultural conservation easements include lands that support intact habitat for covered species and for which no substantial land use changes are required and lands needed mainly for ecological corridors. Use of conservation easements is the preferred habitat protection method over fee title acquisition for rangelands and croplands for which the ongoing agricultural use is compatible with achieving the biological goals and objectives of the NHP.

This conservation measure provides the mechanism and guidance for the acquisition of lands and the establishment of the NHP conservation lands system that will meet the natural community and covered species habitat protection biological objectives presented in Section 5.3, Biological Goals and Objectives. The conservation lands system will be assembled over the term of the NHP permits as per the implementation schedule in Section 7.3, NHP Implementation Schedule, to accomplish the following:

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29 See the glossary for the definition of the term “protect/protection” as it is used in this document. All lands protected under the NHP will have conservation easements placed on them.

30 Acreages presented in these tables represent the maximum acreage that will be protected and restored with full implementation of the NHP covered activities (i.e., all protection and restoration for mitigation is implemented).

31 See Appendix M, Glossary, for the definition of the term “conservation easement” as it is used in this document and Section 7.9, Conservation Easement Requirements, for a description of the minimum requirements for conservation easements under the NHP.
• Protect and enhance areas of existing natural communities and covered species habitat;
• Protect and maintain occurrences of covered plant species with limited distributions and habitat areas occupied by specified covered wildlife species (see Section 5.4.3, Species-Level Conservation Measures);
• Provide sites for restoring natural communities and covered species habitat; and
• Provide habitat connectivity among the various land units within the conservation land system.

This conservation measure describes the land acquisition procedures, including pre-acquisition survey requirements, land acquisition methods, and land selection criteria that will be applied to ensure that the ecological attributes of the acquired lands will serve to achieve the biological goals and objectives.

5.4.1.1.1 Pre-Acquisition Surveys and Evaluations

The Implementing Entity will develop and implement protocols for assessing physical and biological resources and infrastructure present on lands being considered for acquisition to determine the degree to which they are suitable for achieving NHP biological goals and objectives. In instances where land occupied by a particular covered species is being considered for acquisition, federal and state protocol-level surveys may be required to determine occupancy. Pre-protection surveys will be conducted by qualified biologists and other qualified scientists or technical experts, as appropriate. Surveys will assess the following and any other relevant physical and biological attributes of the lands consistent with the conservation land assembly principles (see Section 7.4, Spatial Criteria for Conservation Lands).

• The presence of covered species
• The extent and quality of existing covered species habitats
• Connectivity with other habitat areas
• Infrastructure supporting existing habitats or necessary to restore habitats
• Adjacent land uses and resources
• Potential constraints to long-term management and maintenance of habitats
• Other conservation-related opportunities and constraints

5.4.1.1.2 Site Selection Criteria

The Implementing Entity will apply, and revise when necessary, the following criteria, based on the conservation land assembly principles described in Section 5.2.3.4, Spatial Criteria for Conservation Lands Assembly, for evaluating and prioritizing acquisition of natural communities (non-cultivated lands) for achieving habitat protection targets. Level of benefits the acquisition will provide for covered species.
• Presence and abundance of covered species and life history functions (e.g., presence of nesting Swainson’s hawk, white-tailed kite, and western burrowing owl).

• Presence of plant species of highly limited distribution (e.g., Heckard’s peppergrass, San Joaquin spearscale, palmate-bracted bird’s-beak).

• Presence of uncommon specialized ecological conditions (e.g., alkali soils, seeps) required by covered species with a narrow range of habitat requirements.

• Likely effects of adjacent land uses on the ability to maintain or improve desired ecological functions into the future.

• Habitat patch size relative to the habitat patch size requirements of the covered species intended to benefit from the habitat.

• Opportunities for effectively implementing management actions to enhance ecological functions.

• Level of contribution for maintaining local and regional ecological processes.

• Level of connectivity provided between and among NHP conservation lands and PEHL habitat areas.

• Level of contribution for protecting natural environmental gradients.

• Level of contribution towards establishment of large units of conserved lands.

• Likely effects of climate change on future ecological functions.

• Role in maintaining and complementing the habitat functions of adjoining natural communities for covered and other native species.

• Level of contribution towards protection of a heterogeneous mix of natural communities and native species, including native grasses and forbs;

• Effectiveness in contributing towards achieving multiple NHP biological goals and objectives.

In addition to the spatial and other considerations identified above for assembling the NHP conservation lands system, the Implementing Entity will apply, and revise when necessary, the following criteria for evaluating and prioritizing acquisition of agricultural habitats for achieving habitat protection targets.

• Presence of Swainson’s hawk, white-tailed kite, northern harrier, western burrowing owl, black tern, and tricolored blackbird nest sites;

• Proximity to active Swainson’s hawk or white-tailed kite nesting territories;

• Ability to support crops that provide high value foraging habitat for Swainson’s hawk and other covered species that use agricultural habitats;
• Occupancy by giant garter snake or western pond turtle and proximity and connectivity to habitat occupied by these species;

• Suitability of water conveyance infrastructure and practices for supporting giant garter snake and western pond turtle habitat and their movements; and

• Opportunities to protect patches of other high value non-agricultural habitats (e.g., oak groves, wetlands, tree and hedgerows) that are supported among farmed fields.

The Implementing Entity will apply, and revise when necessary, the following criteria for evaluating and prioritizing acquisition of lands for achieving natural communities and covered species habitat restoration targets.

• Ability of lands to achieve biological goals and objectives (e.g., location relative to existing habitat occupied by target covered species; the ability to develop as habitat for target covered species).

• Suitability (e.g., soils, hydrology) and cost effectiveness for restoring target habitats, including water sources for restored giant garter snake habitat and fresh emergent wetlands.

• Ability to meet the same patch size, shape, and connectivity criteria as identified for protection of existing habitats.

• Support the restored habitat over time.

• Level of management necessary to maintain desired ecological functions into the future.

Protection of fresh emergent wetlands, riparian habitats, and ponds must ensure sufficient watershed lands are present to support hydrologic requirements. Protection of rice land, restored fresh emergent wetland, and protected and restored giant garter snake habitat must also include securing (e.g., via water rights and/or contracts) the artificial water sources supporting these habitats.

To be credited as contributing towards achieving the biological goals and objectives, the amount and distribution of lands acquired for protection of existing and restoration of natural communities and covered species habitats must be acquired within the Planning Units/Landscape Units as indicated in Tables 5-5a–5-5d, 5-6, and 5-7. The existing extent of unprotected and PEHL Category 1 natural communities and modeled and mapped covered species habitat types within each of the Landscape and Planning Units are presented in Tables 5-3a–5-3d and 5-4a–5-4d, respectively.

5.4.1.3 Approach to Land Acquisition

Lands may be acquired for the purpose of achieving the NHP biological goals and objectives through the following mechanisms.
• Purchase in fee title by the Implementing Entity or a Permittee and put under a conservation easement (see Section 7.9, Conservation Easement Requirements).

• Acquisition of voluntary conservation easements on private lands that meet NHP habitat protection requirements (see Section 7.9, Conservation Easement Requirements).

• Conservation easement or fee title acquisition by conservation organizations (e.g., land conservancies and land trusts) that protect and manage lands in conformance with NHP requirements.

• Protection of lands by federal or state agencies that provide designations for those lands that meet NHP protection and management requirements.

• Transfer of management authority from federal or state land owners to the Implementing Entity and the appropriate designation of such lands to meet NHP protection and management requirements.

• Purchase of mitigation credits from private mitigation or conservation banks approved by USFWS and DFW and meeting the protection and management requirements of the NHP.

In addition, the conservation lands system incorporates connectivity to the PEHL depicted in Figure 5-2 because habitats present on PEHL lands are afforded a level of protection that allow them to contribute to the overall conservation of the covered species and natural communities. Several PEHL will be incorporated into the NHP conservation lands system as described in the conservation measures.

Procedures and requirements for conservation easements are described in Section 7.9, Conservation Easement Requirements. The Implementing Entity may acquire conservation lands in partnership with other government entities or conservation organizations, or through grants of land from participating or other entities where such lands will serve to achieve the NHP biological goals and objectives.

The NHP conservation lands system will be comprised of the following:

• Lands managed by the Implementing Entity (lands that are under direct management of the Implementing Entity and lands acquired through conservation easements for which the Implementing Entity holds the easement);

• Private lands acquired through conservation easements that may be managed by other qualified entities; and

• Lands owned and managed by participating entities that are dedicated, through binding agreement with the Implementing Entity, to be managed to maintain or enhance habitat functions that meet all NHP requirements.

It is anticipated that NHP conservation lands will predominately be acquired through use of conservation easements with fee title acquisitions being focused on acquisition of lands that
would require severe restrictions on existing land uses to provide the intended biological objectives (e.g., lands acquired for restoration of habitat).

Habitat restoration will occur primarily on lands acquired by the Implementing Entity in fee title or in other public ownership to ensure the maximum flexibility to modify the land to achieve habitat restoration objectives for both quantity and quality of habitat. Lands acquired to maintain the existing habitat functions may be protected through conservation easements that specify the range of permitted land uses and practices that will maintain or enhance the intended habitat functions of the acquired lands. Habitat enhancement may be conducted on lands through conservation easements, depending on the compatibility of enhancement actions with other land uses.

Target acreage commitments for protection of natural communities are presented in Tables 5-5a–5-5d and natural community and covered species habitat restoration targets are presented in Table 5-6. Acquisition of these lands will also fulfill the target acreage requirements for each of the covered species for which habitat protection targets are established (Table 5-7). These targets represent the extent of natural communities and covered species habitats that the Implementing Entity will need to be acquired under the NHP to achieve the biological goals and objectives for conservation of natural communities and covered species habitats. These targets represent the minimum extent of land that will be acquired; the actual extent that will be acquired may be greater because acquired parcels may not be comprised wholly of habitat types that contribute towards achieving habitat target acreage (for example, many acquired properties may include developed and disturbed sites, that support little or no habitat function, along with intact natural communities and high-function habitat).

5.4.1.1.4 Hill and Ridge Landscape Unit Natural Communities Acquisition Requirements

The Implementing Entity will acquire 51,995 acres of the land cover types comprising the natural communities distributed among the Planning Units within the Hill and Ridge Landscape Unit as indicated in Table 5-5a. In addition, sufficient land must be acquired to achieve the land cover type restoration targets in Table 5-6. The land acquisition strategy for the Hill and Ridge Landscape Unit is primarily to acquire large patches of existing habitat areas that are connected to other patches of high functioning habitat areas and to manage those lands to maintain or enhance existing habitat functions for the associated covered and other native species. The Hill and Ridge Landscape land acquisition requirements for natural communities are designed to meet the covered species habitat targets (Table 5-7); to establish the Blue Ridge, Foothill, Dunnigan Hills, and Putah Creek Corridors (Figure 5-3); to protect existing stands and ecological functions that support shrublands and scrub, forest and woodland, and grassland and associated native species biodiversity; and to protect watershed lands important to stream and riparian habitats.
The Hill and Ridge Landscape Unit encompasses hilly and mountainous terrain in the west side of the Plan Area and is divided into seven Planning Units (Figure 5-1). The Hill and Ridge Landscape Unit supports a high diversity of habitats, but is dominated by grassland, woodlands and forest, and shrubland and scrub natural communities with lesser amounts of valley foothill riparian and agricultural land (Table 5-1). These dominant natural communities within the Hill and Ridge Landscape Unit are relatively common in the Plan Area. Although they have been modified by historical and ongoing land uses, they are more ecologically intact (i.e., are less severely modified by human activities and support a much larger proportion of native plants and wildlife in their historical locations) than habitats in lowland areas of the Valley Landscape Unit. The protection of the grassland natural community is emphasized in the Hill and Ridge Landscape Unit because a large number of covered species use grassland relative to other natural communities in this Unit and a low proportion of existing grassland is in PEHL Category 1 (Table 5-3b).

5.4.1.1.5 Valley Landscape Unit Natural Community Acquisition Requirements

The Implementing Entity will acquire 22,877 acres of land supporting each of the land cover types comprising the natural communities distributed among the Planning Units of the Valley Landscape Unit as indicated in Tables 5-5c–5-5d during the term of the NHP. The primary purposes of conservation land acquisition for the Valley Landscape Unit are to acquire remnant patches of important natural habitat areas and to maintain the functions of the predominant agricultural landscape as habitat for associated covered species. The Valley Landscape natural community land acquisition requirements are designed to meet the covered species habitat targets (Table 5-7) and to establish the Cache Creek and Putah Creek Corridors (Figure 5-3). Targets for field crops, grain/hay crops, pasture, truck/nursery/berry crops (Tables 5-5c–5-5d) requires the protection of agricultural lands that are maintained in production of crop types that provide very high, high, and moderate value foraging habitat for Swainson’s hawk.32

The Valley Landscape Unit encompasses relatively level terrain in the lowland portion of the Plan Area and is comprised of 15 Planning Units (Figure 5–1). The Valley Landscape Unit is dominated by agricultural lands (Table 5–1); important examples of natural communities are present, but most of these natural communities occur in a matrix of agricultural and developed lands. The landscape unit supports important riparian habitat corridors along major creeks and along many sloughs and ditches that serve to convey agricultural and flood water. Small areas of grasslands adjacent to vernal pool complex and alkali sink areas provide important habitat for covered plants and invertebrates that are mostly restricted to these areas. Large areas of managed wetland habitat (mapped as fresh emergent wetland) occur in the Yolo Bypass and Colusa Basin. Scattered remnant oak groves and isolated oak trees occur within a much larger component of groves and windrows of nonnative trees. A diverse agricultural use pattern

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32 Crop types that provide very high to moderate value Swainson’s hawk foraging habitat includes the DWR crop type categories of alfalfa, native pasture, undifferentiated pasture, mixed pasture, clover, miscellaneous grasses (grown for seed), sugar beets, tomatoes, and grain and hay (see Appendix F, Agricultural Habitat Valuation and Forecasting Model).
supports a number of covered species that have acclimated to the artificial habitat conditions provided.

The conservation strategy for the Valley Landscape Unit emphasizes the protection and enhancement of natural community patches that serve as important habitat areas within the primarily agricultural landscape, the loss of which could reduce the abundance and distribution of associated covered and other native species within the Unit (Tables 5-5c–5-5d). For the acquisition of annual grassland, priority will be given to the protection of patches of grassland that exceed 30 acres, that support important occurrences of covered species with limited distributions, and that provide connectivity with other conserved covered species habitat areas. Because the Yolo Bypass is periodically inundated for flood control, land acquisition in the Yolo Bypass (i.e., Planning Units 17 and 18) will be limited to the acquisition of lands whose habitat functions for target covered species are not negatively affected by periodic inundation of the Bypass.

There are a number of existing programs in the Plan Area that are active in the conservation of riparian habitats.33 Riparian woodland and scrub will be protected in the Valley Landscape Unit by acquiring riparian habitats in a manner that compliments existing riparian habitat conservation programs in Plan Area while achieving the NHP biological objectives for riparian-associated covered species. Conservation of riparian habitats in the Valley Landscape Unit, and the integration of conservation with water supply, flood control, water quality protection, and recreation uses, has received considerable attention in Yolo County. Various citizen-based and local government plans have been developed and projects have been implemented to conserve riparian habitat in recent years. Conservation actions have included fee title acquisition of or easements on lands supporting riparian habitat (in fee title or conservation easements) and implementation of management actions to protect, enhance, and restore riparian habitat. Many of these efforts are focused on particular stream systems and reaches, while other areas have not been formally identified as conservation priorities.

Specific acquisition targets for herbaceous riparian vegetation along stream courses are not established because this habitat type could not be effectively delineated from aerial imagery (some is likely identified as “grassland”) and often are sites where woody riparian has been artificially removed. Herbaceous riparian habitats will be acquired as part of parcels acquired for riparian woodland and scrub and within NHP conservation lands protected for other habitat types. These protected herbaceous riparian habitats will be managed to maintain and enhance their habitat functions for covered and other native wildlife and also will be used as sites for restoration of riparian forest and scrub, where appropriate ecological conditions are present.

5.4.1.1.6 Acquisition of Occupied Covered Species Habitats

The following three properties are specifically identified for protection under the NHP:

- City of Woodland Regional Park/Mavis Henson Field in Planning Unit 19 (Figure 5-5)
- Grasslands Regional Park in Planning Unit 16 (Figure 5-4)
- Davis Communication Facility in Planning Unit 16 (Figure 5-4)

These properties include the last remaining natural or semi-natural unprotected vernal pool complex in the Plan Area. All NHP covered plant species have known occurrences at one or more of these properties. These three properties will be brought under a conservation easement and managed specifically for the benefit of the populations of covered plant species present. In addition, habitat for covered shrimp species found on these properties will be maintained and managed appropriately for these shrimp species. The natural communities and species habitat protected within these three properties will be counted as part of achieving the acquisition targets for natural communities and habitat within the Valley Landscape Unit.
Figure 5-5. Southeast Woodland Habitat Protection
To meet NHP biological goals and objectives, occupied habitat will also be acquired for the following species in the amounts stated.

- Brittlescale (5 newly discovered occurrences [or fewer if 5 are not found] in salt spring habitat in the Hill and Ridge Landscape Unit).
- San Joaquin spearscale (5 newly discovered occurrences [or fewer if 5 are not found] in salt spring habitat in the Hill and Ridge Landscape Unit).
- California tiger salamander 5 existing or newly discovered breeding pools (or fewer if 5 are not found).
- Western spadefoot toad 5 newly discovered breeding pools (or fewer if 5 are not found).
- Western pond turtle (20 patches of pond, wetland, and/or water conveyance channel habitat).
- Swainson’s hawk (165 nest sites).
- Western yellow-billed cuckoo (5 newly discovered nest sites, or fewer if 5 are not found).
- Western burrowing owl (10 currently occupied or newly discovered nesting burrows, or fewer if 10 are not found).
- Bank swallow (5 currently occupied or newly discovered nesting colony sites, or fewer if 5 are not found).
- Least Bell’s vireo (5 newly discovered nest sites, or fewer if 5 are not found).
- Tricolored blackbird (5 existing or newly discovered nesting colony sites, or fewer if 5 are not found).
- Townsend’s big-eared bat (10 newly discovered maternity/roosting colony sites, or fewer if 10 are not found).

Sufficient information is not currently available regarding the number of occurrences in the Plan Area of the types of occupied habitat specified above for brittlescale, San Joaquin spearscale, California tiger salamander, western spadefoot toad, western yellow-billed cuckoo, western burrowing owl, bank swallow, least Bell’s vireo, tricolored blackbird, and Townsend’s big-eared bat. Consequently, the occupied habitat objectives described above may not be attained if the specified number of occurrences of occupied habitat are not found in the Plan Area during the term of the NHP.

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34 Only 1 historical occurrence of western spadefoot toad is reported from the Plan Area (see Appendix A, Covered Species Accounts).
35 Western yellow-billed cuckoo is not known to currently nest in the Plan Area, but nest sites could become established during the term of the NHP.
36 Least Bell’s vireo is not known to currently nest in the Plan Area, but nest sites could become established during the term of the NHP.
37 Townsend’s big-eared bat maternity roosts are not currently known to be present in the Plan Area, but existing unknown roost sites or newly established roost sites could be discovered during the term of the NHP.
The occupied habitat types specified above for each of the species will be identified through pre-acquisition surveys conducted on lands considered for acquisition (see Section 5.4.1.1.1) and reports of the occurrence of these species from USFWS, DFW, NHP stakeholders, and other sources. It is expected that the occupied habitat acquisition requirements will be attained through conservation easements or fee title acquisitions necessary to meet the natural community conservation targets presented in Table 5-5a, but, depending on when the specified types of occupied habitat described above are discovered during the term of the NHP, the acquisition of additional lands may be required (e.g., if occupied habitat for a species is discovered after the conservation target for the natural community type that supports the species’ habitat has been achieved). Newly discovered occurrences of covered species found on NHP conservation lands qualify as meeting the biological objectives for these species (i.e., they become protected at the time of NHP land acquisition, though unknowingly, and were discovered later).

5.4.1.1.7 Elevation Gradients and Inter-Planning Unit Connectivity

In addition to the spatial distribution requirements among the Planning Units for protection of a broad geographic range of the natural communities, conservation lands must be distributed within and among Planning Units to protect elevation gradients and ecological connectivity among natural communities and covered species habitats. Ecological corridors are included in the Hill and Ridge Landscape Unit to provide elevation gradients and north-south corridors to provide for the movement of wildlife and for distribution shifts in covered and other native wildlife and plants, and natural communities anticipated to result from climate change. Ecological corridors are included in the Valley Landscape Unit along the major stream systems because the aquatic and riparian habitats provide important wildlife movement corridors within the matrix of agricultural and urban lands that dominate the Valley Landscape Unit. Protection and enhancement of the main riparian habitat along Cache and Putah Creeks (Figure 5-3) will provide important wildlife movement corridors within the Valley Landscape Unit and between the Valley Landscape and Hill and Ridge Landscape Units. Remaining patches of natural communities (e.g., alkali sink, vernal pool complex, grasslands, and valley oak woodland) in the Valley Landscape Unit are too small and disconnected to provide connecting land corridors. No attempt to connect these natural communities is proposed because of the major disruption to the existing working agricultural landscape and high cost such an action would entail – it is not practicable or feasible.

Tools for acquisition of lands within ecological corridors are the same as for other conservation lands described in Section 5.4.1.1.3, Approach to Land Acquisition; however, for agricultural lands that provide wildlife movement corridors, but not necessarily covered species habitat (e.g., orchards and vineyards), less restrictive agricultural easements (i.e., less restrictive to agricultural practices than conservation easements to specify cultivation of crop types that support habitat for covered species that forage in agricultural habitats) may be used.

An ecological corridor along the Sacramento River is not included in the NHP Conservation Strategy because the portion of the Sacramento River in the Plan Area that supports valley foothill riparian is mostly federally owned along maintained levees and thus not within the jurisdiction of the permit applicants and the Implementing Entity.
The Blue Ridge, Foothill, and Dunnigan Hills Corridors will be established entirely in the Hill and Ridge Landscape Unit as well as the portion of the Putah Creek Corridor in Planning Unit 8 (Figure 5-3). Existing protected lands within each of the corridors or protected contiguous lands outside of the Plan Area serve to contribute towards establishment of these corridors. Where physically feasible and necessary to meet the needs of targeted species, the Blue Ridge, Foothill, and Dunnigan Hills Corridors will be at least 1.2 miles wide. Lands comprising each of the corridors may include agricultural lands, existing roads and utilities, and new roads and utilities that address movement of wildlife through design. It is expected that the corridors can be established through meeting the natural community conservation targets presented in Table 5-5b, but, depending on the availability of conservation lands, additional land acquisition may be required to achieve ecological corridor objectives.

The Cache Creek Corridor is located in the Valley Landscape Unit and the Putah Creek Corridor includes Planning Unit 8 in the Hill and Ridge Landscape Unit and Planning Unit 9 in the Valley Landscape Unit extending to the City of Davis (Planning Unit 20; Figure 5-3). The width of these corridors is limited by the width of the constrained floodplains of these creeks and development around those floodplains. These corridors are intended to establish a corridor of riparian habitat (woody and herbaceous) that will provide a linkage for the east-west movement of covered and other native wildlife species across the Plan Area through the open agricultural-dominated habitats of the Valley Landscape Unit. These corridors may include gaps of non-riparian land cover separating patches of riparian vegetation of no more than 300 feet to accommodate movement of native riparian obligate wildlife species unless site conditions necessary to support riparian vegetation (e.g., hydrologic conditions) are not present. To meet this criteria, the Plan provides for restoration of riparian habitat along Cache and Putah Creeks to improve connectivity among existing patches of riparian habitat (see CM4, Restore Natural Communities and Habitat).

In addition to the criteria for the establishment of ecological corridors described above, priority will be given to the acquisition of lands with no or minimal barriers to movement of covered and other native wildlife species and with high permeability for movement of wildlife through

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39 Recommended corridor width in *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (Spencer et al. 2010) for meeting the movement needs of large wildlife species such as mountain lion and mule deer, which will also meet the needs of smaller wildlife species (e.g., reptiles, rodents).

40 The distance between patches is an important factor affecting corridor effectiveness. If patches are spaced too widely, the likelihood of moving animals to reach these patches is reduced, and dispersal along the corridor is curtailed. Using allometric relationships between body size, movements and homerange (Bowman et al. 2002), and median and maximum dispersal distance for small mammals (Sutherland et al. 2000), a maximum inter-patch distance within ecological corridors was determined to be 100 meters (328 feet). This inter-patch distance includes the predicted median dispersal distance of small mammals weighing 45 grams (1.6 ounces) or more. This threshold value corresponds to dispersal distances reported for small mammals (Bowman et al. 2002).

41 Roads and highways represent one of the most important anthropogenic impacts on natural areas and contribute to habitat fragmentation because they are linear features that can inhibit animal movement along a corridor (Forman and Alexander 1998; Trombulak and Frissell 2000; Forman et al. 2003). The road surface is a barrier for many species and central dividers and cement-lined road ditches create even stronger barriers for more species. Road traffic and vehicle strikes also create barriers, with higher traffic loads and greater speeds resulting in greater barriers to more species.
patches of non-habitat. Given the large size of the planned ecological corridors, it is likely that some lands that do not meet NHP conservation land criteria but are suitable as movement habitat will need to be acquired to establish the corridors. On such lands, the Implementing Entity will undertake enhancements to minimize the effects of barriers and habitat gaps that adversely affect the movement of covered and other native wildlife species (see CM3, Improve the Permeability of Linear Structures for Native Wildlife).

5.4.1.2 CM2: Develop an Invasive Species Control Program

The Implementing Entity will develop a plan for the control of invasive animal and plant species that could substantially degrade the functions of protected natural communities as habitat for covered and other native species on NHP conservation lands. The comprehensive invasive species control plan will be implemented under CM5, Enhance and Manage Protected Natural Communities.

Nonnative invasive plant species currently of highest concern in the Plan Area include giant reed, ravenna grass, tamarisk, Himalayan blackberry, eucalyptus, perennial pepperweed, Italian ryegrass, barbed goatgrass, medusahead grass, yellow starthistle, and parrot feather. These species dominate or are a significant component of some mapped patches of grassland, riparian and wetlands, and woodlands and forest natural communities and have the potential to spread to other sites in the Plan Area. Animal species that are known to degrade the habitat functions for covered species and are of highest concern in the Plan Area include feral domesticated animals (e.g., house cats), nonnative fish and amphibians (e.g., bullfrog), feral pig, European starling, house sparrow, and brown-headed cowbird. These species either prey upon or compete for ecological resources that sustain covered and other native species.

The invasive species control program will identify protocols for evaluating known and identifying new occurrences of disruptive invasive species on NHP conservation lands. The program will identify protocols to assess and treat invasive species that are disruptive to ecosystems and habitat values for covered species. The Implementing Entity will coordinate development and implementation of the control program with governmental agency control programs and efforts of other conservation programs. Monitoring and control requirements for specific NHP conservation lands will be incorporated into conservation land management plans (see CM5, Enhance and Manage Protected Natural Communities).

Elements of the invasive species control plan will include the following.

- Protocols for periodically surveying for and assessing the abundance of nonnative predators and competitors on NHP conservation lands. Protocols for periodically

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42 If the ecological conditions of gaps between habitat patches are impermeable to species movement or do not sustain life history requirements of species, they effectively act as movement barriers or as population sink habitats (Debinski 2006, Fahrig 2003, Crooks 2002). The maximum inter-patch distance that an organism can traverse is inversely related to the habitat suitability of the gap; in locations with a high gap permeability and suitability, individual species may be able to traverse wider gaps than in locations where gap conditions are incompatible with the dispersing organism.
surveying for and assessing the occurrence and abundance of invasive nonnative plants on NHP conservation lands.

- A brown-headed cowbird monitoring and control program (see discussion below).
- Methods for assessing the degree of biological effect nonnative species have on covered and other native species within NHP conservation lands.
- Methods for assessing threats for establishment of nonnative animals and plants adjacent to lands onto NHP conservation lands.
- Methods for assessing threats for the spread of nonnative plants from NHP conservation lands onto adjacent lands.
- A decision-making process for determining the need for implementing management actions to control nonnative species.
- A description of potential nonnative species control methods.
- A process for developing and implementing monitoring necessary to assess the effectiveness of implemented control methods.

**Invasive Nonnative Plants.** Specific elements of the control program for invasive plant species will include the following.

- Gathering and maintaining information regarding locations of large scale infestation by nonnative vegetation types, including giant reed, tamarisk, Himalayan blackberry, and eucalyptus woodlands within the Plan Area.
- Methods for assessing degree of biological effect of nonnative plant species on covered and other native species within NHP conservation lands to set priorities for and guide control efforts. The evaluation process should consider potential benefits provided by nonnative communities to covered species, such as the use of Himalayan blackberry stands by the tricolored blackbird and yellow-breasted chat for breeding and the use of eucalyptus groves by Swainson’s hawk and white-tailed kite for nesting.
- Methods for assessing threats for the spread of nonnative plants between NHP conservation lands and adjacent lands.

**Nonnative Aquatic Vertebrates.** Several nonnative vertebrates, including various fish species, bullfrog, and turtles may compete with or prey upon covered species in aquatic habitats, including the California tiger salamander, western spadefoot toad, foothill yellow-legged frog, and western pond turtle. Measures to control nonnative fish and aquatic amphibians and reptiles on NHP conservation lands include measures to modify habitat conditions to encourage native aquatic species and discourage nonnatives, and to directly control invasive species populations (e.g., capture and removal, temporary dewatering of impoundments).

**Brown-Headed Cowbird.** Brown-headed cowbird poses a threat to the conservation of several covered bird species. The brown-headed cowbird is a native North American species that has
expanded its range into central California in response to the conversion of the landscape to
livestock grazing and agriculture over the last 150 years. The cowbird is an obligate “brood
parasite” that suppresses the productivity of host species by laying its eggs in the host species’
 nests and the cowbird young competing with or displacing the host bird’s young. The cowbird is
a primary direct cause for the near elimination of the least Bell’s vireo from the Central Valley
and is a frequent brood parasite of yellow-breasted chat (see Appendix A, Covered Species
Accounts).

The cowbird is nearly ubiquitous in Yolo County, while the yellow-breasted chat and least Bell’s
vireo are highly localized and not known to be regularly established as breeding species in the
Plan Area. Therefore, it is not necessary or practical to conduct large-scale control or population
reduction of the cowbird. Rather, control efforts will apply only to the immediate vicinity of
known least Bell’s vireo and yellow-breasted chat nesting localities or as adaptive management
experiments at removing cowbirds from areas to encourage establishment of least Bell’s vireo
and yellow-breasted chat nesting. Measures to control brown-headed cowbird include the
following.

- Cowbird surveys, cowbird habitat suitability assessments, and covered species
  reproductive monitoring on NHP conservation lands that are occupied or become
  occupied by the yellow-breasted chat and least Bell’s vireo to assess risks of parasitism to
  covered host species.
- Localized brown-headed cowbird control on NHP conservation lands occupied by the
  yellow-breasted chat and least Bell’s vireo where cowbirds may pose a threat to
  reproduction using methods approved by USFWS and DFW.
- Modification of habitat conditions that may be encouraging cowbird use on NHP
  conservation lands occupied by yellow-breasted chat and least Bell’s vireo.

5.4.1.3 CM3: Improve the Permeability of Linear Structures for Native Wildlife

The Implementing Entity will assess the permeability for movement of small mammals,
amphibians and reptiles across linear anthropogenic structures (e.g., roads, railroads, and
utilities) in NHP established and proposed ecological corridors (Figure 5-3). To conduct the
assessment, the Implementing Entity will review DFW, Caltrans, and other relevant wildlife
roadkill records for roads within NHP ecological corridors and will coordinate with DFW to
identify locations within the corridors where movement and migration of covered and other
native wildlife may be substantially impeded by roads and other anthropogenic barriers. Based
on results of the assessment, the Implementing Entity will identify high priority areas for
implementing actions to improve wildlife passage across structures. The Implementing Entity
will coordinate with entities with jurisdiction over the high priority structures to identify and
implement appropriate and cost effective structural solutions for improving passage and reducing
the risk for roadkill and other associated sources of native wildlife mortality.
Permeability of roadways can be enhanced by wildlife overpasses, underpasses, and culverts, especially if substrate conditions are conducive to animal movement (e.g., natural soils, vegetation, and rocks or coarse woody debris). Inexpensive crossing tubes, pipes, and small culverts with drift fences and other associated structures may be sufficient for successful movement of smaller animals as well as for reptiles and amphibians that tend to move over short distances. Mata et al. (2005) showed that structural characteristics of crossing facilities most influenced the species that used them. Circular and adapted culverts were used selectively by small mustelids (weasel family), amphibians, reptiles and small mammals (Mata et al. 2005).

The Implementing Entity will evaluate NHP conservation lands within ecological corridors to identify and prioritize inter-habitat patch gaps that are unsuitable for the movement of covered and other sensitive native wildlife species or that create conditions for elevated risk of mortality. Wildlife movement through and mortality risk associated with inter-habitat patch gaps can be improved through habitat enhancements. The Implementing Entity will enhance habitat in designated high priority inter-habitat patches through implementation of CM5, *Enhance and Manage Protected Natural Communities*. Examples of actions to enhance gap permeability include growing of vegetation and ceasing or reducing mowing. It is also important to recognize that the distance between habitat patches that an organism can traverse is inversely related to the habitat suitability of the gap; in locations with a high gap permeability and suitability, individuals may be able to traverse wider gaps than in locations where gap conditions are incompatible with the dispersing organism’s capabilities.

### 5.4.2 Natural Community-Level Conservation Measures

#### 5.4.2.1 CM4: Restore Natural Communities and Habitat

The Implementing Entity will restore 100 acres of valley oak woodland, 476 acres of valley foothill riparian, 210 acres of fresh emergent wetland, and 370 acres of giant garter snake habitat in the quantities and with the distribution indicated in Table 5-6. Restoration will be conducted on NHP conservation lands, will be designed to support habitat for covered species, and be dominated by the native vegetation types listed in Table 2-1 associated with each restored community. Effectiveness monitoring will be conducted at each restoration site as described in Section 6.3, *Monitoring Program*, to collect the information necessary to evaluate the effectiveness of restoration methods and species use of restored habitats. Based on analyses of monitoring results, the Implementing Entity may adjust restoration methods through the adaptive management process (Section 6.2, *Adaptive Management Plan*).

The Implementing Entity will select restoration sites based on the following criteria.

- Degree to which restoration at the site will improve connectivity among existing patches of the same and other natural community types (this criterion applies particularly to

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43 All or a portion of mitigation restoration may be achieved through acquisition of mitigation credits from mitigation banks rather than the Implementing Entity directly restoring habitat under this CM.
riparian habitat restoration and to achieving objectives for ecological connectivity of
riparian corridors on Putah and Cache creeks).

- Proximity to habitat areas occupied by covered species associated with each of the
  restored natural community types;
- Degree to which restoration adjacent to existing patches of the natural community will
  increase the overall habitat functions of existing patches (e.g., increase interior and
  reduce edge; improve habitat mosaic of serial stages; habitat patch size relative to
  covered species habitat patch size requirements); and
- Sufficiency of site hydrology to maintain the restored natural community and its habitat
  functions for covered species over time.

5.4.2.1.1 Valley Oak Woodland

The Implementing Entity will restore 100 acres of valley oak woodland distributed among the
Planning Units as indicated in Table 5-6. Restored valley oak woodland will be designed to
develop as habitat for woodland-associated covered species, meet the vegetative characteristic of
either Valley Oak Alliance or Valley Oak Alliance – Riparian (Table 2-1), and achieve a CWHR
habitat stage designation of 5M-D at maturity (e.g., 100 years after restoration). Plants
established in restored valley oak woodland will include native midstory shrubs, including
elderberry, typically associated with valley oak woodland habitats in the Sacramento Valley.
Valley oak woodland will be restored in patch sizes of at least 50 acres. The 50-acre patch size
may be achieved in combination with patches of contiguous existing valley oak woodland or
valley foothill riparian (all vegetation types).

Activities necessary to restore valley oak woodland may involve, depending on site-specific
conditions, the following actions/

- Site clearing of debris and existing vegetation.
- Site grading to improve micro-habitat conditions, hydrology, and planting/seeding
  conditions.
- Planting and seeding of native plants.
- Irrigation of sufficient duration to establish valley oak trees and other restored vegetation.
- Control of weeds and herbivory of sufficient duration to establish restored vegetation.

5.4.2.1.2 Fresh Emergent Wetland and Giant Garter Snake Habitat

The Implementing Entity will restore up to 210 acres of fresh emergent wetland and 340 acres of
giant garter snake habitat distributed in the quantities indicated for the Planning Units in

44 Under WHR: 5 = medium/large trees, canopy diameter greater than 45 feet, dbh greater than 24 inches; M = moderate cover,
  canopy closure 40-59 percent; D = dense cover, canopy closure 60-100 percent (Mayer and Laudenslayer 1988).
Table 5-6. Restored fresh emergent wetland will be designed to achieve a WHR habitat stage designation of 2D\textsuperscript{45} at maturity (sensu: Mayer and Laudenslayer 1988). Of the 210 acres of fresh emergent wetland to be restored, 7 acres will be restored in the Planning Unit 5 and 203 acres will be restored in the Planning Units 11–13 (Table 5-6).

Restored fresh emergent wetlands in the Planning Unit 5 will be a minimum of 1 acre to achieve habitat restoration objectives for target covered species.\textsuperscript{46} Restored patches of fresh emergent wetland in the Planning Unit 5 will be larger if needed to meet the minimum habitat patch size and connectivity requirements of the target covered species. Fresh emergent wetland restored in the Planning Unit 5 will be on sites that are contiguous with, hydrologically supported by, and connected to surface stream and tributary systems.

The 203 acres of fresh emergent wetland to be restored in Planning Units 11–13 will be specifically designed to support giant garter snake. These restored fresh emergent wetlands will be flooded from early spring through mid-fall, will be a minimum of 10 acres, and will be restored within a matrix of open water and upland habitat (existing or restored) suitable for giant garter snake. Restored fresh emergent wetland in Planning Units 11–13 will be situated in or adjacent to and hydrologically connected to rice land or existing wetlands that are occupied by giant garter snake. These restored fresh emergent wetlands and will be supported by surface streams or by surface and subsurface hydrology associated with agricultural and flood control practices that maintains ponding and soil saturation at a frequency and duration sufficient to support hydrophytic vegetation typical of permanent emergent wetlands that support giant garter snake. Restored fresh emergent wetlands will be designed to allow for rapid drawdown of water if needed to control mosquitoes or nonnative invasive species.

The 340 acres of restored giant garter snake habitat will be composed of a mosaic of open water, fresh emergent wetland, and upland. This restored giant garter snake habitat will be distributed among Planning Units 11, 12, and 13 as described in Table 5-6. The acreage and geometry of giant garter snake habitat restoration sites in rice fields will be based on the size of the rice fields, but will be at least 20 acres of a mosaic of restored open water, fresh emergent wetland, and upland. All giant garter snake habitat sites must have a secure source of water for maintaining the intended restored habitat functions (i.e., natural hydrology, a dedicated source of irrigation water and delivery systems, or a combination of the two) that maintains ponding and soil saturation at a frequency and duration sufficient to support hydrophytic vegetation typical of permanent emergent wetlands that support giant garter snake. Restored giant garter snake habitat will be designed to allow for rapid drawdown of water if needed to control mosquitoes or nonnative invasive species.

\textsuperscript{45} Under WHR: 2 = emergent vegetation greater than 12 inches in height; and D = dense cover, canopy closure 60–100 percent (Mayer and Laudenslayer 1988).

\textsuperscript{46} The total habitat patch size requirements for a particular species may be met in combination with other suitable existing habitat area.
The primary natural habitat of giant garter snake is comprised of permanent wetland, which typically supports substantially higher densities of giant garter snake than rice land (Wylie et al. 2010). Restored giant garter snake habitat will be located at sites that are hydrologically connected to occupied giant garter snake habitat and include habitat corridors that support movement among habitat existing and restored habitat areas. It is anticipated that giant garter snake habitat will be restored primarily on rice lands or managed wetlands that could be occupied by giant garter snake. To minimize the potential for injury or mortality of giant garter snake as a result of operating restoration-related equipment, habitat restoration activities will only be conducted during the giant garter snake active period.

Giant garter snake habitat restoration projects (the 340 acres restored as a mosaic of open water, wetlands, and uplands and the 203 acres of restored fresh emergent wetlands associated with existing or restored open water and uplands) will be designed to support a mix of native emergent vegetation and open water and upland edge configuration that provide maximum function, within site constraints. These functions include:

- Adequate water during the snake's active season (early spring through mid-fall) to provide food and cover;
- Emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season;
- Basking habitat of grassy banks and openings in waterside vegetation; and
- Higher elevation uplands for cover and refuge from flood waters during the snake’s dormant season in the winter (USFWS 2006d).

Giant garter snake habitat restorations will be managed to provide water over the course of the giant garter snake’s active season at suitable elevations and depths. Water levels will be managed to ensure that hibernacula burrows will not be flooded during winter. However, drawdown of water levels during winter will be managed adaptively to ensure residual habitat for prey species. In addition, bullfrog abundance will be monitored in restored wetlands and will be controlled if necessary to substantively improve juvenile giant garter snake survival rates by reducing the predation loss. Habitat restoration designs will incorporate upland habitat areas that support movement and aestivation habitat. The Implementing Entity will manage uplands near restored emergent wetlands to provide small mammal burrows and soil crevices located above prevailing flood elevations throughout its winter dormancy period (USFWS 2006d). Adequate burrows are typically located in sunny exposures along south and west facing slopes.

Activities necessary to restore fresh emergent wetland and giant garter snake habitat may involve, depending on site-specific conditions, the following actions.

- Site clearing of debris and existing vegetation.

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47 NHP land cover types that support giant garter snake aquatic breeding and movement habitat are described in Appendix A, *Covered Species Accounts*. 
• Site grading to improve micro-habitat conditions, hydrology, and planting/seeding conditions.
• Erosion control measures.
• Collection of native emergent plant species rhizomes and other propagules for establishment in restoration sites.
• Planting and seeding of native emergent wetland and aquatic plants.
• Plant protection and ground cover manipulation.
• Installation or modification of water irrigation and drainage infrastructure, including wells, pumps, water control structures and irrigation ditches.

5.4.2.1.3 Valley Foothill Riparian

The Implementing Entity will restore up to 476 acres\(^{48}\) of valley foothill riparian. Of the total valley foothill riparian habitat acres restored, 404-428 acres will be designed to achieve a WHR habitat stage designation of 6D\(^{49}\) (i.e., riparian forest) and 48–72 acres will be designed to develop as Great Valley willow scrub (mixed scrub series) at maturity (Table 5-6). At least 75 acres of valley foothill riparian will be restored on Cache Creek and at least 75 acres on Putah Creek. In addition to supporting habitat for covered and other native species, priority will be given to restoring riparian habitat in locations that fill gaps between patches of existing valley foothill riparian along streams and channels. Valley foothill riparian restoration projects will be designed to include sufficient plantings of elderberry shrubs to replace elderberry shrubs that are removed by covered activities (see Table 5-12).

Valley foothill riparian will be restored in patches of at least 10 acres, except where smaller patches are required to fill gaps to improve connectivity among existing patches of riparian habitat. At least one patch of at least 100 acres of valley foothill riparian designed to support western yellow-billed cuckoo habitat will be restored in the Valley Landscape Unit. The 100-acre patch of restored western yellow-billed cuckoo habitat area may be achieved by designing the restored habitat to expand or connect one or more existing patches of foothill valley riparian that are smaller than 25 acres (roughly the minimum patch size for cuckoo habitat), but that otherwise support components of suitable western yellow-billed cuckoo habitat.\(^{50}\)

Activities necessary to restore riparian habitats may involve, depending on site-specific conditions, the following actions.

• Site clearing of debris and existing vegetation

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\(^{48}\) This acreage represents the maximum acreage that will be restored with full implementation of the NHP covered activities (i.e., all restoration for mitigation is implemented). If all covered activities are not implemented, a lesser acreage of riparian habitat may be restored.

\(^{49}\) Under WHR: 6 = multi-layered tree (top layer canopy diameter greater than 45 feet with dbh greater than 24 inches over a distinct layer of smaller trees); D = dense cover, canopy closure 60-100 percent (Mayer and Laudenslayer 1988).

\(^{50}\) For example, 70 acres of cottonwood-willow riparian forest restoration could be designed to connect two separate 15-acre existing patches of mature cottonwood-willow riparian forest for a total of 100 acres of western yellow-billed cuckoo habitat.
• Site grading to improve micro-habitat conditions, hydrology, and planting/seeding conditions

• Planting and seeding of native plants

• Irrigation of sufficient duration to establish riparian vegetation

• Control of weeds and herbivory of sufficient duration to establish riparian vegetation

5.4.2.2 CM5: Enhance and Manage Protected Natural Communities

The Implementing Entity will prepare and implement management plans for protected natural communities and covered species habitats supported by those communities in the NHP conservation lands. Management plans may be prepared for specific protected parcels or multiple protected parcels within a specified geographic area of the NHP conservation lands system. Management plans will provide the information necessary to guide habitat enhancement and management actions to achieve the biological objectives established for the conserved lands addressed by each plan. Within two years of acquisition of conserved parcels, the Implementing Entity will complete baseline ecological surveys to collect the information necessary to assess the level of ecological condition and function of conserved species habitats and supporting ecosystem processes, and the functional connectivity of conserved lands within and among habitats.\(^{51}\) See Section 6.3, Monitoring Program for more detail on baseline surveys. Within one year of completing the assessment of ecological condition and function, the Implementing Entity will prepare a management plan that identifies habitat enhancement actions to be implemented to enhance habitat functions for the target covered species and any subsequent ongoing management actions that are necessary to maintain habitat functions over time. The collected information will also establish the base ecological conditions from which the effectiveness of enhancement and management measures can be evaluated through subsequent effectiveness monitoring (see Section 6.3, Monitoring Program) and the adaptive management program (see Section 6.2, Adaptive Management Plan).

The content of management plans will include, but not be limited to, a description of the following.

• The biological goals and objectives to be achieved with the protection and management of the parcels.

• Base ecological conditions (e.g., habitat maps, assessment of covered species habitat functions, occurrence of covered and other native wildlife and plant species, vegetation structure and composition, occurrence and extent of nonnative species, assessment of nonnative species abundance and effect on habitat functions, habitat and landscape connectivity).

\(^{51}\) Note that pre-acquisition biological surveys are required for all properties that are brought into the NHP conservation lands system, but such surveys serve a different purpose and are not necessarily of the same type or level of detail as baseline surveys.
Vegetation management actions that benefit covered communities, habitats, and species and reduce fuel loads as appropriate and are necessary for implementing species-specific conservation measures.

Current and historical livestock grazing management practices.

The incorporation of a fire management plan developed in coordination with the appropriate agencies and to the extent practicable, consistent with achieving the biological objectives of the NHP.

Infrastructure, hazards, and easements.

Existing land uses and management practices and their relationship to covered species habitat functions.

Allowable recreational access and uses.

Applicable permit terms and conditions.

Terms and conditions of conservation easements when applicable.

Management actions and schedules, including mosquito abatement monitoring and treatment methods and restrictions.

Monitoring requirements and schedules.

Established data acquisition and analysis protocols.

Established data and report preservation, indexing, and repository protocols.

The adaptive management approach.

Any other information relevant to management of the protected parcels.

Based on the assessment of existing site conditions (e.g., soils, hydrology, vegetation, occurrence of covered species) and site constraints (e.g., size, infrastructure, adjacent land uses), and depending on biological objectives of the conserved lands, management plans will specify measures for enhancing and maintaining habitat as appropriate, including applicable invasive control measures identified in the NHP invasive species control program (prepared under CM2, Develop an Invasive Species Control Program).

Management plans will be periodically updated to incorporate changes in maintenance, management, and monitoring requirements based on new knowledge gained through the adaptive management program over the term of the NHP.

The following subsections provide examples of possible enhancement and management actions to improve habitat connectivity within NHP conservation lands and for each of the protected natural communities.
5.4.2.2.1 Habitat Connectivity

The Implementing Entity will identify and delineate areas among lands addressed under each management plan where connectivity among existing habitats is low, and where habitat enhancement and management actions would bolster the viability of existing habitat patches supporting a metapopulation of covered species. The Implementing Entity will include provisions on managing gaps and barriers between habitat patches in management plans and will design habitat enhancement methods that support connectivity at the landscape scale (see also CM3, Improve the Permeability of Linear Structures for Native Wildlife).

Examples of actions to enhance gap permeability include growing of vegetation (e.g., selecting restoration and enhancement sites to increase connectivity) and ceasing or reducing mowing or other vegetation management practices to increase habitat permeability for a variety of terrestrial species. Where possible, surface roads on conservation lands will be minimally maintained and will be allowed to develop vegetated shoulders and center strips to reduce their fragmenting effect on small terrestrial species (e.g., rodents, amphibians, reptiles). Other measures, such as removal of fences and barriers, ceasing bank vegetation management, and allowing revegetation of denuded or altered areas also support connectivity between habitat patches.

5.4.2.2.2 Woodlands and Forest

The woodlands and forest natural community is primarily located in the Hill and Ridge Landscape Unit. Protected oak woodland and other woodlands and forest habitats will be managed to maintain and enhance functions for foothill yellow-legged frog, Swainson’s hawk, white-tailed kite, and loggerhead shrike, as well as for native species diversity and ecosystem function. Depending on site-specific conditions, appropriate management actions may include the following.

- Evaluation of age class distributions and vigor of oak trees to assess oak regeneration condition and management needs.
- Retention of snags and downed wood.
- Prohibiting tree harvest for firewood and other uses unless tree harvest is identified in the management plan as a method for achieving habitat enhancement objectives. Managing grazing to maintain desirable herbaceous cover conditions and to enhance tree survival and recruitment.
- Protecting seedlings from herbivory.

5.4.2.2.3 Shrublands and Scrub

Shrublands and scrub habitats are largely confined to the Hill and Ridge Landscape Unit where they occur on steeper slopes in association with woodlands and forest and grasslands natural communities. Protected shrublands and scrub habitats will be managed to maintain and enhance functions for native species diversity, and general ecosystem function (e.g., maintaining habitat

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Depending on site-specific conditions, appropriate management actions may include the following:

- Evaluating fire risk to ecosystem function and adjacent lands and implementing measures to protect onsite and adjacent values from intense or large-scale effects of wildfire through implementation of appropriate fuel reduction and fire control measures.
- Evaluating vegetation diversity and vigor and evaluating the feasibility and desirability of incorporating prescribed fire to enhance ecosystem and habitat function, or to protect resources from large-scale wildfire.

### Grasslands

Protected grassland habitats will be managed to maintain and enhance functions for valley elderberry longhorn beetle, California tiger salamander, western spadefoot toad, western pond turtle, white-tailed kite, northern harrier, Swainson’s hawk, western burrowing owl, loggerhead shrike, grasshopper sparrow, and tricolored blackbird. Grassland will also be managed to benefit native species diversity and general ecosystem function. Protected serpentine grasslands will be managed to enhance or maintain their function as habitat for serpentine-associated native plant species. A key goal for management of annual grassland will be to increase the availability of fossorial rodents, especially ground squirrels, to provide prey for covered raptors and burrows for amphibians (including California tiger salamander) and burrowing owls. Depending on site-specific conditions, appropriate management actions may include the following.

- Prohibiting rodent control activities on conservation lands, except where required for public safety or to protect key resource values or important infrastructure.
- Creating debris piles to provide habitat for small mammals and birds.
- Managing grazing to improve the abundance of fossorial mammals.

Other habitat enhancement and management actions to improve the functions of protected grassland land cover types as habitat for covered species, depending on site-specific conditions, could include the following actions.

- Managing grazing to achieve desired habitat conditions for targeted covered species.
- Use of fire, managed grazing, or other vegetation management techniques to influence vegetation structure or composition, or increase the absolute cover and diversity of native plant species and to control undesirable nonnative plant species.
- Installation of fencing, water sources, or other livestock management improvements to improve control of livestock in key habitat areas and effects of livestock grazing across the landscape.
- Installing artificial nesting burrows for western burrowing owl to facilitate use of unoccupied areas.
• Localized application of herbicides to remove heavy infestations of nonnative plants.
• Reseeding of native plant species.

5.4.2.2.5 Riparian and Wetland Habitats

Most of the NHP covered species are associated with riparian or wetland habitats. Protected riparian and wetlands habitats will be managed to maintain and enhance ecosystem functions of these communities for these covered species as well as for native species diversity and general ecosystem functions (e.g., wildlife habitat corridor functions).

**Alkali Sink and Vernal Pool Complex.** The Implementing Entity will manage and enhance NHP protected alkali sink and vernal pool complex habitats that have been degraded through anthropogenic activities (e.g., disking, altered hydrology) to improve their habitat function for covered and other native species (Figures 5-5 and 5-6. Enhancement actions could include the following.

• Modifying or removing topographic or constructed structures and supplemental sources of water that have altered the historical inundation period or water quality of protected alkali sink habitat;
• Controlling invasive plant species that infest vernal pool and alkali sink habitats and compete with native species or alter habitat conditions. Grazing will not be used as a vegetation or invasive plant species management tool in vernal pools supporting either Solano grass or Colusa grass as the impacts of grazing have been shown to be detrimental to those species in the Plan Area.
• Improving habitat conditions on upland portions of NHP conservation lands encompassing protected vernal pool and alkali sink habitats to increase the abundance of native pollinator species.

**Valley Foothill Riparian.** Protected riparian habitats will be managed to maintain and enhance habitat functions for valley elderberry longhorn beetle, foothill yellow-legged frog, western pond turtle, Swainson’s hawk, white-tailed kite, western yellow-billed cuckoo, least Bell’s vireo, and yellow-breasted chat. Enhancement and management of NHP protected riparian habitats will be coordinated with existing riparian habitat management and restoration programs and plans, including:

• Lower Putah Creek Watershed Management Action Plan (EDAW 2005);
• Willow Slough Watershed Integrated Resources Management Plan (Jones & Stokes Associates, Inc. 1996);
• Revised Final Cache Creek Resources Management Plan for Lower Cache Creek (Yolo County Planning, Resources, and Public Works Department 2002);
• Yolo County Oak Woodland Conservation and Enhancement Plan (Yolo County Planning, Resources, and Public Works Department 2007); and

Depending on site-specific conditions, appropriate management actions for protected valley foothill riparian habitats may include the following.

• Managing livestock grazing to maintain favorable habitat conditions for covered species.
• Controlling nonnative predators and invasive plant species.
• Modifying vegetation management measures along canals and sloughs to encourage development of woody and herbaceous riparian vegetation that is compatible with water management programs.
• Planting native species to improve habitat structure and species composition.

Fresh Emergent Wetland. The NHP will protect and restore fresh emergent wetland habitat on conservation lands as inclusions within other protected land cover types. Most of the restored fresh emergent wetlands will be established and managed as habitat for giant garter snake. Fresh emergent wetland will be managed to maintain and enhance wetland function and hydrogeomorphic processes through site-specific management practices.\(^\text{52}\) Depending on site-specific conditions, management practices would include the following.

• Controlling nonnative species and restoring native species.
• Increasing relative cover of native vegetation.
• Managing livestock grazing to maintain favorable habitat conditions for covered species.
• Managing water sources supporting wetlands. Erosion control.
• Maintaining or enhancing adjacent upland habitats to support upland transitions.
• Maintaining sufficient water levels and water quality throughout the year to support emergent vegetation, aquatic food webs, and diverse aquatic habitat structure.
• Protecting upland basking and overwinter/hibernation sites, including rodent burrows.

Ponds. Protected ponds will be managed to maintain and enhance habitat functions for California tiger salamander, western spadefoot toad, and western pond turtle. Depending on site-specific conditions, habitat enhancement actions could include the following.

• Planting emergent vegetation along pond margins to increase habitat functions for breeding California tiger salamander, western spadefoot toad, and western pond turtle.

\(^\text{52}\) The NHP does not include targets for protection of the fresh emergent wetland because this habitat type is considered to be adequately conserved within the Plan Area (approximately 65 percent of the acreage of existing fresh emergent wetland in the Plan Area is protected in Category 1 PEHL).
• Maintaining and improving pond water control structures and water supplies.
• Controlling nonnative predators in ponds (e.g., bullfrog).
• Increasing or decreasing ponding (duration and frequency) to improve wetland functions and to control nonnative invasive species.

5.4.2.2.6 Agricultural Lands

Protected NHP agricultural habitats will be comprised of rice lands supporting giant garter snake habitat and crop types that support very high, high, and moderate foraging habitat value for Swainson’s hawk.53 Protection of agricultural lands supporting these types of crops will also contribute towards achieving habitat protection targets for western pond turtle, white-tailed kite, northern harrier, black tern, western burrowing owl, loggerhead shrike, and tricolored blackbird. Protected agricultural lands will be managed to increase the habitat functions they support for these and other native wildlife species that use agricultural lands. Depending on site-specific conditions, appropriate management actions on permanently protected agricultural lands may include the following.

• Cultivation of crop types that provide very high, high, and moderate value Swainson’s hawk foraging habitat, inclusive of crop types of lesser foraging value that must be grown in rotation to maintain long-term viability for cultivation of the targeted crop types.
• Planting of cover strips and hedgerows to provide rodent habitat to increase prey abundance for covered species and other raptors.
• Planting native trees and shrubs to establish habitat for covered and other native wildlife species (e.g., Swainson’s hawk nesting habitat, raptor hunting perches).
• Creating secure nesting habitat for black tern on mounds or by retention of areas of dense cover in rice fields and adjacent water infrastructure.
• Reducing the use of herbicides and pesticides.
• Maintaining water in canals and ditches during the active period (early spring through mid-fall) for the giant garter snake, western pond turtle, and other native wildlife species.
• Modifying ditch configurations within rice growing areas to increase basking and nursing habitat for the giant garter snake.
• Agricultural conservation easement requirements related to allowable farming practices on NHP agricultural lands are described in Section 7.6, Allowable Activities in NHP Conservation Lands.

53 See Appendix F, Agricultural Habitat Valuation and Forecasting Model. Very high value foraging habitat is comprised of alfalfa; high value foraging habitat is comprised of native pasture, undifferentiated pasture mixed pasture, clover, and miscellaneous grasses (grown for seed); and moderate value foraging habitat is comprised of sugar beets, tomatoes, and grain and hay.
5.4.3 Species-Level Conservation Measures

5.4.3.1 CM6: Restore Covered Plant and Vernal Pool Shrimp Species Habitat and Establish Occurrences

The Implementing Entity will restore habitat functions necessary to support the establishment of sufficient numbers of alkali milk-vetch, Heckard’s pepper-grass, Baker’s navarretia, brittlescale, San Joaquin spearscale, palmate-bracted bird’s-beak, vernal pool fairy shrimp, and vernal pool tadpole shrimp to replace individuals of these species that are directly impacted by covered activities in newly identified occurrences, as determined by USFWS and DFW. Habitat will be enhanced or restored and new occurrences established or existing occurrences expanded on NHP conservation lands. NHP conservation lands acquired to achieve the natural community protection targets (Table 5-5a) would support suitable site conditions for enhancement or restoration of habitat for these species. As no natural habitat for these species remains in areas proposed for covered activities, occurrences subject to impacts will be associated with disturbed sites such as drainage channels and agricultural fields. In many cases a disturbance regime created by human activities will be supporting maintenance of habitat for the occurrence (e.g., channel maintenance removes nonnative competitors allowing establishment and short term presence of covered species occurrence). USFWS and DFW will determine at the time of proposed projects if impacts on such occurrences must be mitigated under this conservation measure or if the occurrence may be removed without affecting the species’ potential for survival and recovery.

Restored habitat for each species will be designed to provide the same or higher level habitat functions as the affected habitat. A single habitat restoration site may be used to establish individuals of one or more of impacted species and species occurrences. Activities necessary to restore habitat and establish covered plant and vernal pool shrimp species occurrences may involve, depending on site-specific conditions, the following actions.

- Site clearing of debris and existing vegetation.
- Site grading to improve micro-habitat conditions, hydrology, and planting/seeding conditions.
- Erosion control measures.
- Collection and storage of covered plant species seeds and fairy shrimp cysts from impacted occurrences or other nearby occurrences for seeding/inoculation of restoration sites.
- Plant protection and ground cover manipulation.
- Placement of fencing around established occurrences to manage grazing.
- Ongoing control of invasive plant species competitors.
To establish replacement plant species occurrences, sufficient seed will be collected from impacted plant occurrences to establish the number of plants required to replace, at a minimum, the number of affected plants. The seed will be stored at a USFWS and DFW approved seed bank until used to implement initial and any subsequent seeding/planting of restoration sites to establish the occurrences.

To establish replacement vernal pool tadpole shrimp and vernal pool fairy shrimp occurrences, surface soil containing shrimp cysts will be collected from the impacted occurrence site and stock piled. The stock piled soil will be used to inoculate the restored habitat to establish the replacement individuals.

Monitoring will be conducted at restoration sites to collect information necessary to determine that the requisite number of plant and shrimp individuals have become established and to assess the effectiveness and long-term viability of habitat restoration and plant and shrimp establishment methods (Section 6.3, Monitoring Program).

5.4.3.2 **CM7: Increase the Abundance of Covered Plant Species in NHP Protected Occurrences**

The Implementing Entity will implement actions to increase the mean annual number of alkali milk-vetch, Heckard’s pepper-grass, Baker’s navarretia, brittlescale, San Joaquin spearscale, palmate-bracted bird’s-beak, Colusa grass, and Solano grass in NHP protected occurrences relative to base conditions. The goal of this conservation measure is to achieve the greatest potential carrying capacity of habitat for each species within conservation lands recognizing that the carrying capacity will fluctuate with annual conditions of temperature, moisture, and other factors. NHP habitat management, enhancement, and restoration actions on conservation lands (under this conservation measure and CM5 and CM6) are designed to increase carrying capacity to a level that ongoing management can support. No additional increase in mean annual populations will likely be possible, or desirable, once appropriate ongoing management is occurring within enhanced and restored habitat.

To implement this conservation measure the Implementing Entity will conduct the following actions.

- Coordinate with USFWS and DFW to develop appropriate methods for determining mean annual base condition abundance of covered plant and shrimp species in each protected occurrence.
- Evaluate historical land management practices, site conditions, and species’ stressors to identify management actions that can be implemented to increase the number of individual plants.
- Conduct effectiveness monitoring to assess the response of plant and shrimp occurrences to management actions.
Adaptively manage habitat and occurrences under the NHP Adaptive Management Program to improve management methods as knowledge increases over time.

Depending on specific site conditions, the types of actions likely to benefit occurrences include control of competitor nonnative plant species, improvements in site hydrology, and control of undesirable levels of herbivory.

5.4.3.3 CM8: Establish Nest Trees for Raptors

The Implementing Entity will establish 500 native trees that support Swainson’s hawk nesting habitat at locations where Swainson’s hawk foraging habitat is present but nest trees are lacking and hypothesized to be limiting occupancy by Swainson’s hawk. As this conservation measure is implemented, the NHP monitoring and adaptive management programs will be implemented to determine if newly established trees are utilized and improvements made in locating new nest tree sites.

To implement this conservation measure the Implementing Entity will undertake the following actions.

• Evaluate existing information and conduct surveys if needed to identify specific locations where sufficient Swainson’s hawk foraging habitat is available to support nesting, nest trees are lacking, and soil and hydrologic conditions are suitable for the establishment of nest trees. Prepare and protect nest tree establishment sites (e.g., clearing of existing vegetation, placement of herbivory protection fencing or other structures, irrigation system).

• Plant seedlings/saplings of nest tree species on suitable NHP conservation lands and existing protected lands (Category 1 PEHL). Ongoing weed control and irrigation as needed until nest trees are established.

• Monitoring of tree condition, growth, and use by Swainson’s hawk and other native raptors.

• Adaptive management, through the NHP adaptive management program, to ensure improvements in tree placement as knowledge is gained through the monitoring program and other sources of information over time.

5.4.3.4 CM9: Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

Existing Category 1 and 2 PEHL in the Plan Area (Figure 5-2) support occurrences and habitat of covered species. These lands are owned and managed by federal, state, and local agencies and include private lands under various types of easements. These lands do not necessarily provide the level of protection of permanent conservation easements and management of species occurrences and habitat that is required for NHP conservation lands. Although these lands
receive some level of ecological protection and will not be developed, many of these lands are not specifically managed to maintain or enhance covered species occurrences and habitats (see Section 5.2.1.2, Existing Public and Easement Habitat Lands). Under this conservation measure, the Implementing Entity will coordinate with federal, state, and local government agencies and other organizations and entities responsible for PEHL in the Plan Area to implement actions that will maintain or enhance occurrences and habitat for the following covered species:

- Occurrences of all covered plant species.
- Occupied California tiger salamander and western spadefoot toad habitat.
- Occupied giant garter snake and western pond aquatic habitats.
- Active Swainson’s hawk, white-tailed kite, western yellow-billed cuckoo, and least Bell’s vireo nest sites.
- Occupied western burrowing owl nesting burrows.
- Bank swallow and tricolored blackbird nesting colonies.
- Townsend’s big-eared bat maternity/roosting colonies.

The following actions will be undertaken by the Implementing Entity.

- The Implementing Entity will coordinate and may enter into agreements (e.g., memoranda of agreement, memoranda of understanding, and cooperative management agreements) with federal and state agencies, land trusts, and other organizations and individuals that manage PEHL that support the covered species listed above to implement additional or adjust existing management actions, if needed, to maintain or benefit these resources.
- The Implementing Entity will coordinate with and enter into agreements with Permittees (e.g., City and County agencies) to manage PEHL under their jurisdiction to similarly benefit these resources.
- Preparatory to entering into agreements, the Implementing Entity will coordinate with entities having jurisdiction over PEHL to (a) gather relevant available information and, if appropriate, conduct surveys necessary to determine the presence and status of the covered species resources listed above on PEHL, and (b) gather information necessary to describe the range of land management practices that are permissible on these lands.
- Based on information collected under action 3, the Implementing Entity in coordination with the landowner/land manager will identify the need for adjustments in land management practices to maintain or improve the covered species resources listed above and, if needed, identify new or revised management actions that will be implemented.
- For lands that are protected under existing conservation easements and for which modifications to existing land use practices are proposed by the Implementing Entity, the Implementing Entity will coordinate with the easement holders and the landowners to
seek modifications to the conservation easements necessary to implement any changes in land use practices.

- In certain instances the Implementing Entity may provide funding necessary to implement prescribed management actions on PEHL.

### 5.4.4 Avoidance and Minimization Measures

Avoidance and minimization measures (AMMs) are designed to avoid or minimize the take of and reduce impacts on covered species and their habitat (including designated critical habitat) and impacts on natural communities. These measures include such actions as avoidance of species occurrences and habitat through project design, timing construction activities in the vicinity of occupied habitat to times of year when a covered species is not present, and avoiding habitat removal during breeding periods. These measures may also avoid or minimize the potential for take of covered and other native species by altering construction plans or activities (e.g., modifying construction footprints, covering open trenches, and using materials to reduce runoff from construction sites) or by modifying design elements of projects to reduce operational effects (e.g., noise, lighting, and urban runoff). The avoidance and minimization measures presented here are in addition to and complement the protection of species occurrences and habitat, restoration of habitat, enhancement of habitat, management of conservation lands, and other beneficial actions described in the conservation measures in Section 5.4.1, Landscape-level Conservation Measures, Section 5.4.2, Natural Community-level Conservation Measures, and 5.4.3, Species-Level Conservation Measures. Also note that the total allowable take of covered species and impacts on natural communities and covered species habitat from permanent direct effects of covered activities are limited to the amounts and distributions identified in Tables 4-3a–4-3c, 4-4, 4-5a–4-5c, and 4-6. The avoidance and minimization measures provide an additional level of protection of covered species and natural communities from the impacts of covered activities, including temporary direct and permanent indirect effects.

#### 5.4.4.1 Permanent Development Projects

This section describes the avoidance and minimization measures that will be implemented during the design and construction phases of covered residential, industrial, and commercial development and public and private infrastructure permanent development projects described in Sections 3.2, Permanent Development. These avoidance and minimization measures are presented in a roughly sequential order beginning with planning surveys to identify habitat conditions, followed by preconstruction surveys to identify presence or absence of covered species, the establishment of Activity Exclusion Zones to protect occupied sites during specified periods, and construction and design measures to minimize the effects of the covered activity on species and habitat.

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54 Implementation of actions under the West Sacramento Levees Improvement Program (WSLIP) will require the implementation of all applicable avoidance and minimization measures identified in the Final WSLIP EIS/EIR and the WSLIP Draft Fish and Wildlife Coordination Act Report.
5.4.4.1.1 Biological Surveys

Surveys and evaluation of existing information are required to identify the biological resources at permanent development project sites and surrounding areas to determine how certain avoidance and minimization measures will be implemented. Planning surveys are conducted early to aid in project design and allow for avoidance and minimization of impacts on species, habitats, and natural communities as part of the project design. Preconstruction surveys provide for the identification of resources immediately prior to construction activities such that avoidance and minimization measures can be implemented with full spatial knowledge of resources.

AMM1: Conduct Planning Surveys. Planning surveys include both reconnaissance-level and resource-specific surveys conducted for the purpose of identifying, documenting, and assessing habitat conditions and the presence or potential presence of covered species to support the design process for proposed projects. Planning survey requirements are presented in Table 5-17, Planning Survey Requirements. Planning surveys will be conducted prior to or during the design phase for all permanent development covered activities described in Chapter 3, Covered Activities that could result in impacts on the biological resources listed in Table 5-17. Results of planning surveys will be reported and submitted as described in Section 7.8, Compliance and Progress Reporting.

Project proponents are required to conduct planning surveys for the covered species specified in Table 5-17 within and adjacent to project sites. Remote-sensed (e.g., aerial photography) and on-ground mapping of land cover types for proposed project sites as presented in Table 5-17 are part of the required planning surveys. In addition to guiding the implementation of avoidance and minimization measures, this land cover mapping is used to determine land cover acreage for calculation of the NHP mitigation fees (see Chapter 8, Implementation Costs and Funding Sources).

Because the covered plant species may be present in very small patches of habitat, covered plant species surveys must be conducted by a qualified botanist at all project sites with the potential to support occurrences. To determine the need to conduct surveys for the covered wildlife species indicated in Table 5-17, project proponents will conduct a reconnaissance-level survey of project sites for suitable habitat of those species.

All covered species planning surveys will be conducted during the specified time period indicated in Table 5-17. All planning surveys will be conducted by qualified and permitted (as necessary) biologists using the methods indicated in Table 5-17 or alternative methods approved by the Implementing Entity, USFWS, and DFW.
Table 5-17. Planning Survey Requirements
AMM2: Conduct Preconstruction Surveys. Preconstruction surveys are species-specific surveys of project sites and surrounding areas used to determine the impact avoidance and minimization measures that must be implemented to address the species found (see AMM3 through AMM22). Preconstruction surveys are conducted after project design is complete and prior to project construction; the purpose of which is to provide timely information such that disturbance related effects of construction (e.g., the harassment of nesting birds) can be avoided or minimized. Preconstruction surveys will be conducted in and adjacent to permanent development covered activity project footprints if, based on results of planning surveys (conducted under AMM1, Conduct Planning Surveys), review of aerial imagery, and field reconnaissance surveys, the land cover types and other site conditions indicated for the species listed in Table 5-18, *Survey Area and Timing of Preconstruction Surveys for Permanent Development Projects*, are present or species occurrences were directly observed.

Preconstruction surveys are not required for covered species that are not listed in Table 5-18 because 1) either planning surveys have been conducted for those species and appropriate action taken during project planning/design or 2) the species are assumed to be present (i.e., habitat is assumed to be occupied) and are assumed will be impacted by project implementation (i.e., take is permitted). Results of preconstruction surveys will be reported and submitted as described in Section 7.8, *Compliance and Progress Reporting*.

Surveys will be conducted for the covered species indicated in Table 5-18, with the exception described below, for which habitat is located in the project site and outside of the project site within the distance of the project site boundary specified in Table 5-18. This distance determines the survey area as measured from the edge of project site boundaries for each potentially occurring covered species. Survey methods for lands outside the project site may differ from the methods used at the project site. Land outside of the project site that is not accessible by the project proponent will be surveyed using the most suitable methods (e.g., searching for occupied Swainson’s hawk nest sites from public road access). The survey area outside the project site may be reduced based on the professional opinion of a qualified biologist with concurrence from USFWS and DFW using such parameters as line-of-sight, topography, and land use as related to the potential for the proposed project to result in adverse effects on specific species (e.g., harassment from construction noise and lighting). No surveys are required for habitat that occurs beyond the distance specified in Table 5-18 for each of the covered wildlife species. All surveys will be conducted during the specified time period indicated in Table 5-18. All preconstruction surveys will be conducted by qualified and permitted (as necessary) biologists using the methods indicated in Table 5-18 or alternative methods approved by the Implementing Entity, USFWS, and DFW.
Table 5-18. Survey Area and Timing of Preconstruction Surveys for Permanent Development Projects
Preconstruction surveys will not be required for covered species that would otherwise require surveys if the project proponent assumes the species is present, set-backs from patches of the habitat (assumed to be occupied by the species) are established as described under AMM3, Avoid and Minimize Impacts on Covered Species, and all other NHP avoidance and minimization measures applicable to the species are implemented (e.g., assuming that all trees on and adjacent to a project site support nesting Swainson’s hawks during the nesting season and thus implementing all applicable Swainson’s hawk avoidance and minimization measures to the entire area of nesting habitat).

5.4.4.1.2 Project Design

Project design measures are used to adjust project impact footprints or to incorporate habitat elements into project design that further avoid or reduce effects on covered species.

AMM3: Avoid and Minimize Impacts on Covered Species. Permanent development projects will be designed to limit take of the covered species and impacts (i.e., removal) on their habitat as described in Table 5-19 in accordance with the indicated exceptions. Criteria for determining avoidance of take and direct impacts on habitat for these species are also described in Table 5-19.

AMM4: Avoid and Minimize Impacts on Sensitive Land Cover Types. To the extent consistent with the project purpose, projects will be designed to avoid and minimize direct and indirect impacts on serpentine, valley oak woodland, alkali sink, vernal pool complex, valley foothill riparian, and fresh emergent marsh land cover types as described in Table 5-20.

AMM5: Avoid Siting of Construction Staging Areas and Temporary Work Areas in Occupied Covered Species Habitat. Design permanent development projects to site construction staging and other temporary work areas in habitat areas that will ultimately be permanently removed by the permanent development activities. If construction staging and other temporary work areas must be located outside of project footprints, they will be located either in areas that do not support habitat for covered species or that are easily restored to prior ecological functions (e.g., annual grassland and agricultural land). Construction staging and other temporary work areas located outside of project footprints will be sited in areas that avoid impacts on:

- Serpentine, valley oak woodland, alkali sink, vernal pool complex, valley foothill riparian, and fresh emergent wetland land cover types,
- Habitat occupied by covered plant, invertebrate, amphibian, and reptile species,
- Occupied western burrowing owl burrows, and
- Covered bird species nest sites during the breeding season.

Establishment of temporary work areas outside of the project footprint will require surveys to be conducted to determine if any of the biological resources listed above are present.
Following completion of project construction, temporary work and staging areas will be restored to a condition of equal or greater habitat function than the affected habitat. Restoration of vegetation in temporary work and staging areas will use clean seed mixes approved by the Implementing Entity that are free of noxious plant species seeds.
Table 5-19. Take and Habitat Impact Limits for Covered Species Occurrences
Table 5-20. Design Criteria for Avoiding Permanent Direct Impacts of Permanent Development Projects on Sensitive Land Cover Types
AMM6: Establish Permanent Habitat Buffers along Stream and Riparian Corridors. For Planning Units 19–22 (Woodland, West Sacramento, Davis, and Winters), permanent development facility projects that are not transportation or utility crossings (i.e., residential, commercial, public, and industrial facility projects) will be designed to include a minimum 25-foot permanent habitat buffer zone (set-back easement) from the top of bank along both sides of all natural perennial and intermittent stream corridors as defined in the NHP GIS database. Any riparian habitat within this 25-foot buffer will be avoided and protected.

In all other Planning Units (Planning Units 1–18), permanent development facility projects that are not transportation or utility crossings (i.e., residential, commercial, public, and industrial facility projects), will be designed to include a minimum 100-foot permanent habitat buffer zone (set-back easement) from the top of bank along both sides of all natural perennial stream corridors as defined in the NHP GIS database and a minimum 25-foot permanent habitat buffer zone from the edge of existing or restored riparian forest and scrub if riparian forest/scrub is wider than 75 feet from the top of the stream bank. For water and flood conveyance channels that maintain surface water year-long during non-drought years and that support woody riparian vegetation, a minimum 25-foot permanent habitat buffer zone will be established from the edge of the existing or restored riparian forest and scrub. Permanent habitat buffers apply to stream and riparian habitat areas that remain following construction of permanent development projects (note the allowable level of impacts by Planning Unit in Tables 4-3b–4-3c). The habitat buffer will be measured from the top of the stream/channel bank or from the edge of woody riparian vegetation, whichever is wider and extend perpendicular to the bank/riparian vegetation for 100 feet. Where existing development is already within 100-feet of a stream, the habitat buffer will be established within the entire intervening space between the development and the stream.

In Planning Units 1–18, permanent development facility projects that are not transportation or utility crossings (i.e., residential, commercial, public, and industrial facility projects) will be designed to include a minimum 50-foot permanent habitat buffer zone (set-back easement) from the top of bank along both sides of all natural intermittent stream corridors as defined in the NHP GIS database and a minimum 25-foot permanent habitat buffer zone from the edge of existing or restored riparian forest and scrub if riparian forest/scrub is wider than 25 feet from the top of the stream bank. Permanent habitat buffers apply to stream and riparian habitat areas that remain following construction of permanent development projects (note the allowable level of impacts by Planning Units in Tables 4-3b–4-3c). The habitat buffer will be measured from the top of the stream/channel bank or from the edge of woody riparian vegetation, whichever is wider and extend perpendicular to the bank/riparian vegetation for 50 feet. Where existing development is already within 50-feet of an intermittent stream, the habitat buffer will be established within the entire intervening space between the development and the stream.

No project construction-related activities or placement of development-related structures will be allowed within the buffer zone. Buffer zones adjacent to residential permanent development projects will be designed to control access by humans and pets (see AMM7, Design Developments to Minimize Impacts at Urban-Habitat Interfaces).
AMM7: Design Developments to Minimize Indirect Impacts at Urban-Habitat Interfaces.

Where permanent development projects are implemented adjacent to natural communities and non-agricultural covered species habitats, urban-habitat interface elements will be incorporated into project design to minimize the indirect impacts of the development on adjacent habitat areas. Indirect impacts on adjacent habitat result from human activities include noise and visual disturbances that diminish the ability of covered and other native wildlife to use the habitat, increased numbers of pets (e.g., dogs, cats) that can result in harassment and mortality of covered and other native wildlife species, increased levels of direct habitat disturbances associated with increased human access to habitats (e.g., destruction of vegetation and injury or mortality of wildlife associated with use of off-road vehicles), and escape or planting of invasive nonnative plants. This AMM does not apply to permanent developments constructed adjacent to existing developed and agricultural lands because these lands are currently subject to high levels of existing human-related disturbances and often do not support covered species habitat.

- The following urban-habitat interface design elements and activities will be incorporated, as applicable, to each residential, commercial, public, and industrial facility and agricultural services facility development project.
- Place roads at the urban-habitat interface rather than abutting lots against the habitat area boundary to reduce the incidence of pets entering habitats.
- Design roads, bike paths, and trails such that they minimize the likelihood for human access into adjacent habitat areas and also promote community policing at the habitat periphery.
- Establish barriers that discourage entry of humans and pets into habitat areas.
- Design fences to prevent pets from escaping yards into adjacent habitat, control entry and dumping of trash into adjacent habitat, and shield adjacent habitat areas from visual disturbances that may interfere with normal wildlife behavioral patterns.
- Fence new public roads associated with developments to prevent unauthorized public access into habitat areas and to effectively steer wildlife to specially designed crossing structures.
- Design development drainage systems and implement appropriate best management practices (BMPs) to avoid discharges of urban runoff into habitat areas, including stream courses.
- Design development lighting to avoid projecting light into adjacent habitat areas or use low-glare lighting to minimize lighting impacts on habitat.

5.4.4.1.3 Construction

Construction measures are on-site activities implemented during the construction phase to avoid or minimize construction-related effects on covered species.
AMM8: Establish Activity Exclusion Zones for Nesting/Breeding Birds. Where preconstruction surveys indicate that nesting/breeding covered bird species listed in Table 5-21, Activity Exclusion Zones are present and using habitat in or adjacent to the project site as indicated in Table 5-21 (or where presence and use is assumed based on results of planning surveys), direct impacts of construction-related activities on the occupied sites will be avoided through the establishment of activity exclusion zones. The establishment of activity exclusion zones is not required if no construction-related disturbances will occur within the activity exclusion periods indicated in Table 5-21.

An exclusion zone will be established around each occupied habitat site according to the distances indicated for each species in Table 5-21, the boundaries of which will be clearly marked with standard orange plastic construction exclusion fencing or its equivalent. The size of activity exclusion zones can be reduced through consultation with a qualified biologist and with concurrence from USFWS and DFW based on line-of-sight, topography, land uses, type of disturbance, ambient noise and disturbance levels, and other appropriate factors. No project activities (e.g., vehicle use, storage of materials and equipment) will be permitted within activity exclusion zones during the time periods specified in Table 5-21 or until a qualified biologist determines that the risk of impact on individuals of the covered species is sufficiently avoided or minimized (e.g., young birds have fledged and are capable of independent survival and nests sites are no longer active).

AMM9: Establish Activity Exclusion Zones for Covered Plant Species and Conservancy Fairy Shrimp. Where preconstruction surveys indicate that a covered plant species, for which take is not permitted (see Table 5-19), or Conservancy fairy shrimp is present in or adjacent to the project site, direct and indirect impacts of the project on the species will be avoided through the establishment of activity exclusion zones as indicated in Table 5-21. Activity exclusion zones for covered plant species will be established around each occupied habitat site, the boundaries of which will be clearly marked with standard orange plastic construction exclusion fencing or its equivalent. The establishment of activity exclusion zones is not required if no construction-related disturbances will occur within the activity exclusion distances indicated in Table 5-21. The size of activity exclusion zones can be reduced through consultation with a qualified biologist and with concurrence from USFWS and DFW based on project site-specific conditions.

AMM10: Confine and Delineate Work Area. Where natural communities and covered species habitat are present, confine land clearing to the minimal area necessary to facilitate construction activities. Clearly identify the boundaries of work areas using temporary fencing or its equivalent. Movement of heavy equipment to and from the project site shall be restricted to established roadways to minimize habitat disturbance.
Table 5-21. Activity Exclusion Zones
AMM11: Cover Trenches and Holes during Construction. To prevent injury and mortality of covered and other native wildlife, all open trenches and holes associated with implementation of covered activities will be covered or designed with escape ramps during non-working hours. All open trenches and holes will be inspected immediately prior to filling and any trapped wildlife removed and released.

AMM12: Control Fugitive Dust. Water will be spread on work sites as needed to minimize spread of dust to habitat on adjacent lands.

AMM13: Conduct Worker Training. All permanent development facility project construction personnel will participate in a worker environmental training program that will educate workers regarding the NHP covered species and their habitats, the need to avoid impacts, state and federal protection, and the legal implications of violating environmental laws and regulations. Such training may be accomplished through the distribution of informational brochures, with descriptions of sensitive biological resources and regulatory protections, to construction personnel prior to initiation of construction work.

AMM14: Install Erosion Control Barriers. Where ground disturbing activities associated with implementation of permanent development projects will potentially result in runoff of sediment or other materials into emergent wetland, riparian, vernal pool, or other wetland or aquatic habitats (e.g., stream channels), erosion control barriers will be installed as needed to prevent sedimentation or contamination of these habitats. Erosion control materials shall be free of plant seeds and other propagules to prevent introductions of nonnative plant species. Erosion control materials may include coir (coconut husks), jute (fibers from the plant genus Chorchorus), straw or excelsior (fine wood fibers, usually aspen), or other combinations of these types of products. Note that jute may not be used in areas with giant garter snake because of the risk of entanglement (see AMM20, Minimize Take and Impacts on Habitat of Giant Garter Snake).

AMM15: Implement Wet Weather Erosion Control Plan. Each entity implementing a permanent development project that will leave soil disturbed during the rainy season (i.e., October 1 through April 15) will prepare and implement an approved Wet Weather Erosion Control Plan (WWECP). The WWECP must be available 30 days before construction commences. Information to be provided in WWECPs will include, but not be limited to the following information:

- The name, location, period of construction, and a brief description of the project;
- Contact information for the owner and contractor;
- A site map (construction plans may be used) showing the location of erodible land sediment control BMPs that will be implemented for the rainy season; and
- A certification statement that all required and selected BMPs will be effectively implemented.
AMM16: Implement Spill Prevention, Control, and Countermeasure Plan to Eliminate or Minimize Sources of Contaminants. Each entity implementing a permanent development project will prepare and implement a Spill Prevention, Control, and Countermeasure Plan (SPCC). The SPCC Plan will identify all sources of contaminants (e.g., leaking fuel tanks or chemical tanks) at construction sites and eliminate or minimize the potential for such substances to enter ground and surface waters.

AMM17: Night-Time Lighting of Project Construction Sites. With the exception of permanent development project sites surrounded by existing developed areas and sites that require lighting to maintain public safety, all lights for night-time lighting of project construction sites will be directed into the project construction area and will minimize the lighting of natural habitat areas adjacent to the project construction area.

5.4.4.2 Species-Specific Avoidance and Minimization Measures

Additional measures may be required if direct impacts on covered species cannot be fully avoided. Some of these measures are based on state or federal guidance (e.g., western burrowing owl and giant garter snake); others are standard practices that involve relocating animals out of impact areas in order to avoid mortality. The following species-specific AMMs are in addition to the species occurrence and species habitat AMMs identified elsewhere in this chapter.

AMM18: Exclusion of Wintering Western Burrowing Owls. Where preconstruction surveys for permanent development projects indicate occupied western burrowing owl burrows cannot be avoided, the project proponent will prepare and implement an exclusion plan in accordance with guidance for exclusion provided in Staff Report on Burrowing Owl Mitigation (DFG 2012; see Appendix G, Survey Protocols) such that burrowing owl fatalities are avoided.

AMM19: Prevent Raptor Electrocutions. To reduce the likelihood of electrocution of Swainson’s hawk, white-tailed kite, and other native raptors in the Plan Area, all new transmission lines associated permanent development projects and solar energy facilities will be required to comply with raptor-safe power pole design standards for the construction of new power lines as recommended by the Avian Power Line Interaction Committee (APLIC 2006). Wire spacing, installation of electrocution prevention devices, and other design standards will be implemented according to the current Avian Power Line Interaction Committee standards and manufacturer’s recommendations. Maintenance of raptor exclusion devices shall be conducted at regular intervals and missing or broken devices will be replaced prior to the arrival of migrating raptors in the Plan Area.

AMM20: Minimize Take and Impacts on Habitat of Giant Garter Snake. Where preconstruction surveys for permanent development projects indicate the presence of suitable habitat for giant garter snake, impacts will be avoided, if practicable. To avoid impacts on giant garter snake aquatic habitat there must be no in water/in-channel activity and a permanent 200-foot no-disturbance buffer from the outer edge of potentially occupied aquatic habitat must be
maintained. If impacts of construction activities cannot be avoided, the following measures will be implemented to minimize impacts.

- Restrict all construction activity involving the disturbance to giant garter snake habitat to the snake’s active season, May 1 through October 1. During this period the potential for direct mortality is reduced because snakes are expected to actively move and avoid danger;

- In areas where construction is to take place, allow giant garter snakes to leave the site on their own by dewatering all irrigation ditches, canals, or other aquatic habitat between April 15 and September 30 to remove habitat of giant garter snakes. Dewatered habitat must remain dry, with no water puddles remaining for at least 15 consecutive days prior to excavating or filling of the habitat. If a site cannot be completely dewatered, netting and salvage of prey items may be necessary to discourage use by snakes.

- Conduct preconstruction clearance surveys using USFWS approved methods within 24 hours prior to construction activities within identified giant garter snake aquatic and adjacent upland habitat. If construction activities stop for a period of two weeks or more, conduct another preconstruction clearance survey within 24 hours of resuming construction activity.

- Confine land clearing to the minimum area necessary to facilitate construction activities. Flag and designate as “Environmentally Sensitive Areas” giant garter snake habitat to be avoided within or adjacent to the project. The marked environmentally sensitive areas shall be avoided by all construction vehicles, other equipment, and personnel.

- Provide environmental awareness training for construction personnel as approved by the Implementing Entity. Training may be implanted through the distribution of approved brochures and other materials that describe resources protected under the NHP and methods for avoiding impacts. If a live giant garter snake is encountered during construction activities, immediately notify the project’s biological monitor and USFWS. The monitor shall stop construction in the vicinity of the snake and monitor the snake and allow it to leave on its own. The monitor shall remain in the area for the remainder of the work day to ensure the snake is not harmed or, if it leaves the site, does not return. The Implementing Entity will work with USFWS to relocate the snake away from the construction site within three days of reporting the snake’s presence at the construction site to USFWS.

- Employ best management practices to minimize disturbances to habitat, including the following:
  - Install temporary fencing to identify and protect adjacent marshes, wetlands, and ditches from encroachment from construction equipment and personnel;
  - Maintain water quality and limit construction runoff into wetland areas through the use of hay bales, filter fences, vegetative buffer strips, or other accepted practices.
No plastic, monofilament, jute, or similar erosion control matting that could entangle snakes will be permitted on the project site within 200 feet of snake aquatic or rice habitat.

**5.4.4.3 Transportation Infrastructure Construction, Operations, and Maintenance**

In addition to implementation of other AMMs applicable to transportation facility projects, the following avoidance and minimization measure will be implemented for all roadway construction and maintenance actions.

**AMM21: Implement Caltrans Construction Site Best Management Practices (BMPs) to Maintain Water Quality.** Entities implementing covered activities involving the construction and maintenance of transportation facilities will implement applicable California Department of Transportation (Caltrans) BMPs (Caltrans 2003). BMPs include, but are not limited to, the following:

- **Preservation of existing vegetation:** Existing vegetation that provides erosion and sediment control benefits will be identification and preserved to protect streams, wetlands, and other water bodies.

- **Streambank stabilization:** Drainage systems including the stream channel, streambank, and associated riparian areas, are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream’s sediment load, which can cause channel erosion or sedimentation and have adverse effects on the biotic system. Best management practices minimize will be implemented to stabilize exposed banks and reduce the impact of construction activities on watercourses; hence reducing the discharge of sediment and other pollutants into streams. Streams included on the Clean Water Act section 303(d) list of impaired waters by the State Water Resources Control Board (SWRCB) may require monitoring to prevent construction-related increases in sedimentation, siltation and/or turbidity to the stream.\(^{55}\)

- **Wind erosion control:** Wind erosion control will be conducted by applying water and/or other dust palliatives as necessary to prevent or alleviate erosion by the forces of wind. Dust control shall be applied in accordance with Caltrans standard practices. Covering of small stockpiles or areas is an alternative to applying water or other dust palliatives.

- **Water conservation practices:** Water conservation practices will be applied that use water during the construction of a project in a manner that avoids causing erosion and/or the transport of pollutants off site.

\(^{55}\) Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of “impaired waters.” These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. The Clean Water Act requires that these jurisdictions establish priority rankings for waters on the lists and develop total maximum daily loads (TMDLs) for these waters.
• **Sanitary/septic waste management**: Procedures and practices will be used to minimize or eliminate the discharge of construction site sanitary/septic waste materials to the storm drain system or to watercourses.

### 5.4.4.4 Aggregate Mining Covered Activities

Aggregate mine development and ongoing operations and maintenance covered activities will require that mine operators implement all of the applicable performance standards from the Off-Channel Mining Plan (Yolo County 1996). Channel maintenance and restoration in Cache Creek will require implementation of all applicable performance standards in the Cache Creek Resources Management Plan and Cache Creek Improvement Program (Yolo County 2002).

**AMM22: Implement Performance Standards of the Off-Channel Mining Plan and the Cache Creek Resources Management Plan.** Aggregate mine operators will implement all of the applicable performance standards of the Off-Channel Mining Plan Channel (Yolo County 1996) maintenance and restoration in Cache Creek will require implementation of all applicable performance standards of the Cache Creek Resources Management Plan and Cache Creek Improvement Program (Yolo County 2002). These performance standards serve as the avoidance and minimization measures for covered activities related to aggregate mining under the NHP.

### 5.4.4.5 Operations and Maintenance and Other Ongoing Activities

This section describes survey and mitigation requirements for operations and maintenance and other ongoing activities associated with residential, industrial, and commercial development, and public and private infrastructure facilities as described in Chapter 3, Covered Activities. Avoidance and minimization measures for aggregate mining operations and maintenance activities are presented in Section 5.4.4.4, Aggregate Mining Covered Activities.

**AMM23: Cover Trenches and Holes Excavated for Maintenance.** Open trenches and holes excavated to perform maintenance on underground pipes and utilities will be covered or designed with escape ramps during non-working hours to prevent injury and mortality of covered and other native wildlife. All open trenches and holes will be inspected immediately prior to filling and any trapped wildlife removed and released.

**AMM24: Swainson’s Hawk and White-Tailed Kite Nest Surveys.** Surveys will be conducted before implementing operations and maintenance actions that involve the pruning or removal of trees that support Swainson’s hawk and white-tailed kite nesting habitat to determine if occupied nest sites of these species are present. Surveys are only required for tree pruning and removal activities that will be conducted from March 15-August 15. Surveys will use the survey protocol indicated in Table 5-18. If occupied nest sites are present and pruning or removal of the nest tree(s) cannot be avoided, tree pruning and removal will be deferred until the nest is abandoned by adults and young, at which time the tree(s) may be pruned or removed.
AMM25: Minimize Impacts of Water Conveyance Channel Maintenance on Giant Garter Snake. Ongoing maintenance activities by local water agencies covered under the NHP require removal of vegetation, debris, and sediment from water conveyance canals that serve agricultural water users. Maintenance of these conveyance facilities typically can only occur from mid-January through April when conveyance canals and ditches are not in service. This timing is during the giant garter snakes’ inactive period when they may be using underground borrows. To minimize the take of giant garter snake, maintenance of conveyance structures located within modeled giant garter snake habitat (see Appendix A.19) will be limited to clearing one side along at least 80 percent of the linear distance of canals and ditches during each maintenance year (e.g., the left bank of a canal is maintained in the first year and the right bank in the second year). To avoid collapses when re-sloping canal and ditch banks that are comprised of heavy clay soils, clearing along both sides of canal and ditch banks is permissible along no more than 20 percent of the linear distance of canals and ditches during each maintenance year.

Where channel maintenance activities will be conducted within modeled habitat for giant garter snake, removed material will be placed in existing dredged material spoil sites along channels where prior maintenance dredge disposal has occurred. For portions of channels that do not have previously used spoil disposal sites and where surveys have been conducted to confirm that giant garter snakes are not present, removed materials may be placed along channels in areas not occupied by giant garter snake.

Modifications to this AMM may be made with the approval of USFWS and DFW.

AMM26: Covered Plant Species Surveys. To determine if covered plant species are present and could be affected by public and private infrastructure maintenance actions (see Chapter 3, Covered Activities), plant surveys will be conducted in the potential habitat locations indicated in Figure 5-6. The locations indicated in Figure 5-6 indicate Plan Area locations that may support sufficient remnant soil and hydrologic characteristics to support occurrences of covered plant species.56 Surveys are only required before the first implementation of operations and maintenance activities. Following completion of surveys within a work area, no additional surveys of the area will are required prior to implementing maintenance and operations actions in the same location over the term of the NHP.

Surveys will be conducted in accordance with the survey period and survey protocol requirements presented in Table 5-17 before implementation of the action. If no covered plant species occurrences are present in the work area, the work may proceed. If covered plant species are found, the number of plants present will be determined and occurrences will be mapped to determine mitigation requirements. See CM6, Restore Covered Plant and Vernal Pool Shrimp Species Habitat and Establish Occurrences for species habitat restoration and plant establishment requirements.

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56 Survey location requirements may be adjusted by the Implementing Entity based on new information gathered over the term of the NHP.
5.5 Conservation Provided for Natural Communities

As an NCCP, the NHP Conservation Strategy is designed to meet the NCCPA standard to contribute to the conservation of natural communities and covered species. This section describes how implementation of the Conservation Strategy contributes to the conservation of natural communities. This section describes the expected outcomes for each of the natural communities with implementation of the NHP. The approach to conserving natural communities within the Plan Area focuses on protecting a sufficient portion of each natural community in the Plan Area from future changes in land uses such that the extent, spatial distribution, and connectivity among existing and NHP protected natural communities 1) contributes to the conservation of the covered species and 2) provides sufficient habitat to maintain the distribution, abundance, and provide for the movement and migration of native species dependent on natural communities of the Plan Area into the future. Furthermore, management of protected natural communities in combination with habitat enhancement actions are designed to maintain and improve the ecological functions and services of the natural communities that support the abundance and distribution of covered and other native species dependent of the communities.

Figures 5-7 to 5-14 illustrate in “pie diagrams” the acreage of impacts, existing protection, NHP protection, and NHP restoration for each natural community with full NHP implementation.
Figure 5-6. Public and Private Infrastructure Maintenance Covered Plant Species Survey Areas
Figure 5-7. Grasslands Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-8. Shrublands and Scrub Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-9. Woodlands and Forest Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-10. Woodlands and Forest Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-11. Riparian Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-12. Fresh Emergent Wetland Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-13. Alkali Sink and Vernal Pool Complex Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-14. Agriculture Supporting Species Habitat in the Plan Area with Full Yolo NHP Implementation
Table 5-22, *Natural Community Conservation on Existing and Yolo NHP Protected Lands after Implementation* presents the overall Plan Area-wide acreage outcomes of implementing the NHP covered activities and Conservation Strategy for each natural community. Tables 5-23, *Natural Communities Supporting Modeled Covered Species Habitats*, and 5-24, *Natural Communities Supporting Local Concern Species Habitats*, respectively indicate natural communities that are comprised of land cover types that support habitat for NHP covered species and local concern species. The NHP conservation of the natural communities as described below will also provide conservation for the covered species and local concern species as described in Sections 5.6, *Conservation Provided for Covered Species* and 5.7, *Conservation Provided for Local Concern Species*. 
Table 5-22. Natural Community Conservation on Existing and Yolo NHP Protected Lands after Implementation
Table 5-23. Natural Communities Supporting Modeled Covered Species Habitats
Table 5-24. Natural Communities Supporting Local Concern Species Habitats
5.5.1 Grasslands

The conservation approach for the grasslands natural community is to 1) protect large patches of grassland that are connected with existing protected patches of grassland and other natural communities (e.g., woodlands and forest and shrubland and scrub) in the Hill and Ridge Landscape Unit to protect the north-south foothill environmental gradient and the elevational gradient of conditions from the foothills to the valley floor and 2) protect smaller patches of fragmented grassland within the agricultural matrix of the Valley Landscape Unit to maintain remnant natural areas that support use by grassland-associated covered species.

Implementation of the NHP will protect 32,160 acres of grasslands natural community that, in combination with the existing Plan Area acreage of protected grassland, will result in protection of approximately 47 percent of grassland in the Plan Area, including over 46 percent of the annual grassland and 100 percent of serpentine grassland (Table 5-22, Figure 5-7). Up to 2,455 acres of annual grassland will be protected as compensatory mitigation for the direct effects of the covered activities on the natural community and an additional 29,790 acres of annual and serpentine grassland will be protected to provide for conservation of this natural community (see Table 5-9). The synergistic benefits to the grassland natural community associated with the protection of a large and well-connected conservation lands system will serve to mitigate indirect effects of the covered activities and contribute to the conservation of this natural community.

Conservation measure CM1, Protect Natural Communities provides for the protection of important habitat functions for a number of covered species within the Plan Area and the broader ecoregion beyond the Plan Area (e.g., the coastal ranges extending to the south, north, and west of the Plan Area). Protecting sufficiently large and connected patches of annual grassland will establish a network of connected habitat patches of a sufficient size and composition that will provide for the conservation of grassland-associated species and biodiversity of this community. Primarily, large patches of grassland will be selected that have sufficient interior habitat and are adjacent or connected to other large parcels of native habitats (Table 5-14). In addition, the protection of at least 200 seasonal ponds to provide aquatic breeding habitat for California tiger salamander is expected to be located entirely within patches of protected annual grassland. Focusing NHP protection on patches of grassland supporting natural aquatic and wetland habitats (e.g., intermittent and perennial streams, seeps) and seasonal ponds ensures that all of the elements of habitat supporting covered and other native wildlife species that require the presence of surface will be protected. Planned ecological corridors comprised primarily of protected grassland and other natural communities (e.g., woodlands and forest) will protect the connectivity of north-south wildlife movement corridors along the foothills of the Hill and Ridge landscape Unit and will provide for connectivity across the landscape along elevation gradients to facilitate movement of species in response to climate change. See required elevation gradient corridors in Figure 5-3 that provide for connectivity within the grasslands natural community and with lower elevation riparian and wetland communities and agricultural habitats and higher elevation woodlands and forest and shrubland and scrub communities.
Conservation measures CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat provide for the management and enhancement of protected grassland natural community to maintain and enhance ecological functions, such as soil and hydrologic processes, natural and assisted regeneration of native vegetation through control of nonnative plants, and providing debris piles and grazing regimes that maintain and increase populations of fossorial mammals. The development of management and monitoring plans (see Section 6.3, Monitoring Program) for conservation lands, the Implementing Entity will ensure that the grassland natural community and the covered species habitats supported by it are managed in a geographic context and that enhancement actions are implemented to support habitat functions over time. Based on this assessment, implementation of NHP actions to protect, enhance, and manage the grasslands natural community are expected to maintain and improve the habitat function of the grasslands natural community in support of conserving the abundance and distribution of associated covered and other native species in the Plan Area. Under the NHP, the grassland natural community would be included within a larger conservation lands system that provides for a sufficient extent of protection, spatial distribution, and management of this natural community such that ecosystem functions and biodiversity would be conserved within the Plan Area.

5.5.2 Shrublands and Scrub

The conservation approach for the shrubland and scrub natural community is to protect large patches of chamise and mixed chaparral that are connected with existing protected patches of shrubland and scrub and other natural communities (e.g., woodlands and forest) in the Hill and Ridge Landscape Unit to protect the north-south foothill environmental gradient and the elevational gradient of conditions from the foothills to the valley floor. Implementation of the NHP will protect 6,030 acres of shrubland and scrub land cover types. When combined with the existing extent of protected shrubland and scrub land cover types in the Plan Area, 68 percent of the shrubland and scrub community in the Plan Area will be protected (Table 5-22, Figure 5-9). Up to 2 acres of mixed chaparral will be protected as compensatory mitigation for the direct effects of the covered activities on the natural community and an additional 6,028 acres of shrubland and scrub will be protected to provide for conservation (see Table 5-9). The synergistic benefits to the shrubland and scrub community associated with the protection of a large and well-connected conservation lands system will serve to mitigate indirect effects of the covered activities and contribute to the conservation of this natural community.

Conservation measure CM1, Protect Natural Communities provides for the protection of important habitat functions for a number of covered species within the Plan Area and the broader ecoregion beyond the Plan Area (e.g., the coastal ranges extending to the south, north, and west of the Plan Area). Protecting sufficiently large and connected patches of chamise and mixed chaparral will establish a network of connected habitat patches of a sufficient size and composition that will provide for the conservation of shrubland and scrub-associated species and biodiversity of this community. Primarily, large patches of shrublands and scrub will be selected.
that have sufficient interior habitat and are adjacent or connected to other large parcels of native habitats (Table 5-14). Planned ecological corridors comprised primarily of protected shrublands and scrub, woodlands and forest, and grasslands natural communities from the low to mid-elevations of the foothills in Planning Units 1-4 will protect the connectivity of north-south wildlife movement corridors and will provide for connectivity across the landscape along elevation gradients to facilitate movement of species in response to climate change. See required elevation gradient corridors in Figure 5-4 that provide for connectivity within the shrublands and scrub natural community and with woodlands and forest and lower elevation annual grasslands.

Conservation measures CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat provide for the management and enhancement of protected shrublands and scrub natural community to maintain and enhance ecological functions. Enhancement and management actions could include specific grazing prescriptions, erosion control, and maintenance of fire regimes necessary to maintain regeneration of this natural community over time. Management of protected scrublands and scrub lands will be coordinated with and complementary of management of adjacent NHP protected grassland, woodlands and forest, and riparian communities.

Based on this assessment, implementation of NHP actions to protect, enhance, and manage the shrublands and scrub natural community are expected to maintain and improve the habitat function of the natural community in support of conserving the abundance and distribution of associated covered and other native species in the Plan Area. Under the NHP, the shrublands and scrub natural community would be included within a larger conservation lands system that provides for a sufficient extent of protection, spatial distribution, and management of this natural community such that ecosystem functions and biodiversity would be conserved within the Plan Area.

### 5.5.3 Woodlands and Forest

The conservation approach for the woodlands and forest natural community is to protect large patches of blue oak-foothill pine, blue oak woodland, and montane hardwood that are connected with existing protected patches of woodlands and forest and other natural communities (e.g., shrublands and scrub) in the Hill and Ridge Landscape Unit to protect the north-south foothill environmental gradient and the elevational gradient of conditions from the foothills to the valley floor. Implementation of the NHP will protect 14,362 acres of woodlands and forest natural community that, in combination with the existing Plan Area acreage of protected woodlands and forest, will result in protection of over 28 percent of woodlands and forest in the Plan Area (Table 5-22, Figures 5-10 and 5-11). This includes protection of all the remaining unprotected acreage of closed-cone pine cypress and juniper woodland in the Plan Area and the remaining 2 acres of valley oak woodland in the Valley Landscape Unit in Planning Unit 13. Up to 24 acres of blue oak-foothill pine and blue oak woodland will be protected as compensatory mitigation for the direct effects of the covered activities on the natural community and an additional 14,338...
acres of woodlands and forest will be protected to provide for conservation (see Table 5-9). The synergistic benefits to the woodlands and forest community associated with the protection of a large and well-connected conservation lands system will serve to mitigate indirect effects of the covered activities and contribute to the conservation of this natural community.

Conservation measure CM1, Protect Natural Communities provides for the protection of important habitat functions for a number of covered species within the Plan Area and the broader ecoregion beyond the Plan Area (e.g., the coastal ranges extending to the south, north, and west of the Plan Area). Protecting sufficiently large and connected patches of woodlands and forest will establish a network of connected habitat patches of a sufficient size and composition that will provide for the conservation of woodlands and forest-associated species and biodiversity of this community. Primarily, large patches of woodlands and forest will be selected that have sufficient interior habitat and are adjacent or connected to other large parcels of native habitats (Table 5-14). In addition, implementation of CM4, Restore Natural Communities and Habitat will restore 100 acres of valley oak woodland designed to develop as habitat for riparian-associated covered species and will be located on sites with suitable soils and sufficient natural hydrology such that the restored valley oak woodland will be self-sustaining over time. Planned ecological corridors comprised primarily of protected woodlands and forest, shrublands and scrub, and grasslands natural communities from the low to mid-elevations of the foothills in Planning Units 1-4 will protect the connectivity of north-south wildlife movement corridors and will provide for connectivity across the landscape along elevation gradients to facilitate movement of species in response to climate change. See required elevation gradient corridors in Figure 5-3 that provide for connectivity within the woodlands and forest natural community and with shrubland and scrub and lower elevation annual grasslands.

Conservation measures CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat provide for the management and enhancement of protected woodlands and forest natural community to maintain and enhance ecological functions. Enhancement and management actions could include specific grazing prescriptions, erosion control, and maintenance of fire regimes necessary to maintain regeneration of this natural community over time. Management of protected woodlands and forest will be coordinated with and complementary of management of adjacent NHP protected shrublands and scrub, grassland, and riparian communities.

Based on this assessment, implementation of NHP actions to protect, enhance, and manage the woodlands and forest natural community are expected to maintain and improve the habitat function of the natural community in support of conserving the abundance and distribution of associated covered and other native species in the Plan Area. Under the NHP, the woodlands and forest natural community would be included within a larger conservation lands system that provides for a sufficient extent of protection, spatial distribution, and management of this natural community such that ecosystem functions and biodiversity would be conserved within the Plan Area.
5.5.4 Riparian and Wetlands

The conservation approach for the riparian and wetlands natural community is to 1) protect corridors of riparian vegetation that are connected with existing protected patches of other natural communities, support habitat functions for covered and other native wildlife, and facilitate the movement of wildlife along Plan Area drainages, 2) protect the remaining unprotected vernal pool complex in Planning Units 16 and 19 that support known occurrences of covered plant and vernal pool shrimp species, 3) restore fresh emergent wetland that supports giant garter snake habitat in or connected to occupied habitat areas, and 4) protect seasonal and perennial ponds that support habitat for covered amphibian and reptile species.

Implementation of the NHP will protect 4,585 acres of the riparian and wetlands natural community that, in combination with the existing Plan Area acreage of protected riparian and wetland communities will result in protection of over 49 percent of the riparian and wetlands natural community in the Plan Area (Table 5-22, Figures 5-12 through 5-14). Up to 654 acres of alkali sink and valley foothill riparian will be protected and up to 536 acres of fresh emergent wetland and valley foothill riparian will be restored as compensatory mitigation for the direct effects of the covered activities on the natural community. An additional 3,931 acres of valley foothill riparian and vernal pool complex and 200 acres of seasonal ponds\(^{57}\) will be protected and 150 acres of valley foothill riparian will be restored to provide for conservation of this natural community (see Table 5-9). The synergistic benefits to the riparian and wetlands natural community associated with the protection of a large and well-connected conservation lands system will serve to mitigate indirect effects of the covered activities and contribute to the conservation of this natural community.

Conservation measure CM1, Protect Natural Communities provides for the conservation and protection of riparian habitat functions for a number of species within the Plan Area and the broader ecoregion beyond the Plan Area (e.g., migration habitat for neotropical migrant birds). By protecting large patches of riparian habitats and patches that have a critical connecting function, the riparian conservation strategy protects and strengthens a network of connected habitat patches to maintain and increase their ecological functions in support of covered species and ecosystem services. The riparian protection strategy includes the establishment of two riparian corridors along Cache and Putah creeks to maintain and enhance functional connectivity across a broad range of natural communities (Figure 5-3). These corridors will consist of large, connected parcels of riparian habitat, with interspersed “stepping stones” of transitional or matrix patches that are maintained and enhanced to provide permeability for covered species and other native wildlife. These riparian corridors include design characteristics for corridor width, barrier permeability, and inter-patch distance (see Section 5.4.1.1, CM1: Protect Natural Communities). Although the NHP does not include specific objectives to protect stream channels, protection of

\(^{57}\) These ponds will be protected to achieve the covered species targets for California tiger salamander, western spadefoot toad, and western pond turtle. See Table 5-10.
NHP protection of valley foothill riparian will result in protection of stream channels that course through protected patches of riparian habitat.

The NHP will also protect the remaining 53 acres of unprotected vernal pool complex in the Plan Area, which supports occurrences of alkali milk-vetch, Heckard’s peppergrass, Baker’s navarretia, San Joaquin spearscale, vernal pool tadpole shrimp, and Conservancy fairy shrimp, and vernal pool fairy shrimp (see Appendix A, Covered Species Accounts). The NHP will also protect 200 ponds that support seasonal breeding habitat for California tiger salamander and western spadefoot toad. Although the NHP does not include an objective to protect additional fresh emergent wetland in the Plan Area because a sufficient acreage of fresh emergent wetland is currently protected it is anticipated that fresh emergent wetland will be protected to achieve the habitat protection objectives for covered species that use fresh emergent wetland habitat types (e.g., giant garter snake, northern harrier, tricolored blackbird).

Implementation of CM4, Restore Natural Communities and Habitat will restore 476 acres of valley foothill riparian and 210 acres of fresh emergent wetland. Restored valley foothill riparian habitats will be designed to develop as habitat for riparian-associated covered species and will be located on sites with sufficient natural hydrology such that restored riparian habitats will be self-sustaining over time. In addition, restored riparian habitat will be located to improve connectivity among existing riparian habitat patches along stream channels, particularly along the NHP Cache Creek and Putah Creek riparian corridors. Restored fresh emergent wetland will be designed to function as giant garter snake active season aquatic habitat that will be in or connected to known occupied habitat areas and a portion of the 340 acres of habitat to be restored for giant garter snake under the NHP will also result in restoration of fresh emergent wetland (Table 5-6). In addition to providing benefits for giant garter snake, restored fresh emergent wetland will also restore habitat for other covered and other wetland-associated wildlife species (e.g., northern harrier, tricolored blackbird, yellow-headed blackbird, wading birds, waterfowl). Restoration of riparian and wetlands communities is also expected to enhance the habitat functions of adjoining habitats by adding the availability of habitat elements necessary for some species to use or increase their use of adjoining habitats (e.g., restoration of riparian habitat provides nesting substrate and perches for raptors and other birds that forage in adjacent grassland or agricultural habitats, restoration of fresh emergent wetland may increase the availability of nesting substrate in proximity to preferred tricolored blackbird agricultural foraging habitats).

Conservation measures CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat provide for the management and enhancement of protected riparian and wetlands natural community to maintain and enhance ecological functions. Enhancement and management actions could include specific grazing prescriptions, erosion control, and control of nonnative plant species. In particular, protected

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58 Approximately 65 percent of the existing Plan Area acreage is Category 1 PEHL (Table 5-2a).
vernal pool complex will be intensively managed to enhance habitat conditions to levels necessary to maintain and increase the current abundance of existing covered plant species occurrences. Protected seasonal ponds will be managed to control nonnative predators (e.g., bullfrog) to increase the production and distribution of native amphibians and reptiles that breed or rear in ponds. Management of protected woodlands and forest will be coordinated with and complementary of management of adjacent NHP protected shrublands and scrub, grassland, and riparian communities.

Based on this assessment, implementation of NHP actions to protect, enhance, and manage the riparian and wetlands natural community are expected to maintain and improve the habitat function of the natural community in support of conserving the abundance and distribution of associated covered and other native species in the Plan Area. Under the NHP, the riparian and wetlands natural community would be included within a larger conservation lands system that provides for a sufficient extent of protection, spatial distribution, and management of this natural community such that ecosystem functions and biodiversity would be conserved within the Plan Area.

5.5.5 Agricultural Habitats

The conservation approach for agricultural habitats is protect crop lands that provide very high to moderate value foraging habitat for Swainson’s hawk and to protect rice lands that support giant garter snake active season aquatic habitat in core occupied habitat areas for these species (see Section 5.6, Conservation Provided for Covered Species for a description of conservation approaches for Swainson’s hawk and giant garter snake). Protection of these crop lands will also protect habitat for other covered species that use agricultural habitats (Table 5-23).

Implementation of the NHP will protect 6,400 acres of rice and 11,260 acres of non-rice crop lands that support modeled covered species habitat that, in combination with the existing Plan Area acreage of protected agricultural habitats, will result in protection of over 8.9 percent of crop lands supporting modeled covered species habitat in the Plan Area (Table 5-22, Figure 5-14). Up to 11,260 acres of agricultural crop types supporting Swainson’s hawk foraging habitat and up to 1,955 acres of rice land will be protected as compensatory mitigation for the direct effects of the covered activities on these agricultural habitat types and an additional 4,445 acres of rice land will be protected to provide for conservation of agricultural habitat (Table 5-9). The synergistic benefits to agricultural habitats associated with the protection of a large and well-connected conservation lands system comprised of natural communities and agricultural habitats will serve to mitigate indirect effects of the covered activities and contribute to the conservation of agricultural habitats that support covered and other native wildlife species.

CM1, Protect Natural Communities provides for the conservation and protection of agricultural habitat functions for a number of species within the Plan Area. Agricultural habitats provide essential foraging and breeding habitat for western pond turtle, giant garter snake, Swainson’s hawk, northern harrier, white-tailed kite, black tern and tricolored blackbird. The conservation
measure directs the Implementing Entity to protect and enhance agricultural habitats (and natural
communities) of sufficient patch size, connectivity, distribution, and habitat values to meet the
requirements of covered species. This ensures the maintenance and improvement of ecological
connectivity and the opportunity for species to migrate across the landscape.

CM5, Enhance and Manage Protected Natural Communities provides for the management and
enhancement of NHP protected agricultural habitat types, including interspersed native
landscape elements (e.g., valley oak remnants, ditches, hedgerows, field edges) that are present
on protected parcels of crop land. Management actions will include ongoing cultivation
practices that are necessary to grow target crop types that support habitat value for covered
species and modifications of water conveyance maintenance to benefit giant garter snake,
western pond turtle, and other native wildlife that use water supply channels (e.g., maintaining
water in canals and ditches during the active period of giant garter snake). Because protected
agricultural lands also interface with and affect adjacent natural communities (e.g., patches of
valley foothill riparian, fresh emergent wetland, grassland) agricultural land use practices on
protected lands will be compatible with maintaining these existing habitat patches to ensure their
continued functionality as habitat for covered and other native species. Enhancement of
protected agricultural lands will include planting of cover strips, hedgerows, and trees along field
margins to provide nesting and perching habitat for native bird species and habitat for small
mammals that are prey species for native raptors and other predators.

Based on this assessment, implementation of NHP actions to protect, enhance, and manage the
agricultural habitats that support covered species are expected to maintain and improve the
habitat functions of the agricultural matrix in the Valley Landscape Unit in support of conserving
the abundance and distribution of associated covered and other native species in the Plan Area.
Under the NHP, agricultural habitats would be included within a larger conservation lands
system that provides for a sufficient extent of protection, spatial distribution, and management of
agricultural habitats such that ecosystem functions and biodiversity would be conserved within
the Plan Area.

5.6 CONSERVATION PROVIDED FOR COVERED SPECIES

The NHP Conservation Strategy is designed to meet the ESA section 10 standard to minimize
and mitigate the impacts of the covered activities on the covered species to the maximum extent
practicable and the NCCPA standard to conserve covered species. This section describes how
implementation of the Conservation Strategy minimizes and mitigates the impacts of the covered
activities on covered species and provides for their conservation. The approach to conserving
each of the covered species focuses on alleviating the effects of environmental stressors in the
Plan Area that pose a threat to maintaining and increasing the population and habitat of each
species and that can reasonably and practically be addressed through the NHP. The status,
distribution, and primary threats affecting each of the covered species is summarized from

59 50 CFR 17.22(b)(2)(B)
information presented in Appendix A, Covered Species Accounts, at the beginning of each of the following covered species’ section to provide context for the assessment of expected outcomes.

The change in the extent of protected covered species habitats by Planning Unit within the Plan Area with implementation of the NHP is presented in Table 5-25. Figures 5-15 to 5-41 illustrate the acreage of each covered species modeled habitat impacted and protected with NHP implementation.

As described in Section 5.4, Conservation Measures, the NHP includes measures to avoid and minimize the impacts of covered activities on covered species and conservation measures to protect, enhance, and restore an extent of habitat sufficient to mitigate impacts of the covered activities on and to provide for the conservation of covered species. It is not considered practicable to further modify the covered activities to reduce the level of potential impacts on the covered species beyond implementing the avoidance and minimization measures (See Chapter 9, Alternatives to Take, and Section 5.4.4, Avoidance and Minimization Measures).
Table 5-25. Species Conservation on Existing and Yolo NHP Protected Lands after Implementation
Figure 5-15. Alkali Milk-Vetch Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-16. Brittlescale Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-17. San Joaquin Spearscale Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-18. Palmate-Bracted Bird's-Beak Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-19. Heckard’s Pepper-Grass Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-20. Baker’s Navarretia Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-21. Colusa Grass and Solano Grass Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-22. Vernal Pool Shrimp Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-23. Valley Elderberry Longhorn Beetle Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-24. California Tiger Salamander Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-25. Western Spadefoot Toad Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-26. Foothill Yellow-Legged Frog Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-27. Western Pond Turtle Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-28. Giant Garter Snake Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-29. Swainson’s Hawk Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-30. Northern Harrier Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-31. White-Tailed Kite Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-32. Black Tern Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-33. Western Yellow-Billed Cuckoo Habitat in the Plan Area with Full Yolo NHP
Implementation
Figure 5-34. Western Burrowing Owl Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-35. Loggerhead Shrike Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-36. Least Bell’s Vireo Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-37. Bank Swallow Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-38. Yellow-Breasted Chat Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-39. Grasshopper Sparrow Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-40. Tricolored Blackbird Habitat in the Plan Area with Full Yolo NHP Implementation
Figure 5-41. Townsend’s Big-Eared Bat Habitat in the Plan Area with Full Yolo NHP Implementation
5.6.1 Alkali Milk-Vetch

5.6.1.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, enhancement, and management of alkali sink and vernal pool complex communities that currently support known alkali milk-vetch habitat in known occurrences. Of the 572 acres of the mapped alkali milk-vetch habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped alkali milk-vetch habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped alkali milk-vetch habitat that does not support known occurrences (Table 5-10, Figure 5-15).

Implementation of the NHP will provide support for improving the protection level and management of alkali milk-vetch habitat and occurrences at the City of Woodland Regional Park/Mavis Henson Field, the Grasslands Regional Park and the Davis Communications Facility site (Figures 5-5 and 5-6); it will also provide support for enhancing and managing existing protected habitat and occurrences at the Spring Lake Alkali Sink (Figure 5-5).

5.6.1.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of alkali milk-vetch population and habitat enhancement methods. Very little is known about how to manage this species or its habitat. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the alkali milk-vetch (aside from habitat loss) is the aggressive spread of nonnative species such as perennial pepperweed and Italian ryegrass (ESA and Yolo County 2005; Showers 1996; Witham 2003; Dawson et al. 2007), the primary uncertainty associated with this threat is the rate at which these species invade restored habitat, and the effectiveness of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan).

Implementation of the conservation measures is not expected to pose a risk to alkali milk-vetch because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.
5.6.1.3 *Summary of Expected Outcome for Alkali Milk-Vetch*

Implementation of the NHP is expected to maintain the distribution and abundance of alkali milk-vetch in perpetuity within the Plan Area and, through habitat enhancement actions in protected occurrences, result in localized increases in its abundance. Although only a relatively small portion of the range-wide distribution of alkali milk-vetch occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the distribution wide status of alkali milk-vetch. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species. This level of protection meets the requirements of the Recovery Plan to protect 95 percent of its suitable habitat near Woodland and 85 percent of its suitable habitat at the Grasslands Regional Park and Davis Communications Facility site (USFWS 2005).

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on alkali milk-vetch and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports known occurrences of alkali milk-vetch and substantial areas of potentially restorable land that is not currently habitat. To ensure that the biological goals and objectives for alkali milk-vetch are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, *Adaptive Management and Monitoring*). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

5.6.2 *Brittlescale*

5.6.2.1 *Conservation Approach and Expected Outcomes of the Conservation Strategy*

The Conservation Strategy provides for the protection, enhancement, and management of alkali sink and vernal pool complex communities, and salt spring habitat that currently support known brittlescale habitat in known occurrences. Of the 580 acres of the brittlescale habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped brittlescale habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped brittlescale habitat that does not support known occurrences (Table 5-10, Figure 5-16). Implementation of the NHP will provide support for improving the protection level and management of brittlescale habitat and occurrences at the City of Woodland Regional Park/Mavis Henson Field, the Grasslands Regional Park and the Davis Communications Facility site (Figures 5-5 and 5-6); it will also provide support for enhancing and managing existing protected habitat and occurrences at the Spring Lake Alkali Sink (Figure 5-5).
5.6.2.2 **Ecological Uncertainty and Risk of Conservation Actions**

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of brittlescale population and habitat enhancement methods. Very little is known about how to manage this species or its habitat. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, *Monitoring Program*).

Since one of the most significant stressor of the brittlescale (aside from habitat loss) is the aggressive spread of nonnative species such as perennial pepperweed and Italian ryegrass (ESA and Yolo County 2005; Showers 1996; Witham 2003; Dawson et al. 2007), the primary uncertainty associated with this threat is the rate at which these species invade restored habitat, and the effectiveness of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, *Adaptive Management Plan*).

Implementation of the conservation measures is not expected to pose a risk to brittlescale because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.2.3 **Summary of Expected Outcome for Brittlescale**

Implementation of the NHP is expected to maintain the distribution and abundance of brittlescale in perpetuity within the Plan Area and, through habitat enhancement actions in protected occurrences, potentially result in localized increases in its abundance. Although only moderate small portion of the range-wide distribution of brittlescale occurs in the Plan Area), implementation of the NHP is expected to have a stabilizing effect on the distribution wide status of brittlescale. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on brittlescale and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports occurrences of brittlescale and substantial areas of potentially restorable land that is not currently habitat. To ensure that the biological goals and objectives for brittlescale are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, *Adaptive Management and*
Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

5.6.3 San Joaquin Spearscale

5.6.3.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, enhancement, and management of alkali sink and vernal pool complex communities, and salt spring habitat that currently support known San Joaquin spearscale habitat in known occurrences. Of the 580 acres of San Joaquin spearscale habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped San Joaquin spearscale habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped San Joaquin spearscale habitat that does not support known occurrences (Table 5-10, Figure 5-17). Implementation of the NHP will provide support for improving the protection level and management of San Joaquin spearscale habitat and occurrences at the City of Woodland Regional Park/Mavis Henson Field, the Grasslands Regional Park and the Davis Communications Facility site (Figures 5-5 and 5-6); it will also provide support for enhancing and managing existing protected habitat and occurrences at the Spring Lake Alkali Sink (Figure 5-5).

5.6.3.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of San Joaquin spearscale population and habitat enhancement methods. Very little is known about how to manage this species or its habitat. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the San Joaquin spearscale (aside from habitat loss) is the aggressive spread of nonnative species such as perennial pepperweed and Italian ryegrass (ESA and Yolo County 2005; Showers 1996; Witham 2003; Dawson et al. 2007), the primary uncertainty associated with this threat is the rate at which these species invade restored habitat, and the effectiveness of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an
adaptive decision making framework (see Section 6.2, *Adaptive Management Plan*).

Implementation of the conservation measures is not expected to pose a risk to San Joaquin
spearscale because they are directed at protecting and enhancing its habitat and removing or
reducing current existing stressors on the species.

### 5.6.3.3 Summary of Expected Outcome for San Joaquin Spearscale

Implementation of the NHP is expected to maintain the distribution and abundance of San
Joaquin spearscale in perpetuity within the Plan Area and, through habitat enhancement actions
in protected occurrences, potentially result in localized increases in its abundance. Although
only moderate small portion of the range-wide distribution of San Joaquin spearscale occurs in
the Plan Area), implementation of the NHP is expected to have a stabilizing effect on the
distribution wide status of San Joaquin spearscale. Implementation of the Conservation Strategy
will contribute to maintaining the genetic diversity of the species.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the
covered activities on San Joaquin spearscale and will conserve the species in the Plan Area. The
Conservation Strategy will protect all mapped habitat within the Plan Area that supports
occurrences of San Joaquin spearscale and substantial areas of potentially restorable land that is
not currently habitat. To ensure that the biological goals and objectives for San Joaquin
spearscale are achieved, results of ongoing NHP effectiveness monitoring will be periodically
evaluated over the term of the NHP to determine if implementation of the NHP should be
adjusted through the adaptive management process to improve implementation effectiveness (see
Chapter 6, *Adaptive Management and Monitoring*). Such adjustments can include improvements
and adjustments in habitat management and enhancement techniques.

### 5.6.4 Palmate-Bracted Bird’s-Beak

#### 5.6.4.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, enhancement, and management of alkali
sink community that currently support known palmate-bracted bird’s-beak habitat in known
occurrences. Of the 275 acres of the mapped palmate-bracted bird’s-beak habitat in the Plan
Area, 166 acres are currently protected (Table 5-3a). The NHP will protect an additional 2 acres
of mapped palmate-bracted bird’s-beak habitat (Table 5-7) which will mitigate impacts on low
functioning mapped palmate-bracted bird’s-beak habitat that does not support known
occurrences (Table 5-10, Figure 5-18). Implementation of the NHP will provide support for
improving the protection level and management of palmate-bracted bird’s-beak habitat and
occurrences at the City of Woodland Regional Park/Mavis Henson Field (Figure 5-5); it will also
provide support for enhancing and managing existing protected habitat and occurrences at the
Spring Lake Alkali Sink (Figure 5-5). Ecological Uncertainty and Risk of Conservation Actions
The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of palmate-bracted bird’s-beak population and habitat enhancement methods. Despite some long term attempts to manage this species and its habitat in the PEHL Category 1 lands, techniques for managing its primary stressor, invasive nonnative Italian ryegrass, are still in the development phase. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the palmate-bracted bird’s-beak (aside from habitat loss) is the aggressive spread of nonnative species such as perennial pepperweed and Italian ryegrass (ESA and Yolo County 2005; Showers 1996; Witham 2003; Dawson et al. 2007), the primary uncertainty associated with this threat is the rate at which these species invade restored habitat, and the effectiveness of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures is not expected to pose a risk to palmate-bracted bird’s-beak because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.4.2 Summary of Expected Outcome for Palmate-Bracted Bird’s-Beak

Implementation of the NHP is expected to maintain the distribution and abundance of palmate-bracted bird’s-beak in perpetuity within the Plan Area and, through habitat enhancement actions in protected occurrences, potentially result in localized increases in its abundance. Although only a relatively small portion of the range-wide distribution of palmate-bracted bird’s-beak occurs in the Plan Area, implementation of the NHP is expected to have stabilizing effect on the distribution wide status of palmate-bracted bird’s-beak. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species. This level of protection meets the requirements of the Recovery Plan (USFWS 1998).

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on palmate-bracted bird’s-beak and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports occurrences of palmate-bracted bird’s-beak and substantial areas of potentially restorable land that is not currently habitat. To ensure that the biological goals and objectives for palmate-bracted bird’s-beak are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation.
effectiveness (see Chapter 6, *Adaptive Management and Monitoring*). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

### 5.6.5 Heckard’s Pepper-Grass

#### 5.6.5.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, enhancement, and management of alkali sink and vernal pool complex communities that currently support known Heckard’s pepper-grass habitat in known occurrences. Of the 572 acres of the mapped Heckard’s pepper-grass habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped Heckard’s pepper-grass habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped Heckard’s pepper-grass habitat that does not support known occurrences (Table 5-10, Figure 5-19). Implementation of the NHP will provide support for improving the protection level and management of Heckard’s pepper-grass habitat and occurrences at the City of Woodland Regional Park/Mavis Henson Field and the Grasslands Regional Park and the Davis Communications Facility site (Figures 5-5 and 5-6); it will also provide support for enhancing and managing existing protected habitat and occurrences at the Spring Lake Alkali Sink (Figure 5-5).

#### 5.6.5.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of Heckard’s pepper-grass population and habitat enhancement methods. Very little is known about how to manage this species or its habitat. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, *Monitoring Program*).

Since one of the most significant stressor of the Heckard’s pepper-grass (aside from habitat loss) is the aggressive spread of nonnative species such as perennial pepperweed and Italian ryegrass (ESA and Yolo County 2005; Showers 1996; Witham 2003; Dawson et al. 2007), the primary uncertainty associated with this threat is the rate at which these species invade restored habitat, and the effectiveness of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an
adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures is not expected to pose a risk to Heckard’s pepper-grass because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.5.3 Summary of Expected Outcome for Heckard’s Pepper-Grass

Implementation of the NHP is expected to maintain the distribution and abundance of Heckard’s pepper-grass in perpetuity within the Plan Area and, through habitat enhancement actions in protected occurrences, result in localized increases in its abundance. Although only a moderate portion of the range-wide distribution of Heckard’s pepper-grass occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the distribution wide status of Heckard’s pepper-grass. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on Heckard’s pepper-grass and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports occurrences of Heckard’s pepper-grass and substantial areas of potentially restorable land that is not currently habitat. To ensure that the biological goals and objectives for Heckard’s pepper-grass are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

5.6.6 Baker’s Navarretia

5.6.6.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, enhancement, and management of vernal pool complex community that currently support Baker’s navarretia habitat. Of the 297 acres of mapped Baker’s navarretia habitat in the Plan Area, 244 acres are currently protected (Table 5-3a). The NHP will protect an additional 53 acres of mapped Baker’s navarretia habitat (Table 5-7) which is the highest functioning remaining unprotected habitat in the Plan Area. Implementation of the NHP will provide support for improving the protection level and management of Baker’s navarretia habitat at the Grasslands Regional Park and the Davis Communications Facility site (Figure 5-4).

5.6.6.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of Baker’s navarretia population and habitat enhancement methods. Very
little is known about how to manage this species or its habitat. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the Baker’s navarretia (aside from habitat loss) is the aggressive spread of nonnative species such as perennial pepperweed and Italian ryegrass (ESA and Yolo County 2005; Showers 1996; Witham 2003; Dawson et al. 2007), the primary uncertainty associated with this threat is the rate at which these species invade restored habitat, and the effectiveness of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures is not expected to pose a risk to Baker’s navarretia because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.6.3 Summary of Expected Outcome for Baker’s Navarretia

Implementation of the NHP is expected to maintain the distribution and abundance of Baker’s navarretia in perpetuity within the Plan Area and, through habitat enhancement actions in protected occurrences, result in localized increases in its abundance. Because a relatively significant portion of the range-wide distribution of Baker’s navarretia occurs in the Plan Area, implementation of the NHP is expected to have stabilizing effect on the distribution wide status of Baker’s navarretia. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on Baker’s navarretia and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports occurrences of Baker’s navarretia and substantial areas of potentially restorable land that is not currently habitat. To ensure that the biological goals and objectives for Baker’s navarretia are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.
5.6.7 **Colusa Grass**

5.6.7.1 **Conservation Approach and Expected Outcomes of the Conservation Strategy**

The Conservation Strategy provides for the protection, enhancement, and management of Colusa grass habitat. The NHP will protect the 1 acre of mapped Colusa grass habitat and its associated occurrences in the Plan Area that is located at Grasslands Regional Park and the Davis Communications Facility (Table 5-7, Figure 5-4). The protected mapped habitat is an inclusion within the 53 acres of vernal pool and swale complex that will also be protected at the site.

5.6.7.2 **Ecological Uncertainty and Risk of Conservation Actions**

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of Colusa grass population and habitat enhancement methods. The most critical requirement is to maintain the existing occurrences that will be protected under the NHP. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with management efforts (see Section 6.3, *Monitoring Program*).

Since one of the most significant stressor of the Colusa grass, outside of habitat loss through habitat conversion to agriculture outside of the Plan Area (Witham 2013), is the aggressive spread of nonnative species such as perennial pepperweed (ESA and Yolo County 2005; Gerlach 2011), the primary uncertainty associated with this threat is the effectiveness and persistence of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in Colusa grass habitat will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, *Adaptive Management Plan*). Implementation of the conservation measures are not expected to pose a risk to Colusa grass because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.7.3 **Summary of Expected Outcome for Colusa Grass**

Implementation of the NHP is expected to maintain the distribution and abundance of Colusa grass in perpetuity within the Plan Area and, through habitat enhancement actions in protected occurrences, result in localized increases in its abundance. Because a large portion of the northernmost distribution of Colusa grass occurs in the Plan Area (Witham 2013), implementation of the NHP is expected to have a substantial stabilizing effect on the distribution wide status of Colusa grass. Implementation of the Conservation Strategy will contribute to
maintaining the genetic diversity of the species. This level of protection meets the requirements of the Recovery Plan to protect 85 percent of its suitable habitat on the Grasslands Regional Park/Davis Communications Facility site (USFWS 2005).

Implementation of the covered activities will avoid take of Colusa grass (Table 5-19). The Conservation Strategy will protect all mapped habitat within the Plan Area, which supports the only known Plan Area occurrences of Colusa grass. To ensure that the biological goals and objectives for Colusa grass are achieved, results of ongoing monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

5.6.8 Solano Grass

5.6.8.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, enhancement, and management of Solano grass habitat. The NHP will protect the 1 acre of mapped Solano grass habitat and its associated occurrences in the Plan Area that is located at Grasslands Regional Park and the Davis Communications Facility (Table 5-7, Figure 5-4). The protected mapped habitat is an inclusion within the 53 acres of vernal pool and swale complex that will also be protected at the site.

5.6.8.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of Solano grass population and habitat enhancement methods. There is almost no room for error given the rarity of this species and its large inter-seasonal fluctuations in population size (Gerlach 2011). The most critical requirement is to maintain a large population size of the occurrences that will be protected under the NHP so that seed can be collected and reintroduce into its former habitat multiple times. The Implementing Entity will integrate protection, restoration, and management of habitat with active control of nonnative species to identify and evaluate the effectiveness of best management practices. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with management efforts (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the Solano grass is the aggressive spread of nonnative species such as perennial pepperweed (ESA and Yolo County 2005; Gerlach 2011), the primary uncertainty associated with this threat is the effectiveness and persistence of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling
nonnative species in Solano grass habitat will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, *Adaptive Management Plan*). Implementation of the conservation measures are not expected to pose a risk to Solano grass because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

### 5.6.8.3 Summary of Expected Outcome for Solano Grass

Implementation of the NHP is expected to maintain the distribution and abundance of Solano grass in perpetuity within the Plan Area and, through habitat enhancement actions in protected occurrences, result in localized increases in its abundance. Because a large portion of the range-wide distribution of Solano grass occurs in the Plan Area, implementation of the NHP is expected to have a substantial stabilizing effect on the distribution wide status of Solano grass. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species. This level of protection meets the requirements of the Recovery Plan to protect 85 percent of its suitable habitat on the Grasslands Regional Park/Davis Communications Facility site (USFWS 2005).

Implementation of the covered activities will avoid take of Solano grass (Table 5-19). The Conservation Strategy will protect all mapped habitat within the Plan Area which supports the only known Plan Area occurrences of Solano grass. To ensure that the biological goals and objectives for Solano grass are achieved, results of monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, *Adaptive Management and Monitoring*). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

### 5.6.9 Conservancy Fairy Shrimp

#### 5.6.9.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, enhancement, and management of Conservancy fairy shrimp habitat. Of the 572 acres of the mapped Conservancy fairy shrimp habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped Conservancy fairy shrimp habitat (Table 5-7, Figure 5-22), 53 acres of which support the only known occurrence and the highest functioning remaining unprotected habitat in the Plan Area. Implementation of the NHP will provide support for improving the protection level and management of Conservancy fairy shrimp habitat at the City of Woodland Regional Park/Mavis Henson Field, the Grasslands Regional Park and the Davis Communications Facility site (Figures 5-5 and 5-6), including the only known Plan Area occurrence at the Davis Communications Facility site.
5.6.9.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of Conservancy fairy shrimp habitat enhancement methods. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data.

Since one of the most significant stressor of the Conservancy fairy shrimp is the aggressive spread of nonnative species such as perennial pepperweed (ESA and Yolo County 2005; Gerlach 2011), the primary uncertainty associated with this threat is the effectiveness and persistence of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures are not expected to pose a risk to Conservancy fairy shrimp because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.9.3 Summary of Expected Outcome for Conservancy Fairy Shrimp

Implementation of the NHP is expected to maintain the distribution and abundance of Conservancy fairy shrimp in perpetuity within the Plan Area and, through habitat enhancement actions in the NHP protected occurrence, potentially increase its abundance. While a relatively small portion of the range-wide distribution of Conservancy fairy shrimp occurs in the Plan Area, implementation of the NHP is expected to have substantial stabilizing effect on the distribution-wide status of Conservancy fairy shrimp. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species. There are no Recovery Plan requirements for Conservancy fairy shrimp in the Plan Area (USFWS 2005).

Implementation of the covered activities will avoid take of Conservancy fairy shrimp (Table 5-19). The Conservation Strategy will protect all mapped habitat within the Plan Area that supports occurrences of Conservancy fairy shrimp. To ensure that the biological goals and objectives for Conservancy fairy shrimp are achieved, results of ongoing effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.
5.6.10 Vernal Pool Fairy Shrimp

5.6.10.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of vernal pool fairy shrimp habitat. Of the 572 acres of the mapped vernal pool fairy shrimp habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped vernal pool fairy shrimp habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped vernal pool fairy shrimp habitat that does not support known occurrences (Table 5-10, Figure 5-22). Implementation of the NHP will provide support for improving the protection level and management of vernal pool fairy shrimp habitat at the Grasslands Regional Park and the Davis Communications Facility site (Figure 5-4); it will also provide support for enhancing and managing existing protected habitat at the Spring Lake Alkali Sink (Figure 5-5).

Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of on vernal pool fairy shrimp that are habitat enhancement methods. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the vernal pool fairy shrimp is the aggressive spread of nonnative species such as perennial pepperweed (ESA and Yolo County 2005; Gerlach 2011), the primary uncertainty associated with this threat is the effectiveness and persistence of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures are not expected to pose a risk to vernal pool fairy shrimp because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.10.2 Summary of Expected Outcome for Vernal Pool Fairy Shrimp

Implementation of the NHP is expected to maintain the distribution and abundance of vernal pool fairy shrimp in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance. While only a small portion of the range-wide distribution of vernal pool fairy shrimp occurs in the Plan Area, implementation of
the NHP is expected to have a stabilizing effect on the distribution wide status of vernal pool fairy shrimp. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species.

Implementation of the conservation measures will mitigate impacts of the covered activities on vernal pool fairy shrimp and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports known occurrences of vernal pool fairy shrimp. To ensure that the biological goals and objectives for vernal pool fairy shrimp are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

5.6.11 Midvalley Fairy Shrimp

5.6.11.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of midvalley fairy shrimp habitat. Of the 572 acres of the mapped midvalley fairy shrimp habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped midvalley fairy shrimp habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped midvalley fairy shrimp habitat that does not support known occurrences (Table 5-10, Figure 5-22). Implementation of the NHP will provide support for improving the protection level and management of midvalley fairy shrimp habitat at the Grasslands Regional Park and the Davis Communications Facility site (Figure 5-4); it will also provide support for enhancing and managing existing protected habitat at the Spring Lake Alkali Sink (Figure 5-5).

5.6.11.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of midvalley fairy shrimp habitat enhancement methods. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the midvalley fairy shrimp is the aggressive spread of nonnative species such as perennial pepperweed (ESA and Yolo County 2005; Gerlach 2011), the primary uncertainty associated with this threat is the effectiveness and persistence of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental
control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures are not expected to pose a risk to midvalley fairy shrimp as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.11.3 Summary of Expected Outcome for Midvalley Fairy Shrimp

Implementation of the NHP is expected to maintain the distribution and abundance of midvalley fairy shrimp in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance. While only a small portion of the range-wide distribution of midvalley fairy shrimp occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the distribution wide status of midvalley fairy shrimp. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on midvalley fairy shrimp and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports occurrences of midvalley fairy shrimp. To ensure that the biological goals and objectives for midvalley fairy shrimp are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

5.6.12 California Linderiella

5.6.12.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of California linderiella habitat. Of the 572 acres of the mapped California linderiella habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped California linderiella habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped California linderiella habitat that does not support known occurrences (Table 5-10, Figure 5-22). Implementation of the NHP will provide support for improving the protection level and management of California linderiella habitat at the Grasslands Regional Park and the Davis Communications Facility site.
(Figure 5-4); it will also provide support for enhancing and managing existing protected habitat at the Spring Lake Alkali Sink (Figure 5-5).

5.6.12.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of California linderiella habitat enhancement methods. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the California linderiella is the aggressive spread of nonnative species such as perennial pepperweed (ESA and Yolo County 2005; Gerlach 2011), the primary uncertainty associated with this threat is the effectiveness and persistence of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures are not expected to pose a risk to California linderiella as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.12.3 Summary of Expected Outcome for California Linderiella

Implementation of the NHP is expected to maintain the distribution and abundance of California linderiella in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance. While only a small portion of the range-wide distribution of California linderiella occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the distribution wide status of California linderiella. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on California linderiella and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports known occurrences of California linderiella. To ensure that the biological goals and objectives for California linderiella are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.
5.6.13 Vernal Pool Tadpole Shrimp

5.6.13.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of vernal pool tadpole shrimp habitat. Of the 572 acres of the mapped vernal pool tadpole shrimp habitat in the Plan Area, 410 acres are currently protected (Table 5-3a). The NHP will protect an additional 55 acres of mapped vernal pool tadpole shrimp habitat (Table 5-7), 53 acres of which support known occurrences in the highest functioning remaining unprotected habitat in the Plan Area. Up to two acres of the 55 acres to be protected will mitigate impacts on low functioning mapped vernal pool tadpole shrimp habitat that does not support known occurrences (Table 5-10, Figure 5-22). Implementation of the NHP will provide support for improving the protection level and management of vernal pool tadpole shrimp habitat and the Grasslands Regional Park and the Davis Communications Facility site (Figures 5-5 and 5-6); it will also provide support for enhancing and managing existing protected habitat and occurrences at the Spring Lake Alkali Sink (Figure 5-5).

5.6.13.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of vernal pool tadpole shrimp habitat enhancement methods. As NHP conservation measures and covered activities are implemented, monitoring and surveys before, during, and after implementation will provide a better understanding of enhancement methods and will reduce the uncertainty associated with the lack of data (see Section 6.3, Monitoring Program).

Since one of the most significant stressor of the vernal pool tadpole shrimp is the aggressive spread of nonnative species such as perennial pepperweed (ESA and Yolo County 2005; Gerlach 2011), the primary uncertainty associated with this threat is the effectiveness and persistence of control measures. To address this uncertainty, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan). Implementation of the conservation measures are not expected to pose a risk to vernal pool tadpole shrimp because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.13.3 Summary of Expected Outcome for Vernal Pool Tadpole Shrimp

Implementation of the NHP is expected to maintain the distribution and abundance of vernal pool tadpole shrimp in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance. While only a small portion of the
range-wide distribution of vernal pool tadpole shrimp occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the distribution wide status of vernal pool tadpole shrimp. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the species. This level of protection meets the requirements of the Recovery Plan to protect 85 percent of its suitable habitat on the Grasslands Regional Park/Davis Communications Facility site (USFWS 2005).

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on vernal pool tadpole shrimp and will conserve the species in the Plan Area. The Conservation Strategy will protect all mapped habitat within the Plan Area that supports known occurrences of vernal pool tadpole shrimp. To ensure that the biological goals and objectives for vernal pool tadpole shrimp are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements and adjustments in habitat management and enhancement techniques.

5.6.14 Valley Elderberry Longhorn Beetle

5.6.14.1 Conservation Approach and Expected Outcomes

The Conservation Strategy provides for the protection, restoration and enhancement of corridors of valley elderberry longhorn beetle riparian habitat that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection of riparian habitat supporting elderberry shrubs that is connected to occupied or potentially occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. In addition, restoration of the valley foothill riparian will include the establishment of elderberry shrubs, thus expanding the availability of suitable habitat. Valley elderberry longhorn beetle will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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).

Figure 5-23 depicts the status of modeled valley elderberry longhorn beetle habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 2,665 acres of modeled valley elderberry longhorn beetle riparian habitat that, in combination with the acreage protected within existing PEHL Category 1 lands, results in protection of 33.8 percent of the modeled riparian habitat in the Plan Area (see Table 5-25). Up to 326 acres of the protected habitat and plantings of elderberry shrubs in restored valley foothill riparian (Table 5-12) will mitigate the direct and indirect impacts of the covered activities on valley elderberry longhorn beetle (Table 5-10).
5.6.14.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the current population status and distribution of valley elderberry longhorn beetle in the Plan Area. To date, comprehensive surveys for valley elderberry longhorn beetle have not been documented and most occurrence data is based on incidental observations. Uncertainties that may be associated with valley elderberry longhorn beetle habitat enhancement and restoration actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring). Implementation of the conservation measures are not expected to pose a risk to valley elderberry longhorn beetle as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.14.3 Summary of Expected Outcome for Valley Elderberry Longhorn Beetle

Implementation of the NHP is expected to maintain the distribution and abundance of valley elderberry longhorn beetle in perpetuity within the Plan Area and, through habitat enhancement and restoration actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although an unknown portion of the range-wide population of valley elderberry longhorn beetle occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing and beneficial effect on the Plan Area-wide status of valley elderberry longhorn beetle and contribute to maintaining connectivity with occupied habitats adjacent to the Plan Area. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the overall population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on valley elderberry longhorn beetle and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of valley elderberry longhorn beetle and substantial areas of suitable habitat. To ensure that the biological goals and objectives for valley elderberry longhorn beetle are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.
5.6.15 California Tiger Salamander

5.6.15.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection and enhancement of large patches of California tiger salamander aquatic and upland habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and restoration of habitat occupied by California tiger salamander and unoccupied habitat that is connected to occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. California tiger salamander will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 California tiger salamander habitat).

Figure 5-24 depicts the status of modeled California tiger salamander habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect 53 acres of modeled California tiger salamander aquatic breeding habitat, 26,680 acres of upland habitat, and 200 seasonal ponds in modeled habitat resulting in, when combined with the acreage protected within existing PEHL Category 1 lands, protection of over 40 percent of modeled habitat acreage and 46 percent of seasonal ponds supporting aquatic breeding habitat (see Table 5-25). Up to 2,835 acres and 66 seasonal ponds will be protected to mitigate the direct and indirect impacts of the covered activities (Table 5-10).

5.6.15.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures are significant data gaps regarding California tiger salamander distribution and population trends within the Plan Area. California tiger salamanders may be more abundant in the Plan Area than available occurrence records indicate; however, surveys have not been conducted within the Dunnigan Unit (in Planning Unit 5) of designated critical habitat area and other areas where the species potentially occurs (see Appendix A15, California Tiger Salamander).

To address uncertainties regarding both the ecological requirements of California tiger salamander and the efficacy of habitat enhancement techniques, the conservation approach includes effectiveness monitoring to evaluate the response of California tiger salamander to implementation of the conservation measures (see Section 6.3, Monitoring Program) in comparison with regional population trend and status. If indicated by NHP monitoring results and relevant monitoring or research conducted by others, implementation of the conservation measures may be modified to improve their effectiveness through the NHP adaptive management decision making process (see Chapter 6, Adaptive Management and Monitoring).
The Implementing Entity will integrate protection and management of habitat with active control of nonnative species to evaluate the long-term population status of the species. To address uncertainties associated with the effectiveness of nonnative species control actions, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in seasonal breeding ponds will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan).

Implementation of the conservation measures are not expected to pose a risk to California tiger salamander as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.15.3 Summary of Expected Outcome for California Tiger Salamander

Implementation of the NHP is expected to maintain the distribution and abundance of California tiger salamander in perpetuity within the Plan Area and, through habitat enhancement and management actions, potentially result in localized increases in its abundance. In addition, the strategy supports the recommendations made by Shaffer et al (2008) in their “Guidelines for the relocation of California tiger: (1) eliminate fish and bullfrogs, (2) provide a means for draining all permanent ponds or eliminate them in favor of ephemeral ponds, (3) pools ponds should have sufficient watershed to provide an adequate hydroperiod for metamorphosis (three to six months), and (4) graze or burn to manage upland and wetland vegetation. Thus, the species will benefit from the NHP conservation approach, especially the protection and restoration of habitat, and active monitoring and surveys to detect and quantify populations in the Plan Area, and to determine their status and trend over the duration of the NHP. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of California tiger salamander occurs in the Plan Area (see Appendix A.15), implementation of the NHP is expected to halt or reverse negative population trends that may exist in the Plan Area and thus support stabilization of range-wide abundance. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the overall population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on California tiger salamander and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of California tiger salamander and substantial areas of suitable habitat. To ensure that the biological goals and objectives for California tiger salamander are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive
management process to improve implementation effectiveness (see Chapter 6, *Adaptive Management and Monitoring*). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.16 Western Spadefoot Toad

5.6.16.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection and enhancement of large patches of western spadefoot toad aquatic and upland habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and restoration of habitat occupied by western spadefoot toad and unoccupied habitat that is connected to occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. Western spadefoot toad will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 western spadefoot toad habitat.

The western spadefoot toad is covered in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005). The Conservation Strategy supports the goals of the Recovery Plan through protection and enhancement of its habitat. The primary focus of the Recovery Plan is protection of vernal pool habitat from loss, fragmentation, degradation, and incompatible uses. All existing vernal pool complex in the Plan Area is currently protected and this goal is supported through implementation of conservation measure CM5, *Enhance and Manage Protected Natural Communities* which provides for managing protected vernal pool complexes such that their habitat functions for western spadefoot toad are maintained or enhanced.

The extent of western spadefoot toad habitat that will be protected and enhanced in the Plan Area with full implementation of the NHP and the conservation approach for the species are illustrated in Figure 5-25. The approach to conservation of western spadefoot toad focuses on protecting ponds supporting aquatic breeding habitat and enhancing its breeding habitat (ponds and existing protected vernal pool complex) and protecting and enhancing large patches of associated upland grassland non-breeding habitat. Implementation of the NHP, combined with the acreage protected within existing PEHL Category 1 lands, will protect 631 acres of modeled western spadefoot aquatic breeding habitat, 20,748 acres of modeled upland habitat, and 119 seasonal ponds (Table 5-25). When combined with existing protected areas, approximately 71 percent of modeled western spadefoot toad aquatic breeding habitat and 39 percent of modeled spadefoot toad upland habitat in the Plan Area will be protected. Up to 377 acres and 4 seasonal ponds will be protected to mitigate direct and indirect impacts of the covered activities (Table 5-10).
5.6.16.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the current population status and distribution of western spadefoot toads in the Plan Area. To date, little is known about the distribution, size, abundance, and viability of western spadefoot toad populations in the Plan Area. The Implementing Entity will integrate protection and management of habitat with active control of nonnative species to evaluate the long-term population status of the species. To address uncertainties associated with the effectiveness of nonnative species control actions, the Implementing Entity will coordinate experimental control activities with USFWS, DFW, and species experts. The effectiveness of controlling nonnative species in seasonal breeding ponds will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision making framework (see Section 6.2, Adaptive Management Plan).

Implementation of the conservation measures are not expected to pose a risk to western spadefoot toad as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.16.3 Summary of Expected Outcome for Western Spadefoot Toad

Implementation of the NHP is expected to maintain the distribution and abundance of western spadefoot toad in perpetuity within the Plan Area and, through habitat enhancement and management actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of western spadefoot toad occurs in the Plan Area (See Appendix A-16), implementation of the NHP is expected to halt or reverse negative population trends that may exist in the Plan Area and thus support stabilization of range-wide abundance. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the overall population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate impacts of the covered activities on western spadefoot toad and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of western spadefoot toad and substantial areas of suitable habitat. To ensure that the biological goals and objectives for western spadefoot toad are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the
conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.17  Foothill Yellow-Legged Frog

5.6.17.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection and enhancement of modeled foothill yellow-legged frog habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and enhancement of habitat along modeled stream corridors that support suitable foothill yellow-legged frog aquatic breeding and upland habitat. Foothill yellow-legged frog will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 foothill yellow-legged frog habitat).

Figure 5-26 depicts the status of modeled Foothill yellow-legged frog in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 55 acres of modeled aquatic breeding habitat and 60 acres of modeled upland habitat, resulting, in combination with habitat protected within existing PEHL Category 1 lands, in protection of approximately 66 percent of the modeled aquatic breeding habitat and 76 percent of the modeled upland habitat in the Plan Area (Table 5-25).

5.6.17.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the current population status and distribution of foothill yellow-legged frog in the Plan Area. The current observation records are insufficient to assess abundance and population structure across the Plan Area and to evaluate habitat and metapopulation fragmentation. Uncertainties that may be associated with foothill yellow-legged frog habitat enhancement and actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring). Implementation of the conservation measures are not expected to pose a risk to foothill yellow-legged frog as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.17.3 Summary of Expected Outcome for Foothill Yellow-Legged Frog

Implementation of the NHP is expected to maintain the distribution and abundance of foothill yellow-legged frog in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal
gradients. Although only a relatively small portion of the range-wide population of foothill yellow-legged frog occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the range-wide status of foothill yellow-legged frog by maintaining connectivity with occupied habitats west of the Plan Area.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on foothill yellow-legged frog and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of Foothill yellow-legged frog and substantial areas of suitable habitat. To ensure that the biological goals and objectives for foothill yellow-legged frog are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.18 Western Pond Turtle

5.6.18.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of western pond turtle aquatic and upland habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection of western pond turtle habitat that is connected to occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. Western pond turtle will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 western pond turtle habitat). The approach to conservation of western pond turtle is consistent with USFWS Draft Giant Garter Snake Recovery Plan (USFWS 1999) goals for the western pond turtle.

Figure 5-27 depicts the status of modeled western pond turtle habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 5,600 acres of modeled western pond turtle aquatic breeding habitat and 6,180 acres of nesting and overwintering habitat, and 40 perennial ponds in modeled habitat (aquatic breeding habitat) resulting, in combination with habitat protected within existing PEHL Category 1 lands, in protection of approximately 26 percent of modeled habitat acreage and 26.8 percent of ponds supporting aquatic breeding habitat (Table 5-25).
5.6.18.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of habitat restoration, enhancement, and management actions to maintain and increase the abundance of western pond turtle in the Plan Area. Uncertainties that may be associated with western pond turtle habitat enhancement and management actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring). Implementation of the conservation measures are not expected to pose a risk to Western pond turtle as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.18.3 Summary of Expected Outcome for Western Pond Turtle

Implementation of the NHP is expected to maintain the distribution and abundance of western pond turtle in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of western pond turtle occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing and beneficial effect on the Plan Area-wide status of western pond turtle and contribute to maintaining connectivity with occupied habitats adjacent to the Plan Area. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the overall population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on western pond turtle and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of Western pond turtle and substantial areas of suitable habitat. To ensure that the biological goals and objectives for western pond turtle are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.
5.6.19 Giant Garter Snake

5.6.19.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration, enhancement, and management of occupied habitat supporting the Colusa Basin subpopulation in Planning Units 12 and 13 and the Willow Slough/Yolo Bypass subpopulation in Planning Unit 11. Protected and restored habitat will be designed to provide mosaics of giant garter snake aquatic and upland habitat in large patches that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus of the Conservation Strategy is the protection of giant garter snake occupied and unoccupied habitat within the matrix of rice lands supporting the two giant garter snake subpopulations. The protected unoccupied habitat must be connected to occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. Habitat nodes comprised of a mosaic of open water, emergent vegetation, and uplands specifically designed and managed to support high functioning giant garter snake habitat will be restored within the rice land matrix that supports the two subpopulations. The larger and encompassing system of NHP conservation lands will ensure the availability of habitat to accommodate potential future shifts in giant garter snake distribution in response to changed environmental conditions (e.g., effects of climate change on the future distribution habitat). The NHP approach for conserving giant garter snake is consistent with achieving the goals of the USFWS Draft Giant Garter Snake Recovery Plan (USFWS 1999).

Figure 5-28 depicts the status of modeled giant garter snake habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect 6,400 acres of modeled active season aquatic habitat, 192 acres of modeled active season upland and movement habitat, and 312 acres of modeled overwintering habitat, of which up to 3,162 acres will mitigate the direct and indirect impacts of the covered activities on giant garter snake habitat. In addition, under CM4, Restore Natural Communities and Habitat, 170 acres of giant garter snake habitat, comprised of a mosaic of open water, emergent wetland, and upland, will be restored in Planning Units 12 and 13 to benefit the Colusa Basin subpopulation and 170 acres will be restored in Planning Unit 11 to benefit the Willow Slough/Yolo Bypass subpopulation (total of 340 acres of giant garter snake habitat restoration). An additional 203 acres of fresh emergent wetland restoration will be designed and managed as giant garter snake habitat in these Planning Units as a mitigation requirement for impacts on the emergent wetland natural community in the Valley Landscape Unit (Table 5-6).

In combination with habitat protected within existing PEHL Category 1 lands, implementation of the NHP will result in the protection of approximately 45 percent of modeled giant garter snake active season aquatic habitat, 76 percent of modeled active season upland movement habitat, and 57 percent of modeled overwintering habitat in the Plan Area (Table 5-25). Using the methods described in Appendix A.19, Giant Garter Snake, to estimate the number of giant garter snakes in Plan Area, implementation of the NHP, in combination with existing protected giant garter
snake habitat, will protect approximately 25 percent of the baseline giant garter snake population estimate (Table 5-26), including a projected net increase in population of 76 giant garter snakes based on the combined effects of the covered activities and the NHP habitat restoration (Table 5-26).

5.6.19.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the time required for restored habitats to develop as fully functioning habitat for giant garter snake (e.g., establishment of a self-sustaining prey base) and the rate of subsequent colonization of restored habitat by giant garter snakes. Uncertainties that may be associated with giant garter snake habitat enhancement and restoration actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring). Since one of the most significant stressors on giant garter snake (aside from habitat loss) is the aggressive spread of nonnative predators, the primary uncertainty associated with this threat is the rate at which these predators species invade restored habitat, and the effectiveness of predator control measures. To address this uncertainty, the Implementing Entity will conduct directed studies and coordinate predator control experiments with USFWS, DFW, and giant garter snake experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision framework.

Implementation of the conservation measures are not expected to pose a risk to giant garter snake as they are designed to protect and enhance snake habitat and remove and reduce existing stressors.
Table 5-26. Estimated Number of Giant Garter Snakes Protected with in Planning Units
11–13 with Full Implementation of the NHP Relative to Baseline Conditions
5.6.19.3 Summary of Expected Outcome for Giant Garter Snake

Implementation of the NHP is expected to maintain the distribution and abundance of giant garter snake in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance. The Conservation Strategy supports the goals of the Draft Giant Garter Snake Recovery Plan (USFWS 1999). A NHP conservation lands system, assembled based on the principles of conservation biology, will provide for the long-term availability of protected habitat necessary to maintain the snake population in the Plan Area in the face of potential changes to habitat conditions from climate change or other environmental changes. The completed NHP conservation lands system will provide habitat across the range of ecological gradients in the eastern Plan Area and provide ecological connectivity to the habitat in adjacent HCP and NCCP plan areas. Although only a relatively small portion of the range-wide population of giant garter snake occurs in the Plan Area, implementation of the NHP is expected to have a substantial stabilizing effect on the status of the Colusa Basin and Willow Slough/Yolo Bypass subpopulations through protection and enhancement of habitat. Restoration of giant garter snake habitat within NHP protected lands is also expected to increase the abundance of giant garter snakes in these subpopulations. These conservation actions are expected to contribute to maintaining the genetic diversity of the overall population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on giant garter snake and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of giant garter snake and substantial areas of suitable habitat. To ensure that the biological goals and objectives for giant garter snake are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques and habitat restoration design.

5.6.20 Swainson’s Hawk

5.6.20.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of Swainson’s hawk nesting and foraging habitat that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus of the NHP Conservation Strategy is on protection and restoration of habitat within Planning Units that support the highest densities of Swainson’s hawk nesting territories within the agricultural matrix of the Valley Landscape Unit and of natural habitat areas in adjacent Planning Units to ensure sufficient
availability of habitat to accommodate the existing breeding population and allow for future
expansion. Swainson’s hawk will be protected within a larger connected system of conservation
lands that will ensure the availability of habitat 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 Swainson’s hawk habitat, changes in agricultural production).

Figure 5-29 depicts the status of modeled Swainson’s hawk habitat in the Plan Area with full
NHP implementation. Implementation of the NHP will protect 165 Swainson’s hawk nest sites,
7,066 acres of modeled and restored nesting habitat, 17,620 acres of modeled natural foraging
habitat, and 11,260 acres of modeled agricultural foraging habitat resulting, in combination with
habitat protected within existing PEHL Category 1 lands, in protection of 54 percent of known
nest sites, approximately 54 percent of its modeled nesting habitat, approximately 38 percent of
natural foraging habitat, and approximately 6 percent of its modeled agricultural foraging habitat
(Table 5-25).

5.6.20.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures
is related to limiting factors affecting survival and reproduction of Swainson’s hawk in the Plan
Area. Uncertainties that may be associated with Swainson’s hawk habitat enhancement and
restoration actions will be addressed through evaluation of effectiveness monitoring results (see
Chapter 6, Adaptive Management and Monitoring).

Implementation of the conservation measures are not expected to pose a risk to Swainson’s hawk
as they are directed at protecting and enhancing its habitat and removing or reducing existing
stressors on the species.

5.6.20.3 Summary of Expected Outcome for Swainson’s Hawk

Implementation of the NHP is expected to maintain the distribution and abundance of
Swainson’s hawk in perpetuity within the Plan Area and, through habitat enhancement and
restoration actions, potentially result in localized increases in its abundance. Implementation of
the NHP is expected to maintain the existing high density of nesting Swainson’s hawk in the
Plan Area which is expected to maintain and support the potential expansion of nesting
populations in the Sacramento Valley. The long-term availability of protected habitat necessary
to maintain the Plan Area population in the face of potential climate change or other
environmental conditions is provided for through the NHP conservation lands system, the
assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal
gradients.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the
covered activities on Swainson’s hawk and will conserve the population in the Plan Area. The
Conservation Strategy will establish an interconnected system of conservation lands that support
occurrences of Swainson’s hawk and a substantial acreage of suitable habitat. To ensure that the
biological goals and objectives for Swainson’s hawk are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.21 Northern Harrier

5.6.21.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection and enhancement of large patches of northern harrier foraging and nesting habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The conservation strategy for northern harrier includes protecting and enhancing its natural nesting/foraging habitats, including agricultural foraging and nesting habitats. Northern harrier will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 northern harrier habitat).

Figure 5-30 depicts the status of modeled northern harrier habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect 401 acres of modeled northern harrier primary nesting/foraging habitat and 14,310 acres of modeled secondary nesting/foraging habitat, resulting, in combination with habitat protected within existing PEHL Category 1 lands, in protection of approximately 66.7 and 16.1 percent, respectively of these modeled habitat types in the Plan Area (see Table 5-25).

5.6.21.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of habitat restoration, enhancement, and management actions in maintaining and increasing the abundance of northern harrier in the Plan Area. Uncertainties that may be associated with northern harrier habitat enhancement and management actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring).

Implementation of the conservation measures are not expected to pose a risk to northern harrier as they are directed at protecting and enhancing its habitat and removing or reducing existing stressors.
5.6.21.3 Summary of Expected Outcome for Northern Harrier

Implementation of the NHP is expected to maintain the distribution and abundance of northern harrier in perpetuity within the Plan Area and, through habitat enhancement and restoration actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on northern harrier and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of Northern harrier and substantial areas of suitable habitat. To ensure that the biological goals and objectives for northern harrier are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.22 White-Tailed Kite

5.6.22.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of white-tailed kite nesting and foraging habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and restoration of habitat within Planning Units that support high quality white-tailed kite nesting territories within the agricultural matrix of the Valley Landscape Unit and natural habitat areas in adjacent Planning Units to ensure sufficient availability of habitat to accommodate the existing breeding population and provide for its potential future expansion. White-tailed kite will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 white-tailed kite habitat, changes in agricultural production).

Figure 5-31 depicts the status of modeled white-tailed kite habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect 8,950 acres of modeled white-tailed kite nesting habitat and 29,235 acres of modeled primary and secondary foraging habitat, resulting, in combination with habitat protected within existing PEHL Category 1 lands, in
protection of approximately 40 percent of nesting habitat and 14.9 percent of primary and secondary foraging habitat (Table 5-25). Though specific conservation targets are not established for modeled secondary white-tailed kite foraging habitat, secondary foraging habitat will be protected through achievement of the natural communities’ protection objectives (Table 5-5a).

### 5.6.22.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is related to limiting factors affecting survival and reproduction of white-tailed kite in the Plan Area.

Implementation of the conservation measures are not expected to pose a risk to white-tailed kite as they are directed at protecting and enhancing its habitat and removing or reducing current stressors on the species.

### 5.6.22.3 Summary of Expected Outcome for White-Tailed Kite

Implementation of the NHP is expected to maintain the distribution and abundance of white-tailed kite in perpetuity within the Plan Area and, through habitat enhancement and restoration actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of white-tailed kite occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing and beneficial effect on the Plan Area-wide status of white-tailed kite and contribute to maintaining connectivity with populations adjacent to the Plan Area.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on white-tailed kite and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of white-tailed kite and substantial areas of suitable habitat. To ensure that the biological goals and objectives for white-tailed kite are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.
5.6.23 Black Tern

5.6.23.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of modeled black tern habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The conservation strategy for black tern includes protecting, restoring, and enhancing its fresh emergent wetland and rice land habitats. Black tern will be protected within a larger connected system of conservation lands that will ensure the availability of habitat to accommodate potential future establishment of a nesting population in the Plan Area and shifts in its distribution in response to changed environmental conditions (e.g., effects of climate change on the future distribution of black tern habitat).

Figure 5-32 depicts the status of modeled black tern habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 103 acres of modeled black tern freshwater marsh habitat and 6,400 acres of rice field habitat resulting, in combination with habitat protected within existing PEHL Category 1 lands, in protection of approximately 84 and 24 percent, respectively of these modeled habitat types in the Plan Area (see Table 5-25).

5.6.23.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of habitat restoration, enhancement, and management actions to promote the eventual establishment of a nesting population of black tern in the Plan Area. Uncertainties that may be associated with black tern habitat enhancement and management actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring). Implementation of the conservation measures are not expected to pose a risk to black tern as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.23.3 Summary of Expected Outcome for Black Tern

Implementation of the NHP is expected to maintain the distribution and abundance of black tern in perpetuity within the Plan Area and, through habitat enhancement actions, potentially result in localized increases in its abundance and, ultimately, in re-establishment of a nesting population. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of black tern occurs in the Plan Area, implementation of the NHP is expected to maintain sufficient habitat to support the migrant population of black terns that use the Plan Area and to have a beneficial effect on regional populations should black tern become established as nesting species in the Plan Area.
Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on black tern and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of black tern and substantial areas of suitable habitat. To ensure that the biological goals and objectives for black tern are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.24 Western Yellow-Billed Cuckoo

5.6.24.1 Conservation Approach and Expected Outcomes

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of riparian forest that support western yellow-billed cuckoo habitat that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and restoration of suitable western yellow-billed cuckoo habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population and the protection of up to 5 western yellow-billed cuckoo nest sites that could be discovered in the Plan Area over the term of the NHP. Restoration of the valley foothill riparian land cover type will restore patches of habitat suitable to western yellow-billed cuckoo. Western yellow-billed cuckoo habitat will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 western yellow-billed cuckoo habitat).

Figure 5-33 depicts the status of modeled western yellow-billed cuckoo habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 790 acres of modeled western yellow-billed cuckoo nesting/foraging habitat and restore at least 76 acres of habitat that, in combination with the acreage protected within existing PEHL Category 1 lands, results in protection of 36.6 percent of the modeled nesting/foraging habitat in the Plan Area (see Table 5-25). Up to 152 acres of the protected and up to 76 acres of the restored habitat will mitigate the direct and indirect impacts of the covered activities on western yellow-billed cuckoo (Table 5-10).

5.6.24.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the likelihood for their ultimate effectiveness in establishing a breeding population in the Plan Area. Uncertainties that may be associated with western yellow-billed cuckoo habitat
enhancement and restoration actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring).

Implementation of the conservation measures is not expected to pose a risk to western yellow-billed cuckoo because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.24.3 Summary of Expected Outcome for Western Yellow-Billed Cuckoo

Implementation of the NHP is expected to sustain sufficient habitat area to support western yellow-billed cuckoo that migrate through the Plan Area and, through habitat enhancement and restoration actions, support potential future establishment of nesting breeding population in the Plan Area. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although there are no breeding western yellow-billed cuckoo pairs in the Plan Area, implementation of the NHP is expected to have a stabilizing and beneficial effect on the Plan Area-wide status of western yellow-billed cuckoo. Implementation of the Conservation Strategy will contribute to maintaining the Plan Area as a migration corridor for the species and make it more attractive as a nesting area in the future.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on western yellow-billed cuckoo and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of western yellow-billed cuckoo and substantial areas of suitable habitat. To ensure that the biological goals and objectives for western yellow-billed cuckoo are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.25 Western Burrowing Owl

5.6.25.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection and enhancement of large patches of western burrowing owl habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The conservation approach also focuses on protection of unprotected existing western burrowing owl nesting burrows and those that may be discovered over the term of the NHP. Western burrowing owl habitat will be protected within a larger
connected system of conservation lands that will ensure the availability of nesting burrow and
foraging habitat to ensure sufficient availability of habitat to accommodate the potential future
expansion of its population and 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 western burrowing owl habitat).

Figure 5-34 depicts the status of modeled western burrowing owl habitat in the Plan Area with
full NHP implementation. Implementation of the NHP will protect an additional 14,500 acres of
modeled western burrowing owl primary habitat and at least 10 occupied western burrowing owl
nesting burrows (Tables 5-7 and 5-25).

5.6.25.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures
is the effectiveness of habitat management and enhancement actions to maintain and increase the
distribution and abundance of western burrowing owl. These uncertainties will be addressed
through the applicable landscape-, natural community-, and species-level monitoring actions
described in Section 6.3, Monitoring Program.

Implementation of the conservation measures are not expected to pose a risk to western
burrowing owl as they are directed at protecting and enhancing its habitat and removing or
reducing current existing stressors.

5.6.25.3 Summary of Expected Outcome for Western Burrowing Owl

Implementation of the NHP is expected to maintain the distribution and abundance of western
burrowing owl in perpetuity within the Plan Area and, through habitat enhancement and
management actions, potentially result in localized increases in its abundance. The long-term
availability of protected habitat necessary to maintain the Plan Area population in the face of
potential climate change or other environmental conditions is provided for through the NHP
conservation lands system, the assembly of which will provide habitat across the range of Plan
Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-
wide population of western burrowing owl occurs in the Plan Area, implementation of the NHP
is expected to have a stabilizing effect regionally and within the Plan Area. Implementation of
the Conservation Strategy will contribute to maintaining the genetic diversity of the overall
population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the
covered activities on western burrowing owl and will conserve the population in the Plan Area.
The Conservation Strategy will establish an interconnected system of conservation lands that
support occurrences of western burrowing owl and substantial areas of suitable habitat. To
ensure that the biological goals and objectives for western burrowing owl are achieved, results of
ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP
to determine if implementation of the NHP should be adjusted through the adaptive management
process to improve implementation effectiveness (see Chapter 6, *Adaptive Management and Monitoring*). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

### 5.6.26 Loggerhead Shrike

#### 5.6.26.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of loggerhead shrike foraging and nesting/perching habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and restoration of habitat occupied by loggerhead shrike and unoccupied habitat that is connected to occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. Loggerhead shrike will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 loggerhead shrike habitat).

Figure 5-35 depicts the status of modeled loggerhead shrike habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 3,000 acres of modeled loggerhead shrike nesting/perching habitat and 15,000 acres of modeled foraging habitat (Table 5-25). Up to 6,221 acres of the protected habitat will mitigate the direct and indirect impacts of the covered activities on loggerhead shrike (Table 5-10).

#### 5.6.26.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the current population status and distribution of loggerhead shrike in the Plan Area and the effectiveness of habitat restoration, enhancement, and management actions to maintain and increase the abundance and distribution of loggerhead shrike in the Plan Area. These uncertainties will be addressed through the applicable landscape-, natural community-, and species-level monitoring actions described in Section 6.3, *Monitoring Program*. Implementation of the conservation measures are not expected to pose a risk to loggerhead shrike as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

#### 5.6.26.3 Summary of Expected Outcome for Loggerhead Shrike

Implementation of the NHP is expected to maintain the distribution and abundance of loggerhead shrike in perpetuity within the Plan Area and, through habitat management, enhancement, and restoration actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of...
potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of loggerhead shrike occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the status of loggerhead shrike regionally and within the Plan Area.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on loggerhead shrike and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of loggerhead shrike and substantial areas of suitable habitat. To ensure that the biological goals and objectives for loggerhead shrike are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.27 Least Bell’s Vireo

5.6.27.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of least Bell’s vireo aquatic and upland habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and restoration of suitable least Bell’s vireo habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population and the protection of up to 5 least Bell’s vireo nest sites that could be discovered in the Plan Area over the term of the NHP. Restoration of the valley foothill riparian land cover type will restore patches of habitat suitable to least Bell’s vireo. Least Bell’s vireo habitat will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 least Bell’s vireo habitat).

Figure 5-36 depicts the status of modeled least Bell’s vireo habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 2,420 acres of modeled least Bell’s vireo nesting/foraging habitat and restore at least 149 acres of habitat that, in combination with the acreage protected within existing PEHL Category 1, results in protection of approximately 44 percent of modeled habitat acreage (see Table 5-25). Up to 298 acres of the protected and up to 149 acres of the restored habitat will mitigate the direct and indirect impacts of the covered activities on least Bell’s vireo.
5.6.27.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the likelihood for their ultimate effectiveness in establishing a breeding population of least Bell’s vireo in the Plan Area. Uncertainties that may be associated with least Bell’s vireo habitat enhancement and restoration actions will be addressed through evaluation of effectiveness monitoring results (see Chapter 6, Adaptive Management and Monitoring).

Implementation of the conservation measures is not expected to pose a risk to least Bell’s vireo because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.27.3 Summary of Expected Outcome for Least Bell’s Vireo

Implementation of the NHP is expected to sustain sufficient habitat area to support least Bell’s vireo that migrate through the Plan Area and, through habitat enhancement and restoration actions, support potential future establishment of nesting breeding population in the Plan Area. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although there are no breeding least Bell’s vireo pairs in the Plan Area, implementation of the NHP is expected to have a stabilizing and beneficial effect on the Plan Area-wide status of least Bell’s vireo. Implementation of the Conservation Strategy will contribute to maintaining the Plan Area as a migration corridor for the species and make it more attractive as a nesting area in the future.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on least Bell’s vireo and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of least Bell’s vireo and substantial areas of suitable habitat. To ensure that the biological goals and objectives for least Bell’s vireo are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.
5.6.28 Bank Swallow

5.6.28.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The approach to conservation of bank swallow focuses on protecting stream corridors with eroding banks that support its nesting habitat and nesting colonies that may establish in unprotected habitat areas over the term of the NHP. Bank swallow nesting habitat will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 bank swallow habitat). Conservation provided by the NHP also contributes to the goals of the DFW bank swallow recovery plan (DFG 1992) to ensure that (1) the remaining population of this species does not suffer further declines in either range or abundance; and (2) sufficient habitat is available to ensure that the species will be able to survive as a member of California’s avifauna.

Figure 5-37 depicts the status of modeled bank swallow habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect 700 acres of modeled bank swallow nesting habitat along Cache Creek (Planning Unit 7) and Putah Creek (Planning Unit 6) (Tables 5-7 and 5-25). Of the total 700 acres, up to 6 acres will be protected to mitigate the direct and indirect impacts of the covered activities (Table 5-10).

5.6.28.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the current population status and distribution of bank swallow nesting colonies in the Plan Area. These uncertainties will be addressed through the applicable landscape-, natural community– and species-level monitoring actions described in Section 6.3, Monitoring Program. Implementation of the conservation measures are not expected to pose a risk to bank swallow as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.28.3 Summary of Expected Outcome for Bank Swallow

Implementation of the NHP is expected to maintain the distribution and abundance of bank swallow in perpetuity within the Plan Area. Providing for the long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of bank swallow occurs in the Plan Area, implementation of the NHP is expected to have a stabilizing effect on the range wide status of bank swallow. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the overall population and a robust metapopulation structure.
Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on bank swallow and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of bank swallow and substantial areas of suitable habitat. To ensure that the biological goals and objectives for bank swallow are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management techniques.

5.6.29 Yellow-Breasted Chat

5.6.29.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of yellow-breasted chat habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection and restoration of habitat occupied by yellow-breasted chat and unoccupied habitat that is connected to occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. Yellow-breasted chat will be protected within a larger connected system of conservation lands that will ensure the availability of habitat 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 yellow-breasted chat habitat).

Figure 5-38 depicts the status of modeled yellow-breasted chat habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 1,180 acres of modeled yellow-breasted chat nesting and foraging habitat and restore at least 30 acres of habitat that, in combination with the acreage protected within existing PEHL Category 1 lands, results in protection of 52 percent of modeled nesting/foraging habitat acreage (Table 5-25). Up to 60 acres of the protected and up to 30 acres of the restored habitat will mitigate the direct and indirect impacts of the covered activities on yellow-breasted chat (Table 5-10).

5.6.29.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the current population status and distribution of yellow-breasted chat in the Plan Area and the limiting factors that may restrict its current distribution or reproduction and survival. Since one of the most significant stressor of the yellow-breasted chat (aside from habitat loss) is nest parasitism by brown-headed cowbirds, the rate at which cowbirds invade restored habitat, and the effectiveness of control measures are the primary focal points of monitoring. To address this uncertainty, the Implementing Entity will coordinate experimental brown-headed cowbird...
control activities, if necessary and practicable, with USFWS, DFW, and yellow-breasted chat experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision framework.

Implementation of the conservation measures are not expected to pose a risk to yellow-breasted chat because they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors on the species.

5.6.29.3 Summary of Expected Outcome for Yellow-Breasted Chat

Implementation of the NHP is expected to maintain the distribution and abundance of yellow-breasted chat in perpetuity within the Plan Area and, through habitat enhancement and restoration actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of yellow-breasted chat occurs in the Plan Area, implementation of the NHP is expected to have stabilizing effect on the status of yellow-breasted chat beyond the Plan Area.

Implementation of the conservation measures will mitigate direct and indirect impacts of the covered activities on yellow-breasted chat and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of yellow-breasted chat and substantial areas of suitable habitat. To ensure that the biological goals and objectives for yellow-breasted chat are achieved results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if NHP implementation should be adjusted through the NHP adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.30 Grasshopper Sparrow

5.6.30.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection and enhancement of large patches of grasshopper sparrow habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The focus is on protection of habitat occupied by grasshopper sparrow and unoccupied habitat that is connected to occupied habitat to ensure sufficient availability of habitat to accommodate potential future expansion of its population. Grasshopper sparrow will be protected within a larger connected system of conservation lands.
that will ensure the availability of habitat to accommodate potential future expansion of its
breeding population and 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
grasshopper sparrow habitat).

Figure 5-39 depicts the status of modeled grasshopper sparrow habitat in the Plan Area with full
NHP implementation. Implementation of the NHP will protect 17,900 acres modeled
grasshopper sparrow habitat, up to 2,145 acres of which will mitigate the direct and indirect
impacts of the covered activities on grasshopper sparrow (Table 5-10).

5.6.30.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures
is the current population status and distribution of grasshopper sparrow in the Plan Area and the
effectiveness of habitat management and enhancement actions to maintain and improve habitat
conditions in support of grasshopper sparrow breeding. These uncertainties will be addressed
through the applicable landscape-, natural community-, and species-level monitoring actions
described in Section 6.3, Monitoring Program. Implementation of the conservation measures
are not expected to pose a risk to grasshopper sparrow as they are directed at protecting and
enhancing its habitat and removing or reducing current existing stressors.

5.6.30.3 Summary of Expected Outcome for Grasshopper Sparrow

Implementation of the NHP is expected to maintain the distribution and abundance of
grasshopper sparrow in perpetuity within the Plan Area and, through habitat enhancement and
management actions, potentially result in localized increases in its abundance. The long-term
availability of protected habitat necessary to maintain the Plan Area population in the face of
potential climate change or other environmental conditions is provided for through the NHP
conservation lands system, the assembly of which will provide habitat across the range of Plan
Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-
wide population of grasshopper sparrow occurs in the Plan Area, implementation of the NHP is
expected to have a stabilizing effect on the status of grasshopper sparrow regionally and within
the Plan Area.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the
covered activities on grasshopper sparrow and will conserve the population in the Plan Area.
The Conservation Strategy will establish an interconnected system of conservation lands that
support occurrences of grasshopper sparrow and substantial areas of suitable habitat. To ensure
that the biological goals and objectives for grasshopper sparrow are achieved results of ongoing
NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to
determine if implementation of the NHP should be adjusted through the adaptive management
process to improve implementation effectiveness (see Chapter 6, Adaptive Management and
Monitoring). Such adjustments can include improvements in the selection of lands to be
protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.31 Tricolored Blackbird

5.6.31.1 Conservation Approach and Expected Outcomes of the Conservation Strategy

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of tricolored blackbird nesting and upland habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The conservation approach also focuses on protection of unprotected existing tricolored blackbird nest sites and those that may be discovered over the term of the NHP. Tricolored blackbird habitat will be protected within a larger connected system of conservation lands that will ensure the availability of nesting and foraging habitat to ensure sufficient availability of habitat to accommodate the potential future expansion of its population and 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 tricolored blackbird habitat).

Figure 5-40 depicts the status of modeled tricolored blackbird habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 501 acres of modeled tricolored blackbird nesting habitat, 26,600 acres of modeled foraging habitat, and up to 5 nesting colonies that may be located over the term of the NHP (Tables 5-7 and 5-25). Of the total 27,101 acres, up to 6,376 acres will be protected to mitigate the direct and indirect impacts of the covered activities (Table 5-10).

5.6.31.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the effectiveness of habitat restoration, enhancement, and management actions to maintain and increase survival and production in nesting colonies and to encourage the establishment of nesting colonies in protected and restored nesting habitat. These uncertainties will be addressed through the applicable landscape-, natural community-, and species-level monitoring actions described in Section 6.3, Monitoring Program. Since one of the most significant stressor of the tricolored blackbird (aside from habitat loss) is the aggressive spread of brown-headed cowbirds, the primary uncertainty associated with this threat is the rate at which these species invade restored habitat, and the effectiveness of control measures. To address this uncertainty, the Implementing Entity will coordinate any experimental brown-headed cowbird control activities with USFWS, DFW, and tricolored blackbird experts. The effectiveness of controlling nonnative species in existing and restored habitats will be monitored and necessary changes to the methodology or control action frequency will be implemented in an adaptive decision framework. Implementation of the conservation measures are not expected to pose a risk to
tricolored blackbird as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.31.3 **Summary of Expected Outcome for Tricolored Blackbird**

Implementation of the NHP is expected to maintain the distribution and abundance of tricolored blackbird in perpetuity within the Plan Area and, through habitat restoration and enhancement actions, potentially result in localized increases in its abundance. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Although only a relatively small portion of the range-wide population of tricolored blackbird occurs in the Plan Area, implementation of the NHP is expected to have substantial stabilizing effect on the regional status of tricolored blackbird by maintaining and potentially increasing the Plan Area population of breeding tricolored blackbird. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the overall population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on tricolored blackbird and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of tricolored blackbird, including nesting sites, and substantial areas of suitable habitat. To ensure that the biological goals and objectives for tricolored blackbird are achieved, results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in habitat management and enhancement techniques.

5.6.32 Townsend’s Big-Eared Bat

5.6.32.1 **Conservation Approach and Expected Outcomes of the Conservation Strategy**

The Conservation Strategy provides for the protection, restoration and enhancement of large patches of Townsend’s big-eared bat foraging habitats that are spatially distributed to provide landscape-level connectivity among protected habitats. The conservation approach also focuses on protection of unprotected Townsend’s big-eared bat roosts that are located over the term of the NHP. Townsend’s big-eared bat habitat will be protected within a larger connected system of conservation lands that will ensure the availability of foraging habitat 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 Townsend’s big-eared bat habitat).
Figure 5-41 depicts the status of modeled Townsend’s big-eared bat habitat in the Plan Area with full NHP implementation. Implementation of the NHP will protect an additional 14,500 acres of foraging and roosting habitat in addition to the 23,314 acres of existing protected habitat and up to 10 maternity and roosting colonies as they are discovered over the term of the NHP (see Table 5-7, Table 5-25).

5.6.32.2 Ecological Uncertainty and Risk of Conservation Actions

The primary ecological uncertainty associated with implementation of the conservation measures is the current population status and distribution of Townsend’s big-eared bat in the Plan Area, particularly the location and status of roost sites. These uncertainties will be addressed through the applicable landscape-, natural community-, and species-level monitoring actions and possible directed studies described in Section 6.3, Monitoring Program. Implementation of the conservation measures are not expected to pose a risk to Townsend’s big-eared bat as they are directed at protecting and enhancing its habitat and removing or reducing current existing stressors.

5.6.32.3 Summary of Expected Outcome for Townsend’s Big-Eared Bat

Implementation of the NHP is expected to maintain the distribution and abundance of Townsend’s big-eared bat in perpetuity within the Plan Area. The long-term availability of protected habitat necessary to maintain the Plan Area population in the face of potential climate change or other environmental conditions is provided for through the NHP conservation lands system, the assembly of which will provide habitat across the range of Plan Area latitudinal and altitudinal gradients. Protection of Townsend’s big-eared bat roosts is expected to maintain the survival and production of Townsend’s big-eared bat in the Plan Area and potentially increase these parameters through preventing disturbance and management of roost sites. Implementation of the Conservation Strategy will contribute to maintaining the genetic diversity of the overall population and will support a robust metapopulation structure.

Implementation of the conservation measures will mitigate the direct and indirect impacts of the covered activities on Townsend’s big-eared bat and will conserve the population in the Plan Area. The Conservation Strategy will establish an interconnected system of conservation lands that support occurrences of Townsend’s big-eared bat and substantial areas of suitable habitat. To ensure that the biological goals and objectives for Townsend’s big-eared bat are achieved results of ongoing NHP effectiveness monitoring will be periodically evaluated over the term of the NHP to determine if implementation of the NHP should be adjusted through the adaptive management process to improve implementation effectiveness (see Chapter 6, Adaptive Management and Monitoring). Such adjustments can include improvements in the selection of lands to be protected as the conservation land system is assembled and adjustments in roost site management and enhancement techniques.
5.7 **CONSERVATION PROVIDED FOR LOCAL CONCERN SPECIES**

The Steering Advisory Committee designated 42 species as “local concern species” (Table 1–3) that are not proposed as covered species for ESA and NCCPA compliance. These local concern species are rare, declining, or potentially threatened by land use changes, are known to occur in the Plan Area, and are of concern to local organizations. Many of the Conservation Strategy conservation measures for natural communities and covered species (see Section 5.4, *Conservation Measures*) and the local conservation measures see Section 5.9, *Local Conservation Strategy*) address the habitat needs of these local concern species. This section describes how implementation of the Conservation Strategy and Local Conservation Strategy are expected to benefit each of the NHP local concern species. Conservation benefits that will be provided through implementation of the Conservation Strategy and Local Conservation Strategy for local concern species result from the protection, enhancement, restoration, management, and maintenance of natural communities and agricultural crop types that support habitat for local concern species. Table 5-24 summarizes the natural communities and agricultural crop types conserved under the NHP that support habitat for the local concern species. Conservation benefits provided under the NHP for the local concern species are expected to reduce the potential for these species to become listed as threatened or endangered species under the ESA and CESA.

### 5.7.1 Bent-Flowered Fiddleneck

Bent-flowered fiddleneck occurs in coastal bluff scrub, cismontane woodland, and valley and foothill grassland. Bent-flowered fiddleneck occurs as far north as Humboldt County and as far south as Monterey County. Specimens have been collected in Sonoma, Marin, San Mateo, Santa Cruz, Colusa, Lake, Yolo, Napa, San Benito, Merced, Santa Clara, Alameda, and Contra Costa counties. The exact location of a historical occurrence that may have been in the Plan Area is unknown, but it was described in 1938 as located along a grade on Rumsey-Arbuckle Road. Little is known about the specific ecological requirements of bent-flowered fiddleneck, beyond the plant communities in which it has been found. The primary threats to bent-flowered fiddleneck are the loss of grassland and woodland habitats through development (see Appendix B, *Local Concern Species Accounts*).

#### 5.7.1.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, *Conservation Measures*). Local conservation measures are not expected to benefit bent-flowered fiddleneck.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat
5.7.1.2 **Conservation Outcome**

Implementation of the covered activities are not expected to result in impacts on bent-flowered fiddleneck. The enhancement and management of bent-flowered fiddleneck habitat is expected to maintain and provide for the potential future expansion of bent-flowered fiddleneck occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for bent-flowered fiddleneck is provided through the protection and management of annual grassland, shrublands and scrub, and woodland and forest natural communities in the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 29,540 acres of grassland, 6,030 acres of shrublands and scrub, and 14,360 acres of woodlands and forest (Table 5-5a). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.4.2.4, CM5: Enhance and Manage Protected Natural Communities) will benefit bent-flowered fiddleneck and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.2 **Jepson’s Milk-vetch**

Jepson’s milk-vetch generally grows on or near serpentine soils, either in uplands or along drainages and is found in meadows, chaparral, and blue oak woodlands as well as relatively barren areas. Jepson’s milk-vetch occurs sporadically as small populations in the Inner North Coast Range from Yolo County to Tehama County. Little is known about the specific ecological requirements of Jepson’s milk-vetch beyond the plant communities in which it has been found. Jepson’s milk-vetch is typically found in isolated and inaccessible areas so has few threats but disturbances related to road cut maintenance and off-road vehicle activity have been reported (see Appendix B, Local Concern Species Accounts).

5.7.2.1 **Applicable Conservation Measures**

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit Jepson’s milk-vetch.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat

5.7.2.2 **Conservation Outcome**

Implementation of the covered activities are not expected to result in impacts on Jepson’s milk-vetch. The enhancement and management of Jepson’s milk-vetch habitat is expected to maintain and provide for the potential future expansion of Jepson’s milk-vetch occurrences, thus contributing to the conservation of the species in the Plan Area.
Conservation for Jepson’s milk-vetch is provided through the protection and management of annual grassland, shrublands and scrub, and woodland and forest natural communities in the Little Blue Ridge of the Hill and Ridge Landscape Unit. Full implementation of the Yolo HP will protect an additional 80 acres of grassland, 960 acres of shrublands and scrub, and 160 acres of woodlands and forest (Table 5-5b). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.4.2.4, CM5: Enhance and Manage Protected Natural Communities) will benefit Jepson’s milk-vetch and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

### 5.7.3 Ferris’s Milk-vetch

Ferris’ milk-vetch is found in the Central Valley on subalkaline flats in vernaly mesic meadows, valley grassland, claypan vernal pools, fallow rice fields, and vernal. The range of Ferris’ milk-vetch extends from Glenn and Butte counties in the north to Solano County in the south, and from Colusa and Yolo counties in the west and Sutter County in the east. At the Tule Ranch Unit of the DFW Yolo Basin Wildlife Area, Ferris’ milk-vetch was found growing in mesic grassland on the edge of a playa pool. Little is known about the specific ecological requirements of Ferris’ milk-vetch beyond the plant communities in which it has been found. Intensive agriculture, overgrazing, and weed competition are reported threats to the occurrences in the Plan Area (see Appendix B, Local Concern Species Accounts).

#### 5.7.3.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit Ferris’ milk-vetch.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

#### 5.7.3.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on Ferris’ milk-vetch. The enhancement and management of Ferris’ milk-vetch habitat is expected to maintain and provide for the potential future expansion of Ferris’ milk-vetch occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for Ferris’ milk-vetch is provided through the protection and management of vernal pool complex and alkali sink habitat. Full implementation of the NHP will protect an additional 53 acres of vernal pool complex and 2 acres of alkali sink habitat (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit Ferris’ milk-vetch and
maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.4 Heartscale

Heartscale is found in meadows, seeps, riparian wetlands, chenopod scrub, vernal pools, and valley and foothill grasslands in a variety of soils that are either saline or alkaline. Heartscale is endemic to California, and its reported range extends through the Central Valley from Glenn County in the north to Kern County in the south, and in valleys of the inner Coast Range in Alameda and San Luis Obispo counties. Many of the reported occurrences are 70 years old or older and in areas that are now under more intensive agriculture. Heartscale is not currently known from the Plan Area but was collected by Beecher Crampton in the alkaline flats and flood basins between Davis and Woodland in 1952. Little is known about the specific ecological requirements of heartscale beyond the plant communities in which it has been found. Reported threats to heartscale include agriculture intensification, development, nonnative plants, overgrazing, and trampling (see Appendix B, Local Concern Species Accounts).

5.7.4.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit heartscale.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.4.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on heartscale. The enhancement and management of heartscale habitat is expected to maintain and provide for the potential future expansion of heartscale occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for heartscale is provided through the protection and management of vernal pool complex and alkali sink habitat. Full implementation of the NHP will protect an additional 53 acres of vernal pool complex and 2 acres of alkali sink habitat (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives,) will benefit heartscale and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.
5.7.5 Vernal Pool Smallscale

Vernal pool smallscale is found in areas with alkaline or saline soils that are generally clays or clay loams: uplands adjacent to a brackish marsh; alkali sinks or alkali dry sloughs adjacent to the Sacramento and San Joaquin rivers and their tributaries, and vernal pools with calcium carbonate (caliche) hard pans adjacent to the alkali sinks and alkali dry sloughs. Vernal pool smallscale is endemic to California, and with the exception of an occurrence on the northwest side of Suisun Marsh, its reported range extends through the Central Valley from Glenn County in the north to Tulare County in the south. Vernal pool smallscale is not currently known from the Plan Area but habitat is present in the alkali soil area southeast of Woodland and at the Grasslands Regional Park/Davis Communications Facility site. In Solano County, vernal pool smallscale is found in Olcott Lake which is a large playa vernal pool. Little is known about the specific ecological requirements of vernal pool smallscale beyond the plant communities in which it has been found. Reported threats to vernal pool smallscale include agriculture and flood control (see Appendix B, Local Concern Species Accounts).

5.7.5.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit vernal pool smallscale.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.5.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on vernal pool smallscale. The enhancement and management of vernal pool smallscale habitat is expected to maintain and provide for the potential future expansion of vernal pool smallscale occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for vernal pool smallscale is provided through the protection and management of vernal pool complex and alkali sink habitat. Full implementation of the NHP will protect an additional 53 acres of vernal pool complex and 2 acres of alkali sink habitat (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit vernal pool smallscale and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.
5.7.6 Round-Leaved Fillaree

Round-leaved fillaree appears to be restricted to clay-textured soils on hill slopes or on alluvial fans at the base of the hills of the Coast, Transverse, and Peninsular ranges but most of the older records are from alluvial fans that have been converted to agriculture or developed. Round-leaved fillaree is restricted to California, southern Oregon, and Baja California. It is not currently known from the Plan Area but was collected by Beecher Crampton on gravelly clay soils of the Tehama formation on the Plainfield Ridge 7.5 miles west of Davis in 1955. Little is known about the specific ecological requirements of round-leaved fillaree beyond the plant communities in which it has been found. Reported threats to round-leaved fillaree include urbanization, habitat alteration, vehicles, pipeline construction, feral pigs, nonnative plants, potentially threatened by grazing (see Appendix B, Local Concern Species Accounts).

5.7.6.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit round-leaved fillaree.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat

5.7.6.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on round-leaved fillaree. The enhancement and management of round-leaved fillaree habitat is expected to maintain and provide for the potential future expansion of round-leaved fillaree occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for round-leaved fillaree is provided through the protection and management of annual grassland in the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 29,540 acres of annual grassland (Table 5-5a). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit round-leaved fillaree and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.7 Snow Mountain Buckwheat

Snow Mountain buckwheat is found on dry serpentine soils, on rock outcrops, and in barren areas within chaparral habitat. The range of Snow Mountain buckwheat extends from Glenn and Lake Counties in the north, to Colusa and Yolo counties in the east, and Napa and Sonoma
counties in the south and west. There are two identified occurrences in the Plan Area, which occur in the Little Blue Ridge. Little is known about the specific ecological requirements of Snow Mountain buckwheat beyond the plant communities in which it has been found. Reported threats to Snow Mountain buckwheat are the loss of serpentine habitat, energy development, mining, and off-road vehicle traffic (see Appendix B, Local Concern Species Accounts).

5.7.7.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit Snow Mountain buckwheat.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat

5.7.7.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on Snow Mountain buckwheat. The enhancement and management of Snow Mountain buckwheat habitat is expected to maintain and provide for the potential future expansion of Snow Mountain buckwheat occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for Snow Mountain buckwheat is provided through the protection and management of annual grassland, shrublands and scrub, and woodland and forest natural communities in the Little Blue Ridge of the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 80 acres of annual grassland, 960 acres of shrublands and scrub, and 160 acres of woodlands and forest (Table 5-5b). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit Snow Mountain buckwheat and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.8 Adobe-Lily

Adobe-lily occurs in chaparral, cismontane woodland, and valley and foothill grasslands and occurrences are regularly found in relatively flat areas below slopes on fine textured soils. The range of adobe-lily extends from Tehama, Butte, Glenn, and Colusa counties in the north and east, to Yolo, Solano, and Napa counties in the south, to Mendocino and Napa counties in the west. In the Plan Area adobe-lily has been documented more recently at several sites on the hills above Lake Davis in the Little Blue Ridge, north of Rumsey in the Capay Hills, and historically at two other sites north of Rumsey and one site in the Blue Ridge Mountains north of Putah Creek. Little is known about the specific ecological requirements of adobe-lily beyond the plant communities in which it has been found. Reported threats to adobe-lily are the loss of grassland,
chaparral, and woodland habitats, grazing, vehicles, development, mining, and horticultural collecting (see Appendix B, Local Concern Species Accounts).

5.7.8.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit adobe-lily.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat

5.7.8.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on adobe-lily. The enhancement and management of adobe-lily habitat is expected to maintain and provide for the potential future expansion of bent-flowered fiddleneck occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for adobe-lily is provided through the protection and management of annual grassland, shrublands and scrub, and woodland and forest natural communities in the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 29,540 acres of annual grassland, 6,030 acres of shrublands and scrub, and 14,360 acres of woodlands and forest (Table 5-5a). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit adobe-lily and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.9 Hall’s Harmonia

Hall’s harmonia occurs on serpentine soils in open, rocky areas within chaparral habitat, usually on hills and ridges. The range of Hall’s harmonia extends from Lake and Colusa counties in the north, to Napa and Yolo counties in the south. There is one historical location in the Plan Area on Little Blue Ridge. Little is known about the specific ecological requirements of Hall’s harmonia beyond the plant communities in which it has been found. Reported threats to Hall’s harmonia are the loss of serpentine habitat within the range of the species and mining (see Appendix B, Local Concern Species Accounts).

5.7.9.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit Hall’s harmonia.
5.7.9.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on Hall’s harmonia. The enhancement and management of Hall’s harmonia habitat is expected to maintain and provide for the potential future expansion of Hall’s harmonia occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for Hall’s harmonia is provided through the protection and management of shrublands and scrub natural community in the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 6,030 acres of shrublands and scrub (Table 5-5a). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit Hall’s harmonia and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.10 Drymaria-Like Western Flax

Drymaria-like western flax occurs on serpentine soils, primarily in chaparral habitat, but also on non-serpentine soils in closed-cone coniferous forest and cismontane woodland habitats, and on grassland inclusions within those habitat types. The range of drymaria-like western flax extends from Napa, Solano, and Sacramento counties in the north, to Contra Costa, Alameda, and San Joaquin counties in the south. The two historical occurrences in the Plan Area are located in the Little Blue Ridge. Little is known about the specific ecological requirements of drymaria-like western flax beyond the plant communities in which it has been found. Reported threats to drymaria-like western flax are the loss of serpentine habitat within the range of the species and vegetation management activities such as brush clearing and grading (see Appendix B, Local Concern Species Accounts).

5.7.10.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit drymaria-like western flax.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat
5.7.10.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on drymaria-like western flax. The enhancement and management of drymaria-like western flax habitat is expected to maintain and provide for the potential future expansion of drymaria-like western flax occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for drymaria-like western flax is provided through the protection and management of shrublands and scrub, and woodland and forest natural communities in the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 6,030 acres of shrublands and scrub and 14,360 acres of woodlands and forest (Table 5-5a). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit drymaria-like western flax and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.11 Rose Mallow

Rose mallow occurs in freshwater marshes and swamps, and on floodplains and slough islands, and along the banks of rivers and creeks. The range of rose mallow includes Glenn, Butte, Colusa, Sutter, Sacramento, Solano, Contra Costa, San Joaquin, and Riverside counties. The known occurrences in the Plan Area are in the Yolo Bypass, along the Deep Ship Channel, and along the levee of the Sacramento River. Little is known about the specific ecological requirements of rose mallow beyond the plant communities in which it has been found. Reported threats to rose mallow are the loss of marsh, floodplain, and riparian habitat and development, agriculture, recreation, channelization of the Sacramento River and its tributaries (see Appendix B, Local Concern Species Accounts).

5.7.11.1 Applicable Conservation Measures

Implementation of the conservation measures and local conservation measures are not expected to benefit rose mallow.

5.7.11.2 Conservation Outcome

The conservation status of rose mallow in the Plan Area is expected to remain unchanged with implementation of the NHP because the covered activities, including NHP conservation measures, will not be implemented in the tidal and floodplain habitats where this species typically occurs and therefore will not be impacted by the covered activities.

5.7.11.3 Delta Tule Pea

Delta tule pea occurs in freshwater and brackish marshes, floodplains, and swamps. The range of Delta tule pea extends from Napa, Solano, and Sacramento counties in the north, to Contra
Costa, Alameda, San Joaquin counties in the south, to Marin County in the west. There are no
documented occurrences in the Plan Area but there are recorded occurrences in Sacramento and
Solano counties just outside of the Plan Area boundary. Little is known about the specific
ecological requirements of Delta tule pea beyond the plant communities in which it has been
found. The threat to Delta tule pea is the loss of marsh and floodplain habitat (see Appendix B,
Local Concern Species Accounts).

5.7.11.4 Applicable Conservation Measures

Implementation of the conservation measures and local conservation measures are not expected
to benefit delta tule pea.

5.7.11.5 Conservation Outcome

The conservation status of delta tule pea in the Plan Area is expected to remain unchanged with
implementation of the NHP because the covered activities, including NHP conservation
measures, will not be implemented in the tidal and floodplain habitats where this species
typically occur and therefore will not be impacted by the covered activities.

5.7.12 Colusa Layia

Colusa layia occurs on loose serpentine or other rocky soils in fields or on grassy slopes within
chaparral and cismontane woodland habitats. The range of Colusa layia includes Tehama,
Mendocino, Glenn, Colusa, Lake, Sonoma, Napa, and Sutter counties. The occurrences in the
Plan Area are located in the Comanche Hills 4 miles northeast of Rumsey, on a grade along
Rumsey-Arbuckle Road, and on steep east facing rock face on the Tuleyome Ireland Ranch.
Little is known about the specific ecological requirements of Colusa layia beyond the plant
communities in which it has been found. The primary threat to Colusa layia is the loss of habitat
through development (see Appendix B, Local Concern Species Accounts).

5.7.12.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation
Measures). Local conservation measures are not expected to benefit Colusa layia.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or
  Enhance Covered Species Occurrences and Habitat

5.7.12.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on Colusa layia.
The enhancement and management of Colusa layia habitat is expected to maintain and provide
for the potential future expansion of Colusa layia occurrences, thus contributing to the
conservation of the species in the Plan Area.

Conservation for Colusa layia is provided through the protection and management of shrublands
and scrub, and woodland and forest natural communities in the Hill and Ridge Landscape Unit.
Full implementation of the NHP will protect an additional 6,030 acres of shrublands and scrub
and 14,360 acres of woodlands and forest (Table 5-5a). Enhancement and management of natural
communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural
Community-Level Goals and Objectives) will benefit Colusa layia and maintain suitable habitat
and provide for existing and future occurrences of this species in the Plan Area.

5.7.13 Mason’s Lilaeopsis

Mason’s lilaeopsis grows in areas in open areas within brackish or fresh water habitats subjected
to different levels of immersion by waves or tides or during the flood events in such as in
bypasses that are subjected to intense soil disturbance by the flood waters. Mason’s lilaeopsis is
found that are inundated such as estuarine wetlands and immediately below the banks of sloughs
and rivers, and is occasionally found distributed among rip-rap lined levees. The range of
Mason’s lilaeopsis extends from Napa and Solano counties in the north, to Contra Costa and
Alameda counties in the south, to Marin County in the west, and Sacramento and San Joaquin
counties in the east. Although it has not been reported in the Plan Area, there are occurrences
immediately south of the Plan Area border. The primary threat to Mason’s lilaeopsis is the loss
of marsh and floodplain habitat. There are numerous processes and activities that threaten this
habitat including erosion, channel stabilization, levee maintenance and construction, flood-
control improvements, dredging, dumping spoils, agriculture, recreation, and water quality
changes. Successional changes in marsh vegetation to more dense vegetation types or to types
that could grow in the intertidal area could pose an additional threat. Quite a bit is known about
the hydrological and substrate requirements and taxonomic genetics of Mason’s lilaeopsis. A
long-term threat is the stabilization of banks and mudflats due to highly regulated water flow
regimes which can cause floodplain habitat to be less dynamic (see Appendix B, Local Concern
Species Accounts).

5.7.13.1 Applicable Conservation Measures

Implementation of the conservation measures and local conservation measures are not expected
to benefit Mason’s lilaeopsis.

5.7.13.2 Conservation Outcome

The conservation status of Mason’s lilaeopsis in the Plan Area is expected to remain unchanged
with implementation of the NHP because the covered activities, including NHP conservation
measures, will not be implemented in the tidal and floodplain habitats where this species
typically occur and therefore will not be impacted by the covered activities.
5.7.14 Bearded Popcornflower

Bearded popcornflower occurs in vernal pools and vernal swales and also in other vernally moist areas in grasslands that do not pond for significant duration but have saturated soil for long periods during the rainy season. The majority of bearded popcornflower populations occur on soils mapped as San Ysidro sandy loam or Solano loam with relatively impermeable clay texture in the lower soil horizons. Seasonal wetlands occur on these soils in areas where the clay enriched horizon occurs closer to the surface such as where swales or basins are present. Bearded popcornflower was thought to be extinct after 1892 but was re-discovered in Solano County in 2005. It had been collected several times since the 1960s but has been misidentified due to its similarity to two other species. Except for one disjunct population in Napa County, it is endemic to the vernal pool regions of Solano County and the southern Plan Area and has been recorded from the Tule Ranch Unit of the DFW Yolo Bypass Wildlife Area. Little is known about the specific ecological requirements of bearded popcornflower beyond the plant communities in which it has been found. Reported threats to bearded popcornflower include disking, development, and nonnative invasive plants (see Appendix B, Local Concern Species Accounts).

5.7.14.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit bearded popcornflower.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat

5.7.14.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on bearded popcornflower. The enhancement and management of bearded popcornflower habitat is expected to maintain and provide for the potential future expansion of bearded popcornflower occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for bearded popcornflower is provided through the protection and management of vernal pool complex and alkali sink habitat. Full implementation of the NHP will protect an additional 53 acres of vernal pool complex and 2 acres of alkali sink habitat (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit bearded popcornflower and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.
5.7.15 Morrison’s Jewelflower

Morrison’s jewelflower occurs on rocky serpentine and siltstone soils and rock outcrops within chaparral habitat. Confirmed occurrences of Morrison’s jewelflower have been identified in the Austin Creek area of Sonoma County and one specimen was collected from Bartlett Springs Road in Colusa County. Morrison’s jewelflower is not known from the Plan Area. Little is known about the specific ecological requirements of Morrison’s jewelflower beyond the plant communities in which it has been found. The primary threat to Morrison’s jewelflower is the loss of serpentine habitat within the range of the species through mining, off-road vehicle activity, and geothermal energy production (see Appendix B, Local Concern Species Accounts).

5.7.15.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit Morrison’s jewelflower.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat

5.7.15.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on Morrison’s jewelflower. The enhancement and management of Morrison’s jewelflower habitat is expected to maintain and provide for the potential future expansion of Morrison’s jewelflower occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for Morrison’s jewelflower is provided through the protection and management of annual grassland, shrublands and scrub, and woodland and forest natural communities in the Little Blue Ridge of the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 80 acres of annual grassland, 960 acres of shrublands and scrub, and 160 acres of woodlands and forest (Table 5-5b). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit Morrison’s jewelflower and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.16 Saline Clover

Saline clover generally grows on finer textured soils (high clay content) on the landward side of salt marshes of the San Francisco Bay, in seasonal wetlands in the coastal hills, in seasonally wet grasslands and swales, and along the borders of vernal pools. Saline clover occurs sporadically as small to large populations along the coast and coastal ranges from San Luis Obispo County to
Sonoma and Lake counties and eastward from Napa County to Sacramento County. Little is known about the specific ecological requirements of saline clover. Reported threats to Saline clover include development, cattle trampling, road construction, and off-road vehicle activity (see Appendix B, Local Concern Species Accounts).

5.7.16.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures). Local conservation measures are not expected to benefit saline clover.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat or Enhance Covered Species Occurrences and Habitat

5.7.16.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on saline clover. The enhancement and management of saline clover habitat is expected to maintain and provide for the potential future expansion of saline clover occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for saline clover is provided through the protection and management of vernal pool complex and alkali sink habitat. Full implementation of the NHP will protect an additional 53 acres of vernal pool complex and 2 acres of alkali sink habitat (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit saline clover and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

5.7.17 Ancient Ant

Ancient ants are known from only one location in the world: a remnant patch of riparian habitat near the junction of Hwy 113 and Yolo County Road number 17 (Ward 1988). However, subsequent surveys at this site have failed to detect the species again (Ward pers. comm.). Significant areas of riparian woodlands and forests in the Sacramento Valley remain that could support the species, and it is possible the ancient ant may occur in similar nearby habitat in Yolo County. Little is known about the specific requirements of ancient ants, beyond their need for moist bottomland habitat with a significant layer of litter that can support a high population of collembolans, their primary prey. The primary threat to the species is loss of riparian, valley bottom, and mesic floodplain forested habitat in the Sacramento Valley. Most areas that likely supported ancient ants were near permanent water, but not subject to flooding and were probably the first ones to be disturbed during the agricultural conversion of the Central Valley (S. Heydon pers. comm.). Other possible threats include the invasion of remaining riparian patches by exotic...
plant species, low oak recruitment, and mosquito abatement programs which spray pesticides into riparian corridors (see Appendix B, *Local Concern Species Accounts*).

### 5.7.17.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, *Conservation Measures*) and local conservation measures (described in Section 5.9, *Local Conservation Strategy*) are expected to benefit the ancient ant.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

### 5.7.17.2 Conservation Outcome

There are no anticipated impacts on ancient ant from implementation of covered activities, due to its limited distribution. The enhancement and management of ancient ant habitat is expected to maintain and provide for the potential future expansion of ancient ant occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for the ancient ant provided through the protection, restoration, and management of riparian natural community, and to a lesser extent the protection, restoration, and management of valley oak woodland. Most riparian habitat protection and restoration will occur within the riparian corridors of Cache and Putah Creek. Full implementation of the NHP will protect an additional 4,530 acres of valley foothill riparian forest, including 476 acres of restored valley foothill woodland, resulting in protection of 36.4 percent of this community in the Plan Area (Table 5-5a). In addition, 102 acres of valley oak woodland will be protected, including 100 acres of restored valley oak woodland (Table 5-6). Implementation of CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat will be directed at maintaining and increasing riparian habitat values for native wildlife species which is expected to maintain habitat conditions for ancient ant. Implementation of LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units will provide for maintaining the current acreage of riparian habitat within the Valley Landscape Unit over the term of the NHP... Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, *Natural Community-Level Goals and Objectives*) will benefit ancient ant and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.
5.7.18 Molestan Beetle

Molestan blister beetles (*Lytta molesta*) are meloids thought to be dependent, to some degree, on dried vernal pool habitats (Holstein 1980 as cited in DFG 2007). Adults are typically seen foraging on flowers for pollen, perianth structures, and fruit. Little is known about specific life history details of the Molestan blister beetle, but it is generally presumed that larvae of species in this genus are nest parasites of native, ground-dwelling, solitary bees (Evans and Hogue 2006) and target those bee species which frequently visit the same host plants on which the adult beetles forage. Within the bee nest, larval Molestan blister beetles consume the pollen stores collected by the bee for its own offspring, and usually consume the immature bee larvae at the same time. Distribution records for the Molestan blister beetle show that its range extends throughout the Central Valley from Kern County to Yolo County. CNDDB (2007) reports one vouchered record from Yolo County, a 1956 collection from the Cache Creek Canyon area. However, given the descriptions of habitat from which the species has been collected in other counties, much of The Plan Area’s annual grasslands, especially those supporting vernal pools, may represent suitable habitat for the species (see Appendix B, *Local Concern Species Accounts*).

5.7.18.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, *Conservation Measures*) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the Molestan blister beetle.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM4, Support Implementation of the Pollinator Conservation Strategy

5.7.18.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on molestan blister beetle. The enhancement and management of Molestan blister beetle habitat is expected to maintain and provide for the potential future expansion of molestan blister beetle occurrences, thus contributing to the conservation of the species in the Plan Area.

Conservation for the molestan blister beetle provided through the protection, and management of grassland and vernal pool natural community. Full implementation of the NHP will protect an additional 53 acres of vernal pool complex and 2 acres of alkali sink habitat (Table 5-22). It is likely that the molestan blister beetle will also benefit over the term of the NHP from LCM4,
Support Implementation of the Pollinator Conservation Strategy, which will provide the beetle with a greater host and prey population. Enhancement and management of natural communities to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit molestan blisters and maintain suitable habitat and provide for existing and future occurrences of this species in the Plan Area.

### 5.7.19 California Red-Legged Frog

California red-legged frogs are associated with three essential habitat components; these include (1) breeding habitat, (2) non-breeding habitat, and (3) migration corridors. Breeding habitats consist of ponds, marshes, and the lentic components of streams (Bulger et al. 2003). In Marin County, stock ponds are the most frequently used breeding sites (Fellers and Kleeman 2007). Non-breeding habitat may include nearly any area within 1 to 2 miles of a breeding site that stays moist and cool through the summer, and can include vegetated areas with coyote bush (*Baccharis pilularis*), California blackberry thickets (*Rubus ursinus*), and root masses associated with willow (*Salix* spp.) and California bay trees (*Umbellularis californica*) (Fellers and Kleeman 2007). Effective migration corridors may be more degraded than the other habitat components and can include closely grazed fields or plowed agricultural lands (Fellers and Kleeman 2007).

There are no recorded historical or recent occurrences of California red-legged frogs within the Plan Area, although there are historical records (69 FR 19620) and one 1998 record (E. Stitt pers. comm.) from Cold Canyon Preserve, which lies south of the Yolo County line in northwestern Solano County. The 1998 (Stitt pers. comm.) record is a reported observation of a single individual near the confluence of Cold Canyon with Wild Horse Canyon. The California red-legged frog has experienced severe declines in the Central Valley and Southern California (Jennings and Hayes 1994), having lost approximately 70 percent of its former range (69 FR 19620). Habitat loss, degradation, and fragmentation are significant factors in declining populations of California red-legged frog. Conversion of lands to agricultural and urban uses, overgrazing, mining, recreation and off-road vehicles, and timber harvesting have all contributed to habitat losses and disturbances. Urbanization often fragments habitat and creates barriers to dispersal (USFWS 2002). Road densities generally increase as a consequence of urbanization. Roads can create significant barriers to frog and toad dispersal (Reh and Sites 1990) and reduce population densities due to mortality caused by automobile strikes (Fahrig et al. 1995) (see Appendix B, Local Concern Species Accounts).

### 5.7.19.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the red-legged frog. Local conservation measures are not expected to benefit red-legged frogs.

- CM1, Protect Landscapes and Natural Communities
Conservation Strategy

- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.19.2 Conservation Outcome

Conservation for the California red-legged frog provided through the protection and management of seasonal ponds in the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 200 seasonal ponds that could support suitable California red-legged frog breeding habitat, thus providing habitat to accommodate the potential reestablishment of a Plan Area population should the species expand its current range (Table 5-22). Enhancement and management of natural communities supporting California red-legged frog habitat to achieve the biological goals and objectives (see Section 5.3.2.2, Natural Community-Level Goals and Objectives) will benefit California red-legged frog and maintain suitable habitat to accommodate its potential future expansion into the Plan Area.

5.7.20 Redhead

The state’s largest breeding and wintering redhead populations are concentrated at the large wetland complexes at Tule Lake and Lower Klamath National Wildlife Refuges in northeastern California. Small numbers of redheads continue to nest in the Central Valley, especially on public refuges and private duck clubs that maintain summer water (Beedy and Deuel 2008). While about 10 pairs of redheads nested annually at the Spreckel’s Sugar Ponds, east of Woodland, these ponds were abandoned and filled in the mid-1990s (Beedy pers. comm.). Some of the deeper, permanent wetlands at the Yolo Bypass Wildlife Area are occupied by breeding redheads, but only a few broods are usually seen per season. Wintering birds are rare but regular in the Yolo Bypass when it is flooded deeply, and a few spend the winter annually at Solano Lake and wastewater treatment ponds around the county.

Redheads typically nest in freshwater emergent wetlands where dense stands of cattails (Typha spp.) and tules (Schoenoplectus spp.) are interspersed with areas of deep, open water (Grinnell et al. 1918; Grinnell and Miller 1944; Bellrose 1980; Palmer 1976). In winter and migration, redheads forage and rest on large, deep bodies of water and may form rafts far from shore.

The redhead is designated as a state bird species of special concern (DFG 2008). Once among the most abundant breeding ducks in the Central Valley, redhead numbers were greatly reduced in California in the early 1900s in response to drainage of wetlands and over-harvest of breeding and wintering birds by market hunters. Suitable redhead breeding habitat has continued to decline in the Central Valley, as wetlands had been reduced to about 98,000 ha by the mid-1980s, representing a historical loss of >99% (DFG 2008) (see Appendix B, Local Concern Species Accounts).
5.7.20.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the redhead. Local conservation measures (described in Section 5.9, Local Conservation Strategy) are not expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.20.2 Conservation Outcome

Conservation for the redhead is provided through the protection, restoration, and management of fresh emergent wetland, primarily in the Valley Landscape Unit. Full implementation of the NHP will result in the protection (including already protected PEHL Category 1 lands) of 17,285 acres of fresh emergent wetland, including restoration of 210 acres of fresh emergent wetland resulting in the protection of up to 65.7 percent of the community’s extent within the Plan Area. In addition, 340 acres of giant garter snake habitat will be restored, some of which may benefit redhead (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities, and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit redhead and maintain suitable habitat and provide for future occurrences of this species in the Plan Area. Increasing the amount of suitable habitat under protection and expanding the total area of fresh emergent wetland available may increase the low numbers of redhead that currently use the Plan Area and encourage more breeding.

5.7.21 Least Bittern

Least bittern breeding distribution in California includes the northern San Joaquin Valley and southern Sacramento Valley, and portions of southern California (Gibbs et al. 1992). They winter in isolated sites in the Central Valley and Delta Region, as well as the Lower Colorado River Valley and the Imperial Valley (Sterling 2008, Rosenberg et al. 1991, Patten et al. 2003). Least bitterns have been found in recent years in the Plan Area and have been presumed or documented breeding in 1999, 2003, 2004, and 2007 (Sterling 2003; J. Sterling pers. obs.; Yolo Audubon Society 2004). The species was detected in 1999 and again in 2003 at Conaway Ranch and is presumed extant. The 2007 breeding location was in the Yolo Bypass Wildlife Area. This site, apparently supporting 1–2 breeding pairs, will presumably be maintained and protected by DFW.
Least bitterns are restricted to breeding in freshwater marshes with dense stands of tule, cattail, and bulrush (Gibbs et al. 1992; Sterling 2008). Vegetation structure, composition and marsh size appear to be important factors to consider when managing for least bittern populations (Bogner and Baldassarre 2002). Water is an important parameter for successful nest sites, as marshes with dry cattails and bulrushes are avoided. Least bitterns have been found to be most abundant in marshes with an equal amount of open water and dense emergent vegetation (Gibbs et al. 1992). Given the mean territory size calculated by Bogner and Baldassarre (2002), five acres may be regarded as the minimum patch size for this species.

This species is currently considered a bird species of special concern (DFG 2008). Due to its secretive nature, its local abundance is difficult to ascertain and numbers of individual least bitterns are likely underestimated, especially during the winter when they rarely vocalize (Grinnell and Miller 1944, Gibbs et al. 1992). The primary threat to this species is the loss and degradation of its freshwater marsh habitat (Gibbs et al. 1992), and populations are presumed to have declined and continue to decline range-wide as a result of widespread habitat destruction (see Appendix B, Local Concern Species Accounts).

5.7.21.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the least bittern. No local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to provide benefits for the species,

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.21.2 Conservation Outcome

Conservation for the least bittern is provided through the protection, restoration, and management of fresh emergent wetland, primarily in the Valley Landscape Unit. Full implementation of the NHP will result in the protection (including already protected PEHL Category 1 lands) of 17,285 acres of fresh emergent wetland, including restoration of 210 acres of fresh emergent wetland resulting in the protection of up to 65.7 percent of the community’s extent within the Plan Area. In addition, 340 acres of giant garter snake habitat will be restored, some of which may benefit least bittern (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for least bittern. Increasing the amount of
suitable habitat under protection and expanding the total area of fresh emergent wetland addresses the main threat to least bittern in the region, the loss and degradation of its wetland habitat.

5.7.22 Golden Eagle

Golden eagles nest primarily on cliffs and hunt in nearby open habitats, such as grasslands, oak savannas, and open shrublands (Grinnell and Miller 1944). Throughout most of the western United States golden eagles are mostly year-long residents (Polite and Pratt 1999), breeding from late January through August with peak activity in March through July (Polite and Pratt 1999). Migratory patterns are usually fairly local in California where adults are relatively sedentary, but dispersing juveniles sometimes migrate south in the fall (Kaufman 1996). Pairs tend to nest on the periphery of their territories, often near an adjacent pair (USFS 2008). Golden eagle territories in southern California were found to average 93 km² (36 mi²) (Dixon 1937), while northern California territories average 124 km² (48 mi²) (Smith and Murphy 1973). Territories are generally larger in open grassland habitats than in more complex, mountainous terrain (Roberson and Tenney 1993). In the interior central Coast Ranges of California, golden eagles forage primarily in grazed grasslands, open shrublands, and oak savanna communities supporting large populations of ground squirrels (Spermophilus spp.) (Carnie 1954). Most studies of golden eagle foraging habits have shown that ground squirrels (S. beecheyi) are the principal prey item of golden eagles in the interior central Coast Ranges (Dixon 1937; Carnie 1954; Connelly et al. 1976; Hunt et al. 1999).

The nesting distribution of golden eagles in the Plan Area is restricted to the high elevation mountainous areas on the western side of the Plan Area. Like most of the interior Coast Ranges, this area is dominated by a mixture of oak woodland and chaparral communities, steep topography, and rocky ridges. There are potential cliff nesting sites along Blue Ridge and other high elevation ridge lines, some isolated rock outcrop sites that are capable of supporting golden eagle nests, and numerous potential tree-nesting sites. An eagle nest has been reported and has been regularly observed from the northernmost extent of Blue Ridge at Highway 16 (Estep pers. obs.). Other possible nesting areas include the remaining portions of Blue Ridge, portions of Rocky Ridge, and throughout much of the mountainous region east of Blue Ridge, north of Blue Ridge in the extreme northwest corner of the county, and the Capay Hills east of Capay Valley. Golden eagles are regularly observed year round throughout this area (see Appendix B, Local Concern Species Accounts).

5.7.22.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit golden eagle. Local conservation measures (described in Section 5.9, Local Conservation Strategy) are not expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
Conservation Strategy

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• CM5, Enhance and Manage Protected Natural Communities
• CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.22.2 Conservation Outcome

Conservation for the golden eagle is provided through the protection and management of grasslands primarily in the Hill and Ridge Landscape Unit. Full implementation of the NHP will result in the protection of 37,426 acres of grasslands, resulting in 46.7 percent protection of this natural community type in the Plan area (including already protected PEHL Category 1 lands). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for golden eagle, especially the focus on increasing small mammal abundance in protected grassland habitats.

5.7.23 Bald Eagle

The bald eagle is a year round resident at some higher elevation areas of California, and a winter resident in numerous traditionally-used sites throughout much of the state. The breeding season extends from approximately February through July, peaking in March to June (Polite and Pratt 1999). Bald eagles that breed in California may make only local winter movements in search of prey (Polite and Pratt 1999), spending the winter in the vicinity of their nesting areas. Bald eagles that nest in the northwestern United States migrate south to winter in California (Buehler 2000). Nests are constructed in a variety of large, old growth hardwoods and conifers, especially ponderosa pine (Polite and Pratt 1999).

Prior to 1990, there were no records of breeding bald eagles in the Plan Area or elsewhere in the surrounding region. In 1990, an active nest was reported from the east side of Lake Berryessa in Napa County approximately 3 miles west of the Plan Area boundary. Activity at this site, along with at least one other alternate nest site, has been intermittently documented since 1990 (CNDDB 2007). This pair eventually constructed a nest on Big Island, an island on Lake Berryessa, where it has been reported as active and successful as recently as 2003. In 2000, a second breeding pair constructed a nest in a foothill pine at the south end of Wilson Valley along Cache Creek approximately five miles northwest of the Yolo County line (Bureau of Land Management 2005; Mangan pers. comm.). In 2002, a third nesting pair constructed a nest in a ponderosa pine at Davis Creek Reservoir in the northwest corner of Yolo County. This nest remains extant and is the only known nest site in the Plan Area (Mangan pers. comm.). Mangan (pers. comm.) also reports that an additional 6 to 10 bald eagles are year-round residents of the Cache Creek watershed each year. The Cache Creek Watershed is also home to a relatively large wintering population of bald eagles. Numbering between 30 and 70 individuals, this wintering population has been monitored since the early 1980s. Most of these birds roost at Anderson
Marsh on Clear Lake, but each day they fly down Cache Creek in search of food. Eagles are regularly found hunting and roosting along the downstream portion of Cache Creek (Capay Valley) in the Plan Area during the winter months (Mangan pers. comm.). Bald eagles are also occasionally observed on the valley floor in the Plan Area during the winter, particularly in areas that support permanent and seasonal wetlands and open water habitat with abundant waterfowl prey such as the Yolo Bypass Wildlife Area (EDAW 2007) (see Appendix B, Local Concern Species Accounts).

5.7.23.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the bald eagle. No local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.23.2 Conservation Outcome

Conservation for the bald eagle is provided through the protection and management of the woodlands and forest natural community and riparian habitats that support suitable nest and roost trees near foraging habitat. Full implementation of the NHP will result in the protection and restoration of 5,006 acres of valley foothill riparian and 14,462 acres of woodlands and forest land cover types (primarily in the Hill and Ridge Landscape Unit), resulting protection of over 57 percent and approximately 29 percent of these communities in the Plan Area (including already protected PEHL Category 1 lands) (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for bald eagle, especially on conservation lands located in the Cache Creek Watershed, where large numbers of bald eagles roost and forage during winter. Increasing the amount of suitable habitat under protection will maintain and potentially expand the available suitable foraging habitats for bald eagle.

5.7.24 American Peregrine Falcon

American peregrine falcons nest almost exclusively on protected ledges of high cliffs, primarily in woodland, forest, and coastal habitats (DFG 1980; USFWS 1982). Peregrine falcons prefer to nest near marshes, lakes, and rivers that support an abundance of birds, but they travel several
miles from their nest sites to forage on pigeons, shorebirds, waterfowl, and songbirds (DFG 1980, Grinnell and Miller 1944). They have been reported to use man-made structures, such as tall buildings and bridges, and will occasionally use tree or snag cavities or old nests of other raptors (Polite and Pratt 1999).

The California breeding range, which has been expanding, includes the central and southern California coast, inland northern coastal mountains, Klamath Mountains, Cascade Ranges, and Sierra Nevada (DFG 2000). Although relatively uncommon, wintering birds can be seen throughout California (Zeiner et al. 1990). Historically, the American peregrine falcon occurred throughout most of California (USFWS 1982).

There are no records of nesting peregrine falcons in the Plan Area. Possible nesting habitat occurs only along the high elevation ridgelines in the western portion of the county. In 1999 a peregrine falcon nest was reported on the cliffs near Lake Berryessa, just west of the Plan Area (CNDDB 2007). Activity at the site has been reported in subsequent years and it is presumed extant. Additional possible nesting habitat exists along the western face of Rocky Ridge and Blue Ridge along the Yolo-Napa County line above Lake Berryessa. This species is observed uncommonly, but regularly, in the Plan Area during the winter. Observations have been reported throughout the P, but mostly in areas that support wetland or open water habitats where waterfowl and shorebirds congregate, such as the Yolo Bypass Wildlife Refuge, Conaway Ranch, the Davis Sewage Treatment Ponds, Davis Wetlands, Roosevelt Ranch Reserve, and in flooded rice fields (Kemper 1999) (see Appendix B, Local Concern Species Accounts).

5.7.24.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the peregrine falcon.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM1, Maintain Agricultural Habitat Units
- LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat

5.7.24.2 Conservation Outcome

Conservation for the peregrine falcon is provided through the protection, restoration, and management of fresh emergent wetland, primarily in the Valley Landscape Unit, that support
peregrine falcon foraging habitat. Full implementation of the NHP will result in the protection (including already protected PEHL Category 1 lands) of 26,105 acres of emergent wetlands, including restoration of 210 acres of fresh emergent wetland, resulting in the protection of up to 65.7 percent of the community’s extent within the Plan Area (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for peregrine falcon. Implementation of LCM1, Maintain Agricultural Habitat Units and LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat is likely to benefit peregrine falcon by maintaining and enhancing rice lands that support foraging habitat for peregrine falcon over the term of the NHP. Increasing the amount of suitable habitat under protection addresses the main threat to peregrine falcon in the region, the loss and degradation of its wetland foraging habitat.

5.7.24.3 Prairie Falcon

In California, prairie falcons occur over the length of the state except the humid northwest coastal belt (Small 1994). They are considered an uncommon permanent resident, ranging from southeastern deserts northwest throughout the Central Valley and along the inner Coast Ranges and Sierra Nevada (Polite and Pratt 2005). The nesting distribution for prairie falcon includes only the high elevation mountainous areas in the western portion of the County. CNDDB documents two prairie falcon nest locations in the Plan Area, both along the west-facing rock escarpment of Blue Ridge in the northwestern corner of the County. Both of these sites are presumed extant, and there are potentially others in the same general area of the County or nearby in adjacent counties. Prairie falcons are uncommonly, but regularly observed in the Cache Creek watershed year round. The species is also occasionally observed in Capay Valley and the grassland and savannah foothills along the western edge of the valley during the breeding season, and is occasionally observed throughout the County during winter (Wilkerson and Debban 1980; Kemper 1999; various volumes of Yolo Audubon Society’s journal *The Burrowing Owl*, and Sacramento Audubon Society’s journal *The Observer*).

Prairie falcons inhabit shrub-steppe desert, open desert scrub, grassland, mixed shrub-grasslands, and alpine tundra (Garrett and Dunn 1981; Steenhof 1998). They will also occur near agricultural fields (Polite and Pratt 2005). Nest scrapes are typically on sheltered ledges or in potholes of a cliff overlooking a large, open area (Polite and Pratt 2005). Desert scrub and grasslands are preferred foraging habitats in southern California (Garrett and Dunn 1981). In the interior Coast Ranges, prairie falcons forage in grasslands, oak savannahs, seasonal wetlands, pasturelands, and occasionally in grain and hay fields. Prairie falcons most often capture prey in areas of low (less than 12 inches), sparse vegetation in Northern California (Haak 1982).

Throughout their range, prairie falcons are susceptible to habitat loss and degradation of nesting and foraging sites. Prairie falcons can be adversely affected by large-scale agricultural
development, especially in foraging areas with high densities of ground squirrels (USFS 2008). In Yolo County, threats to prairie falcons are largely restricted to activities occurring in the mountainous areas on the western side of the Plan Area. Thus, habitat loss and conversion pose minimal current risk to this population. However, other human disturbances including a variety of recreational activities, pose a more realistic threat to prairie falcon breeding sites in the Plan Area (see Appendix B, Local Concern Species Accounts).

5.7.24.4 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the prairie falcon. No local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.24.5 Conservation Outcome

Conservation for the prairie falcon is provided through the protection and management of grassland, scrub, and woodland nesting and foraging habitat. The vast majority of protection for these natural communities will occur in the Hill and Ridge Landscape Unit. Since its nesting distribution is limited to the high mountainous western portion of the Plan Area, protection of natural communities overlaps well with prairie falcon habitat needs. In combination with existing PEHL Category 1 lands, the NHP will result in protection of 37,673 acres of grassland, 30,346 acres of shrublands and scrub, and up to 23,961 acres of woodlands and forest natural communities will be protected with full NHP implementation, achieving 46.9 percent, 68 percent and 28.7 percent, respectively of these communities in the Plan Area (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for prairie falcon.

5.7.25 California Black Rail

The historic range of the California black rail extended from the San Francisco Bay, throughout the Sacramento-San Joaquin Delta, along the coast to northern Baja California, other Southern California locales such as the Salton Sea, and along the lower Colorado River. Loss of tidal marsh habitat has extirpated populations from much of its coastal range, particularly in Southern California and much of the San Francisco Bay. The species persists in remaining tidal marshes in the northern San Francisco Bay estuary, Tomales Bay, Bolinas Lagoon, Sacramento-San Joaquin Delta, Morro Bay, the Salton Sea, and the Lower Colorado River (Manolis 1978; Evens et al.
1991; Eddleman et al. 1994). The species has also been found more recently at several inland freshwater sites in the Sierra Nevada foothills. Kimball (1974 in Manolis 1978) reports a black rail in Yolo County. The specific location is unclear, but is presumably in the Yolo Basin or vicinity. There are no other historic or recent records of black rails in the Plan Area. However, it is possible that they breed in freshwater marshes in the Yolo Bypass or that individuals from the breeding population in the Delta Region may occasionally disperse into freshwater marshes and flooded rice fields in the Yolo Bypass.

The California black rail is listed as a threatened species under the California Endangered Species Act. It was listed by the California Fish and Game Commission in 1971. It is also designated as a Fully Protected species in California. Declines in populations of the black rail in California are a result of habitat loss and degradation along with an increase in exotic predators such as black rats and red fox (Evens et al. 1991). However, because there were no estimates of historical population levels, the extent of population declines is not fully understood. Evens et al. (1991) examined relative abundance of rails at various locations within the species’ range and determined that more than 80% of the remaining population is confined to the northern reaches of the San Francisco Bay estuary. They also determined that the species was subject to continuing and ongoing population decline due to habitat loss and/or degradation. At inland sites, agricultural practices, livestock grazing, and urbanization may threaten individual subpopulations (see Appendix B, Local Concern Species Accounts).

5.7.25.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the black rail. No local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.25.2 Conservation Outcome

Conservation for the black rail is provided through the protection, restoration, and management of fresh emergent wetland, primarily in the Valley Landscape Unit. Full implementation of the NHP will result in the protection (including already protected PEHL Category 1 lands) of 17,285 acres of emergent wetland, including restoration of 210 acres of fresh emergent wetland, resulting in the protection of up to 65.7 percent of the community’s extent within the Plan Area. In addition up to 340 acres of giant garter snake habitat will be restored, some of which may benefit black rail (Table 5-22). Enhancement and management of natural communities to
achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for black rail. Increasing the amount of suitable fresh emergent wetland habitat under protection of addresses the main threat to black rail in the region, the loss and degradation of its wetland habitat.

5.7.26 Western Snowy Plover

In California, western snowy plovers are found year-round, but breed and winter in different locations and habitats. Western snowy plovers forage on beaches, tidal flats, salt flats, and salt ponds. They probe in the sand for invertebrates. They nest in sand dunes on beaches and lakes, on shores of alkaline lakes, in dry evaporation ponds, and rarely on unvegetated islands in freshwater ponds.

Declines in populations of the western snowy plover in California are a result of habitat loss and human disturbance of nesting colonies on beaches and probably from increase predation from gulls and ravens that have increased in California in recent years (U.S. Fish and Wildlife Service 2007). Human disturbance is also known to reduce chick survival rates (Ruhlen et al. 2003). However, because there were no estimates of historical population levels in the Central Valley, the extent of population trends of this metapopulation is not fully understood.

Western snowy plovers have nested twice at the Yolo Bypass Wildlife Area in 1998, and at the Old Davis Sewage Ponds in 1963; they have also been detected during migration at that location as well as the Davis Wetlands and the Woodland Wastewater Treatment Plant (Yolo Audubon Society Checklist Committee 2004 (see Appendix B, Local Concern Species Accounts)).

5.7.26.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the western snowy plover.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM1, Maintain Agricultural Habitat Units
- LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat
5.7.26.2 Conservation Outcome

Conservation for the western snowy plover is provided through the protection, restoration, and management of fresh emergent wetland, primarily in the Valley Landscape Unit. Full implementation of the NHP will result in the protection (including already protected PEHL Category 1 lands) of 17,285 acres of emergent wetlands, including restoration of 210 acres of fresh emergent wetland resulting in the protection of up to 65.7 percent of the community’s extent within the Plan Area. In addition up to 340 acres of giant garter snake habitat will be restored, some of which may benefit western snowy plover (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for western snowy plover. In addition, implementation of LCM1, Maintain Agricultural Habitat Units and LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat will provide for the maintenance of suitable foraging habitat for western snowy plover on existing agricultural lands over the term of the NHP. Increasing the amount of suitable habitat and protecting fresh emergent wetland addresses the main threat to western snowy plover in the region, the loss and degradation of its wetland habitat.

5.7.27 Mountain Plover

In California, mountain plovers arrive on their wintering grounds in agricultural fields and pasturelands in California from November through December, although occasional migrants are found in September and October and most remain through March (Hunting and Edson 2008). California is the only state/province where this species is considered “common” during the winter (Knopf and Wunder 2006). However, throughout its Central Valley range, it has a spotty distribution and is considered from accidental to rare-and-local based upon recent records from 1970 to 1999 (Edson and Hunting 1999). Currently the Central Valley wintering population is concentrated in two main areas including Colusa, Yolo, and Solano counties and from Stanislaus County south to Kern County, with the main populations in Yolo and Kings counties (Hunting and Edson 2008). Mountain plovers are regular, but uncommon, winter visitors to the Plan Area. In many years, flocks of up to about 100 birds can be observed in recently plowed agricultural fields near Woodland and Davis, especially along County Roads 16, 25, 27, and 102 (E8, also known as “Poleline Road”), and in unflooded portions of the Yolo Bypass.

Declines in numbers of the mountain plover have been reported in the Central Valley (Wunder and Knopf 2003; Edson and Hunting 1999; Hunting and Edson 2008). The only counties with wintering flocks up to 100–300 birds are Colusa, Yolo, Solano, and Kings counties, compared to flocks up to 1,100 birds as recently as the early 1990s (Hunting and Edson 2008). However, it is difficult to measure declines and population levels due to the lack of systematic survey coverage.
of the abundant potential habitat within the Central Valley (Edson and Hunting 1999) as well as due to flock movements during the winter months (Knopf and Rupert 1995).

Habitat loss and degradation of breeding and wintering grounds appear to be the main factors responsible for population declines in mountain plovers (Knopf 1996; USFWS 2003). While habitat availability and quality on breeding grounds may currently be the primary factor limiting plover numbers (Knopf 1996), further loss of native wintering habitat may also be detrimental to the species (USFWS 2003). Loss of traditional wintering sites on grasslands and suitable agricultural cropland to urban development, vineyards, or other incompatible land uses could continue to reduce plover populations already diminished by such changes (Roberson 2002; USFWS 2003; Wunder and Knopf 2003). In the Central Valley, declines in populations of fossorial mammals could affect plovers given the high abundance and availability of invertebrate prey in areas occupied by these mammals (USFWS 2003; J. Engler in litt.; E. Marquis-Brong in litt.) (see Appendix B, Local Concern Species Accounts).

5.7.27.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the mountain plover.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM1, Maintain Agricultural Habitat Units
- LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat

5.7.27.2 Conservation Outcome

Conservation for the mountain plover is provided through the protection of agricultural lands and grasslands in the Valley Landscape Unit, the portion of the Plan Area supporting mountain plover use areas. Full implementation of the NHP will result in the protection (including already protected PEHL Category 1 lands) of 14,713 acres of field crops, grain/hay crops, pasture, truck/nursery/berry crops and 5,235 acres of annual grassland, resulting in the protection of 7.3 percent and 45.7 percent, respectively, of these communities’ acreage within the Valley Landscape Unit (Table 5-5a). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable winter habitat for mountain plover. In addition, implementation of LCM1, Maintain
Agricultural Habitat Units and LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat will maintain suitable mountain plover agricultural field foraging habitat over the term of the NHP.

5.7.28 Short-Eared Owl

Short-eared owls occur as California residents, but probably migrate locally in the state. Populations increase during winter with the influx of migrants from elsewhere in the range of the species. The species is, and perhaps always has been, generally uncommon in the state with a restricted distribution based on the presence of suitable grassland, wetland, and prairie habitats that support abundant vole populations. Limited suitable nesting habitat exists for short-eared owls in the Plan Area. The known nesting distribution is highly restricted and in most years has been limited to a single locale: the Hunt-Wesson Hawk and Owl Reserve east of the Yolo County landfill. While there are no confirmed nesting records for this site since the late 1980s, recent possible nesting activity has been reported by the California Department of Fish and Game (Rocco pers. comm.) on the Yolo Basin Wildlife Area and other possible nesting activity has been documented in the uncultivated fields south of Willow Slough and on the Conaway Ranch.

Short-eared owls occur in freshwater marshlands, seasonal wetlands, fallow fields, meadows, and alfalfa fields. Suitable nesting habitat is characterized by herbaceous vegetation that is tall and dense enough to conceal the incubating female and for daytime cover, which is generally consistent with the habitat requirements of voles (Grinnell and Miller 1944, Holt and Leasure 1993). Foraging habitat is similar to nesting habitat, including grasslands, prairies, marshlands, and seasonal wetlands. In the Plan Area, and throughout the Sacramento Valley, short-eared owls also forage in agricultural fields that are adjacent to nesting areas and winter roosting areas.

This species is currently considered a bird species of special concern (DFG 2008). Short-eared owls do not occupy many areas with seemingly appropriate habitat, indicating that prey abundance or predation pressures affect distribution and abundance (Holt and Leasure 1993). In California, including t, the tremendous annual variation in both breeding and wintering populations is tied to climate and other factors driving vole and other prey population cycles (Roberson 2004). It is likely that the population has declined largely as the result of loss of habitat due to development of agriculture, diversion of water, changes in agricultural practices, and human encroachment (see Appendix B, Local Concern Species Accounts).

5.7.28.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the short-eared owl.

- CM1, Protect Landscapes and Natural Communities
• CM4, Restore Natural Communities and Habitat
• CM5, Enhance and Manage Protected Natural Communities
• CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
• LCM1, Maintain Agricultural Habitat Units
• LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat
• LCM3, Establish Field Edge Habitat Areas

5.7.28.2 Conservation Outcome

Conservation for the short-eared owl is provided through the protection, restoration, and management of wetland, and grassland natural communities, as well as suitable agricultural lands such as pasture. Full implementation of the NHP will protect (including existing PEHL lands) 17,285 acres of fresh emergent wetland, 37,673 acres of grassland, and 14,716 acres of cropland and pasture. Protection of these habitats and the restoration of 210 acres of fresh emergent wetland will result in the protection of 46.7 percent of grassland, 65.7 percent of fresh emergent wetland, and 6.4 percent of croplands and pasture in the Plan Area (Table 5-22). Protected lands will include large expanses of wetlands, grasslands, and agricultural lands that currently support short-eared owl breeding or wintering populations. Enhancement and management of these communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) is compatible with short-eared owl habitat management. Implementation of LCM1, Maintain Agricultural Habitat Units, LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat, and LCM3, Establish Field Edge Habitat Areas will benefit short-eared owl by maintaining high vole populations and foraging habitat over the term of the NHP. Protection and management of these natural communities under the NHP will maintain suitable habitat to support existing short-eared owl populations and enhance protected habitats to provide for future increases of breeding and wintering populations in the Plan Area.

5.7.29 Long-Eared Owl

Long-eared owl is an uncommon resident throughout California except the Central Valley, some coastal areas, and the Coachella and Imperial Valleys of Southern California (Hunting 2008). It is known as a rare winter visitor to the Plan Area. There are no breeding records for this species in Yolo County or elsewhere in the Central Valley. The Checklist of Birds of Yolo County reports long-eared owl as a rare winter visitor in the riparian habitat along the Sacramento Bypass and the riparian woodland along the railroad tracks west of River Road between Interstate 80 and Interstate 5. The species is also considered a rare winter visitor to the Yolo Basin Wildlife Area (EDAW 2007).
Long-eared owls breed in mature live oak and riparian woodlands in coastal and foothill areas, but also occur in desert riparian, woodland, and oasis habitats (Garrett and Dunn 1981; Unitt 1984). They are also found in dense conifer stands at higher elevations (Polite 2005). Long-eared owls also breed in open forests (Marks et al. 1994). In winter, they can be found roosting in small groups in dense, thick groves of trees. Nesting and roosting trees and shrubs used by long-eared owls include oaks, willows, cottonwoods, conifers, and junipers (Marks et al. 1994). Long-eared owls forage in open habitats such as grasslands, deserts, and forest openings (Marks et al. 1994). In the Plan Area, long-eared owl presumably also forages in some agricultural habitats, irrigated pastures, seasonal wetlands, and marsh habitats.

This species is currently considered a bird species of special concern (DFG 2008). Hunting (2008) documents substantial declines in the numbers and range of long-eared owls in California. The species was formerly common to abundant on the coastal plain and western slopes of the Coast Ranges from at least Santa Barbara County south to San Diego but has now been nearly extirpated from those regions (Garrett and Dunn 1981; Hamilton and Willick 1996; Lehman 1994; Unitt 1984; Hunting 2008). Urban development and agricultural expansion are considered the primary causes of population declines in coastal southern California (Bloom 1994) (see Appendix B, Local Concern Species Accounts).

### 5.7.29.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the long-eared owl. No local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

### 5.7.29.2 Conservation Outcome

Conservation for the long-eared owl is provided through the protection, restoration, and management of riparian, oak woodland and conifer forest, and grassland natural communities throughout the Plan Area. Full implementation of the NHP will protect, combined with existing protected PEHL Category 1 lands, 6,677 acres of valley foothill riparian, 22,030 acres of blue oak-foothill pine and blue oak woodland, 122 acres of valley oak woodland, and 37,673 acres of grasslands (Table 5-22). In addition, 100 acres of valley oak woodland and 476 acres of valley foothill riparian will be restored (Table 5-6). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage...
Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) is also expected to maintain habitat conditions that will benefit long-eared owl. The protection of grassland foraging habitat and protection and expansion of potential riparian, woodland, and conifer forest nesting habitat will support existing habitat suitable for long-eared owl populations and may help increase their numbers in the Plan Area.

5.7.30 Purple Martin

In California, purple martins arrive in small numbers from wintering grounds in South America by early March (Hill 1999; Dodge 2007). In fall, they leave breeding areas to migrate to South America by late August–September (Green 2005). While purple martins nest almost exclusively in human-made nest boxes in eastern North America (Doughty and Fergus 2002), in western states they primarily nest in abandoned woodpecker cavities or other natural or artificial cavities (Green 2005). Since the mid-1970s, all known nesting in the Central Valley has occurred within highway bridges (i.e., elevated freeways and longer overpasses) (Airola and Grantham 2003; Leeman et al. 2003; Airola and Kopp 2007).

As a colonial species, purple martins maintain territories only in the area around nesting cavities (Brown 1997). Little is known about territoriality in western populations that typically nest in natural or artificial cavities (Brown 1997). Martins nesting in the Sacramento region readily nest in “weep holes” that are adjacent to each other in the undersides of bridges.

There were no known purple martin nesting records in the Plan Area prior to 2003 (Williams 1998). Based on records from surrounding counties, purple martins may have nested historically in the Plan Area along the Sacramento River, in adjacent oak savanna and oak forest of the Coast Range near Lake Berryessa, and in the Capay Valley. The only known nesting in the Plan Area was in a bridge in Davis in 2003 (Yolo County Audubon 2004; Airola et al. 2004), which was not occupied thereafter (Airola et al. 2008). One nesting season record along Cache Creek in 2008 (S. Hampton pers. comm.) suggests potential for nesting in woodlands there. The closest known active nesting colony to the Plan Area, in the I Street bridge off-ramp adjacent to the Sacramento River in the City of Sacramento, supported 29 to 37 nesting pairs between 2002 and 2005, but has subsequently declined to six pairs in 2008 (Airola et al. 2008). Recent nesting population declines at this site and elsewhere in Sacramento have prompted experimental installation of artificial nesting boxes nearby in the Yolo Bypass Wildlife Area in 2008 (Airola et al. 2008). The species is seen regularly foraging near the Sacramento River from adjacent Sacramento breeding colonies (Airola pers. comm.). It also occurs in small numbers during post-breeding, pre-migration period with groups of other swallow species in the Yolo Bypass (see Appendix B, Local Concern Species Accounts).
5.7.30.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the purple martin.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

5.7.30.2 Conservation Outcome

Conservation for the purple martin is provided through the protection, restoration and management of riparian habitat. Full implementation of the NHP will result in the protection of up to 6,677 acres of valley foothill riparian, resulting in 53.6 percent protection of this natural community type in the Plan area (including already protected PEHL Category 1 lands). Restoration of up to 476 acres of valley foothill riparian and up to 100 acres of valley oak woodland will also increase the acreage habitat available to the purple martin. Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for purple martin, especially on NHP conservation lands located in the Cache Creek Watershed, where the largest potential for nesting in woodlands habitats may exist. In addition, implementation of LCM1, Maintain Agricultural Habitat Units, LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units will maintain at least 90 percent of the existing acreage of riparian habitat present in the Valley Landscape Unit over the term of the NHP. Increasing the amount of suitable habitat under protection will maintain and potentially expand the available suitable foraging habitats for purple martin.

5.7.31 Yellow-Billed Magpie

Yellow-billed magpies are endemic to California. They nest primarily in the Sacramento Valley, foothills of the western Sierra Nevada, and interior valleys in the coast range from Lake County to northern Santa Barbara County (Reynolds 1995). Yellow-billed magpies are common and widespread throughout lowland areas of the Plan Area (Yolo Audubon Checklist Committee 2004), including agricultural areas and orchards around Davis, Winters, Woodland, Capay Valley, and the Yolo Bypass. They often roost, and sometimes nest, in shade trees along urban...
streets and forage in nearby areas, as well as in large areas of lawn and turf in urban and suburban areas.

Yellow-billed magpies typically nest high in large trees, often in association with clumps of mistletoe. Suitable nesting habitat is usually within 1,000 meters of permanent water (natural or stock ponds) (Chase and Reynolds 2002). Yellow-billed magpies usually forage in agriculture fields, grasslands, and oak savanna, and may occasionally forage in livestock feedlots and rice fields. They also frequent urban and suburban settings where they forage at urban parks, cemeteries, golf courses, and suburban lawns (Reynolds 1995).

Yellow-billed magpie numbers in California may be declining due to habitat loss/conversion, rodent poisoning, and West Nile virus (Airola et al. 2007; Crosbie et al. 2008; H. Ernest and S. Crosbie pers. comm.). West Nile virus is a serious threat to the species. Several entire roosting colonies have been vacant since the spread of the virus into the species’ range in 2004 (Crosbie et al. 2008; H. Ernest and S. Crosbie pers. comms.). A widespread population decline of about 40 percent has been detected in the Central Valley during 2005-19 06, based on Christmas Bird Counts, Breeding Bird Surveys and other sources (Airola et al. 2007; Crosbie et al. 2008) (see Appendix B, Local Concern Species Accounts).

5.7.31.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the yellow-billed magpie.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM8, Establish Nest Trees for Raptors
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM1, Maintain Agricultural Habitat Units
- LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat
- LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

5.7.31.2 Conservation Outcome

Impacts associated with implementation of NHP covered activities are expected to include the removal of up 326 acres of valley foothill riparian, some of which may contain suitable foraging habitat or potential nest trees for yellow-billed magpie.
Because yellow-billed magpie is a generalist that may use virtually all habitat types that will be protected under the NHP, it is expected to benefit from the overall establishment of the NHP conservation lands system. A primary benefit to yellow-billed magpie will be the protection, restoration and management of riparian habitat, where the species is known to nest preferentially. Full implementation of the NHP will result in the protection of up to 6,677 acres of valley foothill riparian, resulting in 53.6 percent protection of this natural community type in the Plan area (including already protected PEHL Category 1 lands). Restoration of up to 476 acres of valley foothill riparian and up to 100 acres of valley oak woodland under CM4, Restore Natural Communities and Habitat will also provide additional potential habitat for yellow-billed magpie (Table 5-6). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for yellow-billed magpie. Implementation of the local conservation measures further benefits yellow-billed magpie by maintaining agricultural cropping patterns and valley foothill riparian, which respectively support its foraging and nesting habitats, in the Valley Landscape Unit over the term of the NHP Protection and management of these natural communities and agricultural habitats under the NHP will maintain suitable habitat to support existing magpie populations and enhance protected habitats to provide for future increases in the Plan Area.

5.7.32 Oak Titmouse

The oak titmouse forages foliage, twigs, branches, and trunks by gleaning, hammering hard seeds, chipping bark, and sometimes hovering. (Block 1990). It is occasionally seen foraging on the ground. Within season foraging changes were due to plant phenology (Hejl and Verner 1990).

The species is a secondary cavity nest using natural cavities, woodpecker holes and/or nest boxes (Dixon 1949). In in the Plan Area, oak titmice occupy woodlands, oak savannah, open broad-leaved evergreen forests, and riparian woodlands. Oak titmouse was frequently observed in all seasons and confirmed as a breeding species at Winters Putah Creek Park, the Dry Creek Confluence, and Diversion Dam (Truan et al. 2010). Oak titmice are frequently found along lower Putah Creek (Engilis 2004).

The primary threat to oak titmouse in the Plan Area is loss of suitable oak woodland habitat. The loss of dead standing trees, live trees with dead limbs or diseased trees reduces the number of cavities available for nesting and seems to be causal to the decline. The proliferation of the European Starling may pose an indirect threat to the Oak Titmouse by competing for nesting cavities and displacement (Purcell 1995). The liphorid blowfly larvae are parasites of secondary cavity nesters as they lay their eggs in the additional material used to line the nest cavity. A high rate of parasitism was recorded in nests at San Joaquin Experimental Range (Verner et al. 1997) (see Appendix B, Local Concern Species Accounts).
5.7.32.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the oak titmouse.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM8, Establish Nest Trees for Raptors
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

5.7.32.2 Conservation Outcome

Conservation for the oak titmouse is provided through the protection and management of its oak and riparian habitats. Full implementation of the NHP, in combination with existing protected PEHL Category 1, will result in the protection of up to 6,677 acres of valley foothill riparian, 22,030 acres of blue-oak dominated woodlands, 122 acres of valley oak woodlands, resulting in 28 percent protection of blue-oak dominated natural communities, 53.6 percent of valley foothill riparian, and, with restoration, over 100 percent of the existing acreage of valley oak woodlands (Table 5-22). Restoration of 476 acres of valley foothill riparian and 100 acres of valley oak woodland in the Plan area also benefits oak titmouse by providing additional foraging and nesting habitat (Table 4-6). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will benefit and maintain suitable habitat for oak titmouse, especially on conservation lands located along Putah Creek. Implementation of LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units will benefit oak titmouse by maintaining at least 90 percent of the existing acreage of valley foothill riparian in the Valley Landscape Unit over the term of the NHP.

5.7.33 Sage Sparrow

Sage sparrow is a ground-foraging omnivore during the breeding season, and a ground gleaning granivore during the non-breeding season (Martin and Carlson 1998). During the breeding season, sage sparrows consume adult and larval insects, spiders, seeds, small fruits, and succulent vegetation. Fall, winter, and early spring diets include small seeds, plant material, insects when available (Martin and Carlson 1998).
Sage sparrows require extensive, semi-open habitats with evenly spaced shrubs 1–2 meters high. Sage sparrows benefit from intermediate fire frequencies, but frequent fires in some shrubland habitats can convert shrubland habitat to grassland. This has probably contributed to the decline in sage sparrows throughout the western U.S. Sparrows in coastal shrublands, are highly sensitive to habitat fragmentation, occurring less often in small patches and near developed edges. Sage sparrows densities tend to decline with proximity to human development (Bolger et al. 1997). The species does not occur in fragments surrounded by development, such as isolated canyons enclosed within the city of San Diego (San Diego County Bird Atlas; Soulé et al. 1988; Crooks et al. 2001).

The sage sparrow has experienced slow but persistently increasing trends throughout the California Coastal region (Sauer et al. 2011). No confirmed breeding has been described for the Plan Area (Sauer et al. 2011). Disturbances that reduce shrub cover, such as frequent fire, mechanical disruption, livestock grazing, and off-highway vehicle use appear to have negative effects on sage sparrows, although there may often be a time-lag between the disturbance and any effects due to site-fidelity (Wiens et al. 1986). Sage sparrows may prefer recently burned chaparral because it has a low, open shrub structure (Lovio 1999). Disturbance by domestic grazing animals can also reduce habitat and sage sparrow numbers (Martin and Carlson 1998). Habitat disturbance may also promote nest parasitism (see Appendix B, Local Concern Species Accounts).

5.7.33.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the sage sparrow. Local conservation measures (described in Section 5.9, Local Conservation Strategy) are not expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.33.2 Conservation Outcome

Implementation of the covered activities are not expected to result in impacts on sage sparrow. Conservation for sage sparrow is provided through the protection and management of the shrublands and scrub natural communities in the Hill and Ridge Landscape Unit. Full implementation of the NHP will protect an additional 6,030 acres of shrublands and scrub, resulting, in combination with existing protected PEHL Category 1, in the protection of 68 percent of the Plan Area acreage of shrublands and scrub. Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and
Habitat) will maintain suitable habitat for sage sparrow. Increasing the amount of suitable habitat under protection is expected to maintain the current distribution and abundance of sage sparrow in the Plan Area and protect sufficient habitat to accommodate potential future expansion of its population.

### 5.7.34 Yellow-Headed Blackbird

In California, yellow-headed blackbirds are found year-round, but breed and winter in different locations and habitats. Yellow-headed blackbirds are uncommon nesters (from April through June), and rare winter visitors in the Plan Area (Yolo Audubon Society Checklist Committee 2004). Until their habitat was removed, small colonies (about 15–19 pairs) nested in most years at the Spreckle’s Sugar Ponds, north of Woodland, and at the Trestle Ponds, along Highway 16, just east of Woodland (Beedy 1993). In more recent years, small numbers have also nested at the City of Davis Wastewater Treatment Facility (Meese pers. comm.). Potentially suitable breeding habitat areas also exist at the recently restored wetlands at the Yolo Bypass Wildlife Area and at Roosevelt Ranch.

They are restricted to breeding in freshwater marshes with stands of tule, cattail, bulrush (Twedt and Crawford 1995; Ward and Weatherhead 2005). Water depth is an important parameter for successful nest sites, as deep water levels reduce the number and diversity of predators that have access to nests (Picman et al. 1993) and controls vegetative cover and structure (Lederer et al. 1975). In the Central Valley, important foraging areas for nesting yellow-headed blackbirds tend to be near breeding colonies freshwater marshes, in pastures, and agricultural crops, especially in alfalfa fields where insect prey are abundant (Crase and DeHaven 1972; Twedt and Crawford 1995) and rice fields.

Declines in populations of the yellow-headed blackbird in California are a result of habitat loss and sometimes competitive exclusion from great-tailed grackles (*Quiscalus mexicanus*) that have invaded California in recent years. However, because there were no estimates of historical population levels in California, the extent of population declines is not fully understood (Twedt and Crawford 1995). Primary threats to yellow-headed blackbirds have been the conversion of wetlands to croplands and urbanization, and this has been especially true in the Central Valley (Twedt and Crawford 1995). Abrupt changes in water levels of occupied marshes can also cause nesting failures and abandonment (Jaramillo 2008). Additionally, nesting females are easily disturbed by humans entering active colonies or approaching them too closely (Twedt and Crawford 1995) (see Appendix B, *Local Concern Species Accounts*).

#### 5.7.34.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, *Conservation Measures*) and local conservation measures (described in Section 5.9, *Local Conservation Strategy*) are expected to benefit the yellow-headed blackbird.

- CM1, Protect Landscapes and Natural Communities
5.7.34.2 Conservation Outcome

Conservation for the yellow-headed blackbird is provided through the protection, restoration, and management of fresh emergent wetland, primarily in the Valley Landscape Unit. Full implementation of the NHP will result in the protection (including already protected PEHL Category 1 lands) of 17,285 acres of fresh emergent wetland, including restoration of 210 acres of fresh emergent wetland, resulting in the protection of up to 65.7 percent of the fresh emergent wetland present in the Plan Area. In addition, restoration of up to 340 acres of giant garter snake habitat will be restored and 23,311 acres of agricultural croplands protected, a portion of which is expected to support suitable yellow-headed blackbird nesting and foraging habitat (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will maintain suitable habitat for yellow-headed blackbird. Implementation of the local conservation measures will maintain the current matrix of agricultural lands that support yellow-headed blackbird foraging habitat over the term of the NHP. Increasing the amount of suitable habitat under protection addresses the main threat to yellow-headed blackbird in the region, the loss and degradation of its wetland habitat.

5.7.35 Ringtail

The ringtail is considered widely distributed in California and is believed to be a common to uncommon permanent resident (Ahlborn 2005). The distribution in California has been described to include all portions of the state except portions of the Sacramento and San Joaquin valleys, Modoc Plateau, eastern Sierra Nevada, and Mojave Desert (Grinnell et al. 1937). Due to its secretive nature, there is little documentation on known occupied areas in the Plan Area. However, it is likely to occur along the Sacramento River, Putah Creek, Cache Creek, and potentially in other smaller drainages with sufficient riparian habitat with suitable rocky areas or tree hollows for den sites. It also has the potential to occur in chaparral habitats in rocky drainages of the hills and mountains in the western portion of the Plan Area.

The ringtail occurs in various riparian habitats and in forest and shrub habitats (Ahlborn 2005), at elevations from sea level to 2,682 meters (8,800 feet) (Schempf and White 1977). In the Central Valley of California, ringtails were found almost exclusively in riparian forests along major...
Conservation Strategy

5.7.35.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the ringtail.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

5.7.35.2 Conservation Outcome

Conservation for the ringtail is provided through the protection, restoration and management of its riparian and woodland habitats. Full implementation of the NHP, in combination with existing protected PEHL Category 1, will result in the protection of up to 6,677 acres of valley foothill riparian, 22,030 acres of blue-oak dominated woodlands, and up to 222 acres of valley oak woodlands, resulting in approximately 28 percent protection of blue-oak dominated natural communities, 53.6 percent of valley foothill riparian, and over 100 percent, including restoration, of the existing Plan Area acreage of valley oak woodland (Table 5-22). Most riparian habitat protection and restoration will occur within the riparian corridors of Cache and Putah Creek.

Restoration of up to 476 acres of valley foothill riparian and of up to 100 acres of valley oak woodland in the Plan area also benefits ringtail by increasing the acreage of its preferred habitat. Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will maintain suitable habitat conditions for ringtail on protected lands, especially on conservation lands located along Putah Creek and Cache Creek. Implementation of LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units will maintain at least 90 percent of the existing valley foothill...
Conservation Strategy

5.7.36 Pallid Bat

Central Valley pallid bat occurrences include capture data from blue oak woodland in the Sutter Buttes, Sutter County (Johnson 2000) and pear orchards near Fairfield, Solano County (Johnson unpubl. data). Roost sites have been found in cropland near Woodland, Yolo County, and in grassland/riparian complexes near Red Bluff, Tehama County and near Griffith, Sutter County (H. Johnson unpubl. data). Post-1980 localities submitted to the Yolo County Health Department (16 specimens) included Davis, Winters, Woodland, between Davis and Woodland, Guinda Dunnigan, Capay, and an unknown Yolo County locality. Recent surveys (2006) by H. Johnson have confirmed continued use of the historical roost site near Capay and revealed a new site south of Esparto.

During the day pallid bat shelters inside crevices or cavities found in natural features such as trees, cliffs, caves and rocky outcrops, and in man-made features such as barns, bridges, mines and attics (Barbour and Davis 1969; Hermanson and O’Shea 1983; Pierson and Rainey 1998). Recent radio-tracking efforts suggest that the pallid bat is far more dependent on tree roosts than previously realized. It has been located in tree cavities in oak, ponderosa pine, coast redwood, and giant Sequoia (Rainey et al. 1992; Cross and Clayton 1995; Pierson and Heady 1996 in Pierson and Rainey 1998). After sunset pallid bat emerges from the day roost to forage for insects. Water features are a vital habitat component because bats often drink immediately after emergence and water is an important source and concentration site for insects. Habitat requirements in the Plan Area may include open, free water for drinking and foraging, undisturbed crevice and cavity day and night roost sites that provide thermal buffering, protection from predators, room for colonies to gather, and structurally diverse vegetation that support a diversity of insect prey for foraging habitat.

Current population trends are unknown, however California bat biologists are documenting roost and habitat loss, and there are strong concerns that foothill oak woodland and rural landscapes where pallid bats are most abundant are highly impacted by urbanization. Threats to the pallid bat include mortality and/or loss of roosting habitat due to disturbance, vandalism, exclusion, extermination, pesticide use (Clark 1981), building demolition, bridge replacement and modification projects (Sidner 1997), and selective hardwood removal. Indirect threats to this species include loss of habitat to urban/industrial land-use conversions and hydrological alteration of watersheds and associated riparian habitat by surrounding developments and land uses (Hinman and Snow 2003). Some bat species can adapt to urban habitats but the pallid bat has only been found near the edges of urban areas or in outlying areas (Hinman and Snow 2003). Pierson and Rainey (1998) state the pallid bat will coexist with humans in rural settings, but appears to be intolerant of suburban and urban development (see Appendix B, Local Concern Species Accounts).
5.7.36.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the pallid bat.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
- LCM1, Maintain Agricultural Habitat Units
- LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat
- LCM3, Establish Field Edge Habitat Areas
- LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

5.7.36.2 Conservation Outcome

Conservation for the pallid bat is provided through the protection and management of its woodland, riparian, and agricultural habitats in the Plan Area. Full implementation of the NHP will result, in combination with existing PEHL Category 1, in the protection of up to 6,677 acres of valley foothill riparian, 22,030 acres of blue-oak dominated woodlands, 222 acres of valley oak woodland, and 23,311 acres of agricultural habitats, resulting in protection of approximately 28 percent of blue-oak dominated natural communities, 53.6 percent of valley foothill riparian, and, with restoration, over 100 percent of valley oak woodland, and 8.8 percent of the agricultural habitats in the Plan Area. Restoration of up to 476 acres of valley foothill riparian and of up to 100 acres of valley oak woodland in the Plan area also benefits pallid bat by providing additional roosting habitat. Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management onExisting Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will maintain suitable habitat for pallid bat on protected lands. Implementation of LCM1, Maintain Agricultural Habitat Units, LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat, LCM3, Establish Field Edge Habitat Areas, LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units will maintain a substantial proportion of the remaining unprotected suitable pallid bat foraging and roosting habitat in the Valley Landscape Unit over the term of the NHP. Increasing the amount of suitable pallid bat habitat under protection and restoring suitable roosting habitat is expected to maintain sufficient
habitat to sustain the current distribution and abundance of pallid bat in the Plan Area and provide for its potential increases in its abundance.

5.7.37 Western Red Bat

The western red bat occurs throughout the Central Valley in broadleaf tree communities and is less abundant above low and middle elevations in mixed conifer forests (Pierson et al. 1999). This species has been captured in blue oak woodland in the Sutter Buttes, Sutter County (Johnson 2000) and one western red bat was found in downtown Sacramento in an area with large diameter, mature sycamore trees (H. Johnson, pers. obs.). The CNDDB (2007) has one record from Knight’s Landing.

Western red bat roosts in the foliage of large shrubs and trees, usually sheltering on the underside of overhanging leaves. Roosting habitat is found in woodland borders, rivers, agricultural areas, and urban areas with mature trees (Harvey et al. 1999). Roost sites have been found in edge habitats adjacent to riparian habitat or open fields, and in orchards (WBWG 1998). Roost trees are typically large cottonwoods, sycamores, walnuts, and willows associated with riparian habitats (Adams 2003). Foraging occurs in and amongst vegetation and this species forages regularly over the same territory (Allen 1939). Foraging has been noted in habitats such as mature orchards, oak woodland, low elevation conifer forest, along riparian corridors, among nonnative trees in urban and rural residential areas, and also near strong lights that attract flying insects. Habitat requirements in the Plan Area may include open, free water for drinking and foraging, undisturbed foliage roost sites that provide protection from predators, and structurally diverse vegetation that support a diversity of insect prey for foraging habitat.

The primary threats to the western red bat are habitat loss and wind farm mortality. The Central Valley is this species’ primary breeding region based on museum and capture records (Pierson et al. 2004); it is estimated that less than 6 percent of relatively intact old growth, riparian forest remains (Katibah 1984). This species is especially susceptible to impacts from wind farms based on evidence from mortalities reported for eastern red bats (Johnson et al. 2003) and from a wind farm in Solano County (B. Hogan pers. comm.). Pesticides and herbicides used in orchards likely directly impact roosting bats, as well as potentially reducing prey resources.

5.7.37.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) and local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to benefit the western red bat.

- CM1, Protect Landscapes and Natural Communities
- CM4, Restore Natural Communities and Habitat
- CM5, Enhance and Manage Protected Natural Communities
• CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

• LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

5.7.37.2 Conservation Outcome

Conservation for western red bat provided through the protection, restoration, and management of its riparian roosting and foraging habitat and oak foraging habitats. Full implementation of the NHP will result, in combination with existing protected PEHL Category 1, in the protection of 6,677 acres of valley foothill riparian, 22,030 acres of blue-oak dominated woodlands, and up to 222 acres of valley oak woodland, resulting in protection of approximately 28 percent of blue-oak dominated communities, 53.6 percent of valley foothill riparian, and, with restoration, over 100 percent of valley oak woodland in the Plan Areas (Table 5-22). Restoration of up to 476 acres of valley foothill riparian and of up to 100 acres of valley oak woodland in the Plan area will increase the extent of available red bat roosting habitat in the Plan Area (Table 5-6). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will maintain suitable red bat roosting habitat in protected lands. Implementation of LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units will maintain at least 90 percent of unprotected red bat riparian roosting and foraging habitat in the Valley Landscape Unit over the term of the NHP. Protecting a substantial proportion land cover types that support red bat in the Plan Area is expected to maintain sufficient habitat to maintain the current distribution and abundance of red bat in the Plan Area and, with restoration of roosting habitat, provide for the potential increases in its abundance.

5.7.38 San Joaquin Pocket Mouse

The San Joaquin pocket mouse is found in the Upper Sacramento Valley, Tehama County, southward through the San Joaquin and Salinas valleys and contiguous areas to the Mojave Desert in Los Angeles, Kern, and extreme western San Bernardino counties, as well as the Tehachapi Mountains and foothills of the western Sierra Nevada below about 600 meter elevation (Williams et al., 1993; Best 1993). There are no confirmed observations of San Joaquin pocket mouse in the Plan Area, but it could potentially occur.

This species inhabits dry, open, grassy or weedy ground, and arid annual grasslands, savanna, and desert-shrub associations with sandy washes or finely textured soil. It is found in low densities in grassland-blue oak savannas up to 1,500 feet on the east side of San Joaquin Valley. It occurs in alkali sink associations on the floor of the Tulare Basin and in Atriplex and Ephedra associations in the northwestern portion of the Tulare Basin. In Lake County, it occurs on rocky south-facing slope in chamise and buck brush chaparral at elevation of 420 meters (Best 1993).
Habitat loss and degradation due to agricultural expansion and urban development is considered to be the main threat to San Joaquin pocket mouse throughout its range (see Appendix B, Local Concern Species Accounts).

5.7.38.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the San Joaquin pocket mouse. No local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.38.2 Conservation Outcome

Conservation for the San Joaquin pocket mouse is provided through the protection and management of its shrub/scrub and grassland habitats in the Hill and Ridge Landscape Unit. Patches of dry, open grassland and scrub habitat on fine-textured soil that San Joaquin pocket mouse favors are expected to occur in these natural communities. Full implementation of the NHP will protect an additional 29,625 acres of grassland and 6,030 acres of shrublands and scrub in the Hill and Ridge Landscape Unit (Table 5-5b). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will maintain suitable habitat conditions for San Joaquin pocket mouse.

5.7.39 American Badger

In California, the American badger is an uncommon, permanent resident throughout most of the state, with the exception of the North Coast area (Grinnell et al. 1937). The distribution of the badger in the Plan Area is not well documented. There are several areas of potentially suitable habitat in the Yolo Bypass, Dunnigan Hills, Capay Valley, and the lower slopes of the Capay Hills and Blue Ridge Mountains. However, the only documented observations are near Davis, Woodland, and south of Clarksburg. The badger is also listed as a species likely to occur at the Yolo Bypass Wildlife Area. Historical observations include four records from Highway 16, near Rumsey (Grinnell 1937 and Sacramento State Museum specimen 1971).

American badgers are found in a variety of open, arid habitats, but are most commonly associated with grasslands, savannas, mountain meadows, and open areas of desert scrub (Stephenson and Calcarone 1999). Principal habitat requirements for the species include...
sufficient prey base, friable soils, and relatively open, uncultivated ground (Williams 1986).
They are primarily found in areas of low to moderate slope (Stephenson and Calcarone 1999).
The elevational range of the badger extends from below sea level to over 3,600 meters (12,000 feet) (Lindzey 1982).

American badgers have experienced large population declines in many areas of southern California and has been steadily decreasing throughout the state over the last century (Williams 1986). The amount of suitable habitat available has decreased as a result of extensive urban and agricultural developments in the valley and foothill habitat adjacent to the four National Forests (USFS 2008). Badgers are likely to have experienced similar declines in the Plan Area as a result of habitat loss (see Appendix B, Local Concern Species Accounts).

5.7.39.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, Conservation Measures) are expected to benefit the American badger. No local conservation measures (described in Section 5.9, Local Conservation Strategy) are expected to provide benefits to the species.

- CM1, Protect Landscapes and Natural Communities
- CM5, Enhance and Manage Protected Natural Communities
- CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat

5.7.39.2 Conservation Outcome

Conservation for the American badger is provided through the protection and management of grassland natural communities. Full implementation of the NHP will protect an additional 32,245 acres of grassland throughout the Plan Area, resulting, in combination with existing PEHL Category 1, in the protection of 46.7 percent of grasslands in the Plan Area (Table 5-22). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will maintain suitable habitat conditions for American badger.

5.7.40 Sacramento Valley Red Fox

Until recently, red foxes inhabiting the Sacramento Valley were thought to be introduced, either from the Midwest (Grinnell et al. 1937) or from fur farm stock of principally Alaskan and Southeast Canadian ancestry (Aubry et al. 2009; Sacks et al. 2010). Recent genetic work, however, determined that these foxes were native and phylogenetically related to the state-
threatened Sierra Nevada red fox (*V. vulpes necator*) (Perrine et al. 2007; Sacks et al. 2010a, 2010b).

Red foxes hunt small and medium-sized mammals, ground squirrels, gophers, mice, marmots, woodrats, pikas, and rabbits. Foraging is mainly nocturnal and crepuscular, although more diurnal where they are undisturbed. They are independent and thus generally solitary foragers, although individuals may forage in close proximity where resources are clumped. Open areas are used for hunting, forested habitats for cover and reproduction. In lowlands, the species uses fence lines, hedgerows, woodlots, and other brushy, wooded areas for cover and reproduction, and hunts in cropland, wetland, urban habitats and other open areas (Grinnell et al. 1937; Ables 1975; Samuel and Nelson 1982). Native Sacramento Valley red fox den sites are generally associated with grasslands but avoid flooded agriculture and wetlands (Sacks et al 2010a).

The Sacramento Valley red fox range is difficult to assess due to a paucity of historical reports of wildlife from Yolo and Solano Counties to the south and Shasta County to the north. Grinnell et al. (1937) estimated the historical range to extend into Yolo County but not Solano County. The current range of the Sacramento Valley red fox population extends throughout most of the Sacramento Valley, but appears free of hybridization with nonnative red foxes primarily on the west side of the Sacramento River between I-80 and Red Bluff.

The current genetic effective population size was approximately 50 breeding individuals (Sacks et al. 2010a), but approximately 80 native breeding individuals were known during the investigations of Sacks et al (2010a). Also, the distribution of red fox den sites is highly discontinuous, with small clusters of red foxes in some areas (e.g., Woodland, Willows) and apparently isolated den sites in others (Davis, Chico). Based on the figures presented in Sacks et al. (2010a), a minimum of 13 den sites were verified in the Plan Area from 2007 to 2009. The majority of these are located in the central portion of the Plan Area between I-5 and the woodlands at the western edge of the Valley. No foxes have been verified to occur in the Yolo bypass.

The species is currently suspected to have a limited range, very small population size and afflicted by peripheral hybridization with nonnative red foxes. The Sacramento Valley red fox recently experienced a severe bottleneck and has extremely low genetic diversity (Sacks et al 2010b). Sacks et al (2010a) detected parvovirus at 32 percent of the native dens and furthermore identified antibodies to other pathogens, such as canine distemper virus, *Toxoplasma gondii*, and *Neospora caninum*. The apparent decline in abundance from historical levels, associated loss of valley grasslands, generally low genetic effective population size, apparently sparse distribution, restricted range, and hybridization with nonnative foxes suggest this population is vulnerable.

### 5.7.40.1 Applicable Conservation Measures

Implementation of the following conservation measures (described in Section 5.4, *Conservation Measures*) and local conservation measures (described in Section 5.9, *Local Conservation Strategy*) are expected to benefit the Sacramento Valley Red Fox.
Conservation Strategy

Chapter 5

• CM1, Protect Landscapes and Natural Communities
• CM4, Restore Natural Communities and Habitat
• CM5, Enhance and Manage Protected Natural Communities
• CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat
• LCM3, Establish Field Edge Habitat Areas

5.7.40.2 Conservation Outcome

Conservation for the Sacramento Valley red fox is provided through the protection and management of annual grassland, primarily in the Valley Landscape Unit. Full implementation of the NHP will protect an additional 32,160 acres of annual grassland throughout the Plan Area, resulting, in combination with existing PEHL Category 1 lands, in protection of 46.7 percent of grassland natural communities in the Plan Area (Table 5-22). A total of 2,615 acres of annual grassland will be protected in the Valley Landscape Unit which, in combination with existing protected PEHL, will result in protection of over 45 percent of the annual grassland remaining in lowland portions of the Plan Area (Table 5-5a). Enhancement and management of natural communities to achieve the biological goals and objectives (CM5, Enhance and Manage Protected Natural Communities and CM9, Improve Protection and Management on Existing Public and Easement Habitat Lands to Maintain or Enhance Covered Species Occurrences and Habitat) will maintain suitable habitat conditions for Sacramento Valley red fox, including maintaining or increasing its rodent prey base. Implementation of LCM3, Establish Field Edge Habitat Areas will establish at least 230 acres of field edge habitat within the agricultural matrix of the Valley Landscape Unit, thus providing red fox rodent prey and foraging sites, as well as cover for dens and resting. Protecting a large proportion of the remaining annual grassland in the Plan Area is expected to contribute to maintaining the existing distribution and abundance of Sacramento Valley red fox in the Plan Area.

5.8 POST-NHP PERMITS ADMINISTRATION AND MANAGEMENT ACTIVITIES

By the end of the term of the NHP permits (i.e., 50 years), the NHP conservation lands system will be fully assembled and all habitat enhancement and restoration conservation measures will have been implemented. Following the term of NHP permits, the Implementing Entity will continue to perform ongoing administration and management activities necessary to maintain the intended ecological functions of NHP conservation lands for natural communities and covered species in-perpetuity. Post-NHP permit management activities will include the following.

• Maintenance of NHP conservation land infrastructure (e.g., grading of roads, repair of fences, maintenance of fire breaks, maintenance of canals and ditches)
• Management of conservation lands to maintain habitat functions (e.g., management of grazing uses, nonnative species control, delivery and management of water for managed wetlands)

• Activities necessary to maintain restored giant garter snake habitat (e.g., maintenance of wetland berms, flooding of habitat areas)

• A continuation of some of the monitoring actions in the Monitoring Plan (see Section 6.3.6, Post-NHP Permit Monitoring Requirements)

• Administration of the NHP (e.g., submittal of monitoring reports to USFWS and DFW, review of conservation easements, coordination with local, state, and federal agencies and nongovernmental organizations involved in land conservation within and adjacent to the Plan Area).

5.9 LOCAL CONSERVATION STRATEGY

5.9.1 Introduction

The NHP includes a “Local Conservation Strategy” under which the Implementing Entity will implement local conservation measures and associated monitoring actions that are in addition and complementary to conservation provided under the NHP Conservation Strategy (described in Sections 5.1-5.4 and Chapter 6, Adaptive Management and Monitoring). Actions implemented under the Local Conservation Strategy are not necessary to comply with NHP ESA and NCCPA permits, but can contribute to conserving natural communities and covered species under the NCCPA. Local conservation measures that will be implemented by the NHP Implementing Entity include measures to maintain a minimum threshold of habitat values supported by agricultural habitats in the Plan Area; measures to maintain a minimum acreage of riparian habitat within the Valley Landscape Unit over the 50 year term of the NHP; and specific actions to improve habitat conditions for native wildlife on cultivated lands. The Implementing Entity may also incorporate conservation actions implemented by other entities into the Local Conservation Strategy by mutual agreement if the conservation actions directly or indirectly contribute towards conserving NHP natural communities and/or agricultural habitats.


The Local Conservation Strategy includes three key components:

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• **Agricultural Habitat Strategy** to conserve an appropriate mix and extent of agricultural patterns beneficial to specific covered species through a monitoring and market incentive program.

• **Riparian Habitat Strategy** to conserve riparian habitat on private lands through incentive programs.

• **Conservation of Local Concern Species** to assess the benefits of the NHP Conservation Strategy to specific species identified by the NHP Steering Advisory Committee.

### 5.9.2 Agricultural Habitat Strategy

The Local Conservation Strategy includes implementation of actions under an Agricultural Habitat Strategy that are designed to establish or improve patches of uncultivated lands within farmed lands and to maintain habitat values provided by crops grown in the Plan Area for the following eight covered species that regularly use agricultural habitats in the Plan Area (see Appendix A, *Covered Species Accounts*).

- Western pond turtle
- Giant garter snake
- Swainson's hawk
- Northern harrier
- White-tailed kite
- Black tern
- Western burrowing owl
- Tricolored Blackbird

Because these eight species use a broad spectrum of the crop types cultivated in the Plan Area, implementation of the strategy is also expected to benefit local concern species and other native wildlife (e.g., waterfowl, raptors, herons, egrets) that commonly use cultivated lands. All of the species that use agricultural lands are terrestrial vertebrates. None of the covered plants or invertebrates is dependent on cultivated crop types. The loggerhead shrike also regularly uses agricultural lands in the Plan Area, but its use of agricultural lands is not closely dependent on the type of crops that are grown. Consequently, the loggerhead shrike is not included in the agricultural habitat strategy.

### 5.9.2.1 Biological Goals and Objectives

This section describes the biological goals and objectives for the Agricultural Habitat Strategy.

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60 Covered plant and vernal pool shrimp species may occur on cultivated lands in small patches of habitat that support suitable habitat conditions, but these species are not dependent on the inherent habitat value supported by any particular crop type.
Goal LCS1: Maintain habitat values supported by agricultural crops for covered species in the Valley Landscape Unit over the term of the NHP.

Objective LCS1.1: Based on a 5-year running average, ensure a sufficient extent of agricultural habitat types in the Plan Area as indicated in Table 5-27 to achieve the agricultural habitat unit objectives established for western pond turtle, giant garter snake, Swainson’s hawk, white-tailed kite, northern harrier, black tern, western burrowing owl and tricolored blackbird.61

Rationale: Agricultural habitats provide essential foraging and breeding habitat for giant garter snake, western pond turtle, white-tailed kite, northern harrier, Swainson’s hawk and tricolored blackbird. Ensuring an appropriate composition of agricultural habitats as outlined in Table 5-27 provides a spatially and temporally adequate framework for ensuring that life history requisites for the covered and other species are preserved. The 5-year running average ensures that possible changes in land use, cropping patterns and agricultural practices are gradual and allow species distributions to respond without affecting population viability.

Objective LCS1.2: Maintain 10,100 acres of rice land in Planning Units 12 and 13 and 7,330 acres of rice land in Planning Unit 11 over the term of the NHP that support the Colusa Basin and Willow Slough/Yolo Bypass subpopulations of giant garter snake, respectively.

Rationale: Ensuring that at least 17,430 acres of rice land in occupied giant garter snake habitat is maintained in rice production will help ensure that sufficient aquatic habitat is available to sustain the Colusa Basin and Willow Slough/Yolo Bypass subpopulations over the term of the NHP.

See Appendix F, Agricultural Habitat Value Evaluation and Results, for a description of habitat units and agricultural crop type habitat unit values.
Table 5-27. Agricultural Habitat Unit Maintenance Objectives
Objective LCS1.3: Maintain at least 67,300 acres of agricultural lands cultivated in crop types that support Swainson’s hawk and white-tailed kite foraging habitat in Planning Units 11, 13, 15, and 16, at least 29,500 acres of which will be maintained in crop types that provide very high and high value Swainson’s hawk and white-tailed kite foraging habitat over the term of the NHP.

Rationale: Swainson’s hawk foraging habitat consists primarily of farm and pasturelands. Swainson’s hawks feed primarily on small rodents, usually in large fields that support low vegetation cover (i.e., provides easy access to the ground) and high densities of prey (Bechard 1982; Estep 1989). Foraging habitats include hay fields, grain crops, certain row crops, and lightly grazed pasturelands. Urban expansion and conversion to unsuitable crop types (e.g., vineyards and orchards) are responsible for a continuing reduction of available Swainson’s hawk foraging habitat in the Central Valley. Thus, protecting sufficiently large portions of existing foraging and nesting habitat ensures adequate protection of spatially interspersed breeding and foraging habitat. Planning Units 11, 13, 15, and 16 support the highest densities of Swainson’s hawk breeding territories in the Plan Area (see Appendix A, Covered Species Accounts). Maintaining at least 29,500 acres of very high and high value agricultural foraging habitat, representing 72 percent of very high and high value agricultural foraging habitat under baseline conditions, will help ensure the continued reproduction and survival of Swainson’s hawk and white-tailed kite in the Plan Area over the term of the NHP.

Objective LCS1.3: Maintain at least 14,844 acres of agricultural lands cultivated in crop types that support Swainson’s hawk and white-tailed kite foraging habitat in Planning Units 10, 12, and 14 over the term of the NHP.

Rationale: Planning Units 10, 12, and 14 support high numbers of nesting Swainson’s hawk, but at lower densities than the remaining Valley Landscape Unit Planning Units (see Appendix A, Covered Species Accounts). Maintaining at least 14,844 acres of agricultural foraging habitat, representing 50 percent of agricultural foraging habitat under baseline conditions, will help ensure the continued reproduction and survival of Swainson’s hawk and white-tailed kite in the Plan Area over the term of the NHP.

Goal LCS2: Maintain and enhance the biodiversity of the Valley Landscape Unit agricultural habitat matrix.

Objective LCS2.1: Establish at least 230 acres of natural habitat area along the margins of cultivated fields in the Valley Landscape Unit comprised of linear strips of native grasses, shrubs, and trees planted on field edges.

Rationale: The establishment of hedgerows along the margins of farmed fields will add vegetative and structural diversity to the annual cropland dominated landscape of the Valley Landscape Unit and increase their function as habitat for covered and other native wildlife species. Hedgerows provide habitat for rodents and other small mammals that
serve as prey for Swainson’s hawk and other raptors and provide refugia for these species during periods that fields are largely unvegetated and from which they can re-populate re-vegetated fields. The establishment of native vegetation will also provide habitat for native bees and other insects that serve to pollinate and allow for the reproduction of insect pollinated native plants. Trees planted in hedgerows will also replace isolated remnant trees in farmed fields that are dying out as they age. These isolated trees serve as nesting and perching habitat for Swainson’s hawk, white-tailed kite and other raptors, as well as perches that support the movement of songbirds and other species through the agricultural landscape.

Objective LCS2.2: Increase the abundance of native insect pollinators that support reproduction of native plant species and long-term production of agricultural crops that support habitat for covered, local concern, and other native wildlife species through implementation of applicable recommended actions in the Pollinator Conservation Strategy (see Appendix K, Pollinator Conservation Strategy).

Rationale: Current scientific evidence indicates that native insect pollinators, particularly bees, may be in global decline. Native insect pollinators support the reproduction of many of the native plant species that comprise natural communities in the Plan Area and the continued viability of the cultivation of crop types that support habitat for agricultural-associated covered, local concern, and other native wildlife species in the Plan Area. The Pollinator Conservation Strategy identifies conservation actions designed to maintain and increase the abundance of native insects that are pollinators of cultivated crops and native plants in the Plan Area. Implementation of these conservation actions will also support conservation of the NHP natural communities and covered, local concern, and other native wildlife species. For example, maintenance and establishment of patches of natural vegetation along field margins support production of food for native insectivorous and seed eating birds, provide habitat for the production of rodents and other small mammals that are prey for native raptors and other carnivores, provide nesting habitat for ground nesting birds, and escape cover for native rodents and other small mammals.

5.9.2.2 Agricultural Habitat Valuation

The Agricultural Habitat Strategy is based on a habitat valuation method for the various agricultural crops in the Plan Area. Two tools are necessary for achieving Goal LCS1 to maintain habitat values supported by agricultural crop for covered species:

1. A method for evaluating the relative habitat value of different crop types cultivated in the Plan Area for each of the eight covered species that use agricultural habitats (hereafter referred to as agricultural wildlife species) and

2. A model that can forecast changes in the mix of crop types cultivated in the Plan Area as economic market conditions change over the 50 year term of the agricultural habitat
Conservation of covered wildlife species that use agricultural habitats requires an understanding of their habitat relationships, including the relative importance of various crops to each species for foraging and nesting. Evaluating differences in the habitat quality of particular crops is important in understanding how crop variability affects the habitat suitability of different species, some of which specialize in a small subset of crops. Valuation of agricultural habitats for covered species therefore incorporates both quality of habitat and quantity (acreage).

The species habitat models presented in Appendix A, Covered Species Accounts, were developed to predict the occurrence of covered species within all natural and anthropogenic communities and habitats within the Plan Area. For the Agricultural Habitat Strategy, a separate set of agricultural habitat suitability models were developed for the agricultural wildlife species addressed in the strategy.

Wildlife species that use agricultural habitat are attracted to the agricultural crop types that support their foraging, cover, reproduction, or dispersal needs. The ongoing changes in the location and abundance of various crop types within the Plan Area present challenges in quantifying and tracking habitat values for these species. The agricultural habitat value rating system provides a method to quantify the relative habitat values of agricultural lands. These relative habitat values can be combined with habitat quantity to characterize total habitat value supported across the Plan Area at any point in time for the agricultural wildlife species.

A group of biologists knowledgeable about the habitat use patterns of the agricultural wildlife species in the Plan Area and elsewhere in the Central Valley was assembled to design and apply a system to assign numerical crop type habitat values (see Appendix F, Agricultural Habitat Valuation and Forecasting Model). Crops were rated on a 0.0 to 1.0 scale relative to the value of the highest value local habitat (generally a natural land cover type that was scored as 1.0) for each species. Crop habitat values for each species were assigned one of the following five numerical values 0.00, 0.10, 0.25, 0.50, 0.75, and 1.0 as describe in the following table.

<table>
<thead>
<tr>
<th>Value of Agricultural Type to Species</th>
<th>Frequency of Use (Observed Association)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>Species uses the crop at a level equal to the highest value habitat (very strongly associated with the crop)</td>
<td>1.00</td>
</tr>
<tr>
<td>High</td>
<td>Species uses crop frequently but not as often as the highest value habitat (strongly associated with the crop)</td>
<td>0.75</td>
</tr>
<tr>
<td>Moderate</td>
<td>Species uses crop often but not as often in natural habitat (regularly uses the crop, but at a lower level than other habitats)</td>
<td>0.50</td>
</tr>
<tr>
<td>Low</td>
<td>Species uses crop infrequently (only infrequently found in association with the crop)</td>
<td>0.25</td>
</tr>
<tr>
<td>Very Low</td>
<td>Species uses crop rarely or incidentally (only rarely found in association with the crop)</td>
<td>0.10</td>
</tr>
<tr>
<td>No Value</td>
<td>Species rarely or never uses crop</td>
<td>0.00</td>
</tr>
</tbody>
</table>
The values were assigned based on descriptions in the scientific literature of agricultural use by species and the knowledge of biological experts (as summarized in Appendix F, Agricultural Habitat Valuation and Forecasting Model, and Appendix A, Covered Species Accounts). The relative values of crop types were considered separately for each species when habitat values differed between uses (i.e., foraging, breeding, wintering). The assigned habitat values by crop type for each of the agricultural wildlife species and the rationale for each assigned value is presented in Appendix F.

The total existing habitat value provided by agricultural habitats in the Plan Area at any point in time is calculated by multiplying the Plan Area acreage of each crop type by the crop type value and summing the product of all of the crop types that support habitat for each of the species. These calculated habitat values are termed habitat units (HUs).

5.9.2.2.1 Agricultural Habitat Unit Maintenance Targets

Agricultural HU maintenance targets were established for agricultural wildlife species to serve as a threshold level of HUs that will need to be maintained under the NHP to sustain the current distribution and abundance of those species. The annual agricultural HU maintenance targets are presented in Table 5-27 and represent a proportion of the average annual number of HUs supported by the Plan Area from 2005 through 2009. The HU maintenance targets were established based the importance crop types in the Plan Area in sustaining each of the species relative to habitat for those same species supported by natural communities in the Plan Area.

Agricultural Forecasting Model

The Agricultural Habitat Strategy is based on the implementation of market incentives and conservation easements to ensure the proper amount and mix of crop types to support the target HUs for each wildlife species. To successfully implement a conservation strategy that relies on the use of market incentives and conservation easements to influence cropping patterns and ensure sufficient habitat value across the agricultural landscape, it is important to monitor and understand how cropping patterns change and to predict how they will change in various locations within the Plan Area over the duration of the NHP. To provide an analytical basis for predicting changes in cropping patterns, an econometric model was developed that takes into account a number of variables influencing the profitability, and therefore the selection by farmers, of crops across the Plan Area. Such variables include soil type and water availability for a particular field, the distance to market and the consequent transportation costs, and the market price for particular crops. The model is described in detail in Appendix F, Agricultural Habitat Valuation and Forecasting Model.

The predictive model indicates the probability that a particular cultivated field within the Plan Area will be planted with one crop over another in future years. The model further assists in evaluating whether, based on the collective probabilities generated at the field level, the HU targets established for the agricultural wildlife species will be met in future years without the need for NHP intervention. If annual crop monitoring and forecasting model runs conducted by
the Implementing Entity suggest that NHP intervention is required to achieve the HU maintenance targets in a particular year, the model also identifies the specific areas within the Plan Area that are susceptible to cropping changes that would lower the total Plan Area HUs. In this way, model results can be used to assist in prioritizing areas where conservation actions such as conservation easements or crop incentive payments could be used to maintain the HU targets. The identification of priority areas through the agricultural forecasting model will help maximize the conservation benefit of funds expended on conservation easements or market incentives.

In summary, the agricultural forecasting model provides confidence that the HU targets can be maintained during the initial years of NHP implementation (Table 5-27) and it will provide early warning if changes in cropping patterns are likely to result in less habitat value than established by the HU targets. The model further provides information regarding Plan Area locations where the expenditure of funds for conservation easements or market incentives would be most effective at maintaining the HU targets.

5.9.2.3 Local Conservation Measures

5.9.2.3.1 LCM1: Maintain Agricultural Habitat Units

The Implementing Entity will annually monitor the acreage of crop types cultivated in the Plan Area to assess whether or not the HUs targets established for the agricultural wildlife species have been maintained (Table 5-27) and to collect the information necessary to annually update and run the agricultural forecast model to determine whether or not NHP intervention may be necessary to maintain the HU targets in subsequent years. If results of monitoring and forecasting model runs indicate that HU targets may not be maintained, the Implementing Entity will implement actions to ensure that the HU targets are maintained. Initial runs of the agricultural forecasting model indicate that there is a high probability that the HU targets will be achieved during the first 5 years of the Plan without the need for intervention (see Appendix F, Agricultural Habitat Valuation and Forecasting Model). During this period, the Implementing Entity will develop an agricultural crop type production incentive program to ensure that the agricultural crop type targets can be maintained over the term of the NHP in the face of changing market conditions.

To achieve the HU targets for each of the agricultural wildlife species, it is necessary to conserve a combination of agricultural and natural habitats across the Plan Area. Agriculture is a primary land use in the Plan Area that will continue over the term of the NHP. The types of crops, their spatial distribution, and supporting agricultural practices affect habitat values for associated covered species and are expected to change over time with changing markets. To address these dynamic changes in the agricultural landscape, the NHP will provide for maintaining the amount of agricultural land habitat units for each species presented in Table 5-27 based on a 5-year rolling average. Descriptions of the per acre habitat units supported by crop types grown in the Plan Area for each of the covered species are presented in Appendix F, Agricultural Habitat Valuation and Forecasting Model.
Monitor Agricultural Cropping Changes

The Implementing Entity will annually monitor crop type acreages and distribution within the Plan Area using the following information.

- Annual crop pesticides reporting conducted by the County Agricultural Commissioner;
- The DWR crop mapping program, conducted approximately every 10 years;
- Other relevant information provided by other federal, state, and local agriculture agencies;
- Non-government agricultural organizations;
- The local farming community; and
- Supplemental field surveys by the Implementing Entity, as necessary.

This monitoring information will be used to annually confirm that HU targets have been maintained and to update and run the agricultural forecasting model (see Agricultural Forecasting Model in Section 5.9.2.2.1, Agricultural Habitat Unit Maintenance Targets and Appendix F, Agricultural Habitat Valuation and Forecasting Model) to predict changes in future conditions. The ongoing monitoring and predicting future crop type acreages and HUs, and calculating probabilities of achieving agricultural habitat targets during NHP implementation, will provide the Implementing Entity with a basis for assessing whether conservation actions are necessary to be implemented to ensure that the HU targets are achieved in the future. Long-term monitoring of crop type acreages also provides a stronger baseline data set for use in making model predictions, and a basis for evaluating the accuracy of the agricultural forecasting model and improving its predictive performance over time.

Over the term of the NHP, new crop types are expected to be introduced into the Plan Area. If the acreage of new crop types grown in the future is substantial, the Implementing Entity will assign a crop type value for those new crop types using the methods described Section 5.9.2.2, Agricultural Habitat Valuation to assign crop type values to existing Plan Area crop types. This information will be incorporated into the agricultural forecasting model.

Take Actions to Meet Conservation Targets for Habitat Units

The Implementing Entity will implement conservation actions to maintain the agricultural HU targets (Table 5-27) if monitoring and forecasting results indicate there is a potential for a future decline in agricultural HU below the maintenance target for one or more of the agricultural wildlife species. These actions must be implemented no later than one year of a shortfall in achieving the maintenance targets and will ensure that either crops with higher habitat value are grown or that cultivated fields are enhanced to increase their per acre value and maintain the total values across the landscape above the conservation objective for all species. Actions to maintain Habitat Unit value may include 1) market-based incentive payments to induce farmers to maintain or switch to desired crops necessary to increase habitat values for one or more species...
or 2) to provide funding to enhance the comparable habitat value on non-cultivated portions of agricultural parcels (e.g., planting of cover strips to increase production of rodent prey for Swainson’s hawk). Under the latter approach, the Implementing Entity will assign a per acre suitability index rating for the HU type for which there may be a deficit based on the best available information and input from qualified biologists. The suitability index rating will be used to determine the existing HUs supported by the habitat to be enhanced and the increase in HUs that are expected from the enhancement action.

In addition to these market incentives, actions to ensure cropping patterns that will maintain the Habitat Unit objectives could include acquisition of limited-term contracts or permanent easements, property tax reductions, government assistance grants, or other mechanisms.

5.9.2.3.2 LCM2: Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat

In addition to maintaining the HU targets through implementation of LCM1, Maintain Agricultural Habitat Units, the Implementing Entity will implement conservation actions to maintain a specified acreage of specific crop types that provide habitat for giant garter snake and Swainson’s hawk.

**Giant Garter Snake Habitat**

The Implementing Entity will maintain at least 10,100 acres of rice land in rice production in Planning Units 12 and 13 and at least 7,330 acres in Planning Units 11, inclusive of crop types that may be grown on rice lands during standard rotations necessary to maintain ongoing rice cultivation, to provide giant garter snake habitat over the term of the NHP. Other crops or land uses that provide equal or greater habitat function for giant garter snake may be counted toward this target in these areas. The acreage of land in rice production will be annually monitored and the actions described in Section 5.9.2.3.1, LCM1: Maintain Agricultural Habitat Units will be implemented if necessary to maintain the acreage over the term of the NHP.

**Swainson’s Hawk Foraging Habitat**

The NHP will maintain a total 82,144 acres crop types that support Swainson’s hawk foraging habitat, inclusive of crop types that may be of lesser foraging habitat value but must be grown as part of standard crop rotations to maintain the target crop types, over the term of the NHP distributed within Planning Units 10-16 as described below.

The Implementing Entity will maintain at least 67,300 acres of agricultural crop types that provide Swainson’s hawk foraging habitat\(^\text{62}\) in Planning Units 11, 13, 15, and 16, which support the highest nesting densities of Swainson’s hawk in the Plan Area (see Figure A-20 in Appendix A, Covered Species Accounts) over the term of the NHP. At least 29,500 acres of agricultural

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\(^{62}\) Crop types that provide very high to moderate value Swainson’s hawk foraging habitat includes the DWR crop type categories of alfalfa, native pasture, undifferentiated pasture, mixed pasture, clover, miscellaneous grasses (grown for seed), sugar beets, tomatoes, and grain and hay (see Appendix F, Agricultural Habitat Valuation and Forecasting Model).
foraging habitat maintained in these Planning Units must support crop types that provide very high to high value foraging habitat\(^63\) and at least 2,480 acres of which will be located within 4 miles of Swainson’s hawk nest sites. In Planning Units 10, 12 and 14, which support lower densities of nesting Swainson’s hawk, the Implementing Entity will maintain at least 14,844 acres of agricultural crop types that provide Swainson’s hawk foraging habitat\(^64\) over the term of the NHP. At least 3,800 acres of agricultural foraging habitat maintained in Planning Units 10, 12, and 14 must support crop types that provide very high to high value foraging habitat\(^65\). The acreage of land in crop types that support very high to moderate value Swainson’s hawk foraging habitat within Planning Units 10-16 will be annually monitored and the actions described in Section 5.9.2.3.1, LCM1: Maintain Agricultural Habitat Units will be implemented if necessary to maintain the acreage targets over the term of the NHP. In addition, the 2,480 acres of very high to high value foraging habitat to be maintained within 4 miles of Swainson’s hawk nest sites will be protected under contract with participating landowners over the NHP permit term.

5.9.2.3.3 LCM3: Establish Field Edge Habitat Areas

The Implementing Entity will provide funding or other incentives to landowners to establish or enhance at least 230 acres field edge habitat areas on unprotected agricultural lands benefitting covered and other native species over the term of the NHP. Conservation actions implemented by other entities (e.g., NRCS conservation programs, implementation of actions in fulfillment of the Yolo County Climate Action Plan) may also contribute towards achieving this objective.

Habitat establishment and enhancement actions will be implemented through limited term contracts of at least 20 years. Established and enhanced patches of field edge habitat must be in contiguous patches of at least 5 acres and must be maintained over the contract term. Habitat enhancements under this measure are directed at portions of agricultural lands that are not actively farmed. Habitat establishment and enhancement actions implemented by landowners must be approved by the Implementing Entity and are anticipated to include such actions as planting and maintaining herbaceous, shrub, and tree species along field edges, ditches, fence lines, roadsides, and other areas within and adjacent to agricultural lands.

The primary benefits for covered, local concern, and other native wildlife species of these small-scale enhancements includes providing buffer strips and sediment capture between active fields and sensitive natural habitats (e.g., wetlands), increasing interstitial habitat for within agricultural landscape (e.g., by producing rodent prey for raptors, insect prey for birds and bats), and providing habitat for species that provide ecosystem services to agricultural crops (e.g.,

\(^{63}\) Crop types that provide very high to high value Swainson’s hawk foraging habitat includes the DWR crop type categories of alfalfa, native pasture, undifferentiated pasture, mixed pasture, clover, and miscellaneous grasses (grown for seed) (see Appendix F, Agricultural Habitat Valuation and Forecasting Model).

\(^{64}\) Crop types that provide very high to moderate value Swainson’s hawk foraging habitat includes the DWR crop type categories of alfalfa, native pasture, undifferentiated pasture, mixed pasture, clover, miscellaneous grasses (grown for seed), sugar beets, tomatoes, and grain and hay (see Appendix F, Agricultural Habitat Valuation and Forecasting Model).

\(^{65}\) Crop types that provide very high to high value Swainson’s hawk foraging habitat includes the DWR crop type categories of alfalfa, native pasture, undifferentiated pasture, mixed pasture, clover, and miscellaneous grasses (grown for seed) (see Appendix F, Agricultural Habitat Valuation and Forecasting Model).
pollinators). The establishment and enhancement of habitat under this conservation measure will ensure a fine-grained support of species that are adapted to the agricultural landscape and will also enhance the permeability of the landscape for a variety of species (e.g., carnivores).

5.9.2.3.4 LCM4: Support Implementation of the Pollinator Conservation Strategy

The Implementing Entity will undertake the following types of actions to support implementation of the recommended conservation actions identified in the Pollinator Conservation Strategy (see Appendix K, Pollinator Conservation Strategy).

Communicate and coordinate with Plan Area agricultural programs.

The Implementing Entity will maintain ongoing communications with the Natural Resources Conservation Service (NRCS), Yolo County Farm Bureau, Yolo County Agriculture Department and local landowners to identify and develop opportunities and incentives for implementation of Pollinator Conservation Strategy conservation actions with the Plan Area.

Assist Plan Area conservation and agricultural programs to secure funding.

The Implementing Entity, where consistent with NHP conservation objectives, will coordinate with the NRCS, local, state, and federal land managers, and other entities to secure grant and other funding for implementation of Pollinator Conservation Strategy conservation actions.

Assist with public outreach.

The Implementing Entity will coordinate with local conservation and agricultural programs to develop and disseminate information regarding the importance of native insect pollinators to Plan Area ecosystems and economy and technical information describing conservation actions that can be implemented by landowners to improve native insect pollinator habitat conditions and sources of funding to assist with their implementation.

5.9.3 Riparian Habitat Strategy

The Local Conservation Strategy includes implementation of actions through the Riparian Habitat Strategy that are designed to maintain an amount and function of riparian habitat above a minimum threshold in the agricultural Planning Units (Planning Units 6, 7, and 9–16). Even small patches of riparian vegetation provide a variety of important ecosystem services (e.g., wildlife habitat, erosion control, wildlife movement corridors; see Chapter 2, Existing Ecological Conditions). A substantial proportion of the riparian habitat in the agricultural Planning Units is associated with an altered hydrology that is dominated by the system of irrigation, drainage, and flood control channels that permeates the agricultural working landscape. As a working landscape, patches of riparian habitat are subject to periodic removal. Implementation of the riparian habitat conservation strategy is designed to ensure that sufficient amount and function riparian habitat is maintained over the term of NHP to support the current abundance and
distribution of riparian-associated native wildlife species in the Plan Area. In addition, the strategy will promote other ecosystem functions supported by riparian vegetation.

5.9.3.1 Biological Goals and Objectives

This section describes the biological goals and objectives for the JPA’s riparian habitat strategy. Each goal and objective is assigned a unique alphanumeric code that will assist with tracking implementation of the Local Conservation Strategy.

Goal LCS3: Maintain habitat values supported by riparian habitat for riparian-associated native wildlife species in the agricultural Planning Units (Planning Units 6, 7, and 9–16) over the term of the NHP.

Objective LCS3.1: Maintain the acreage of valley foothill riparian on private lands distributed among the agricultural Planning Units as indicated in Table 5-28 over the term of the NHP.

Rationale: Valley foothill riparian communities provide habitat and migratory “stepping stones” for a diverse assemblage of terrestrial species, and achieving this objective will increase the habitat function of adjacent agricultural lands for specific covered and other native wildlife species. The objective will contribute to providing a network of habitat patches that support the diversity of ecosystem functions across the landscape.

5.9.3.2 Local Conservation Measures

5.9.3.2.1 LCM5: Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units

The Implementing Entity will maintain at least 90 percent of the baseline acreage of unprotected valley foothill riparian (i.e., valley foothill riparian not included in existing PEHL Category 1 or future NHP protected lands) in agricultural Planning Units 6, 7, and 9–16 (Table 5-28). Much of the riparian habitat in the agricultural Planning Units is maintained through existing flood control and agricultural water supply and drainage practices. The expectation is that over the term of the NHP, these riparian habitats will continue to be maintained through these practices.
Table 5-28. Valley Foothill Riparian to be Maintained on Private Non-NHP Conservation Lands within Agricultural Planning Units (Planning Units 6, 7, and 9–16)

<table>
<thead>
<tr>
<th>Planning Unit</th>
<th>Area (ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>123</td>
</tr>
<tr>
<td>7</td>
<td>234</td>
</tr>
<tr>
<td>9–16</td>
<td>345</td>
</tr>
</tbody>
</table>
Monitor the Acreage of Valley Foothill Riparian

To ensure that the riparian woodland and scrub acreage targets are achieved, the Implementing Entity will monitor the acreage and distribution of valley foothill riparian on private lands in Planning Units 6, 7 and 9–16 every 5 years over the term of the NHP. Monitoring may be conducted through analysis of aerial imagery; on-ground surveys where access is available; and use of relevant monitoring data collected by others (e.g., DFW). Change analyses will be conducted to determine the trends in amount and distribution of valley foothill riparian over the term of the NHP. Results of these analyses will be used by the Implementing Entity to determine the need to implement actions to achieve acreage targets for the maintenance of valley foothill riparian in each of the Planning Units as indicated in Table 5-28.

Implement Actions to Maintain Valley Foothill Riparian Acreage

The Implementing Entity will implement conservation actions to maintain the riparian habitat acreage targets (Table 5-28) if monitoring results indicate there is a potential for a future decline in riparian habitat acreage below the maintenance targets in one or more of the Planning Units. If monitoring results indicate the acreage of valley foothill riparian has declined below or is trending towards falling below the acreage maintenance objectives in Table 5-28, the Implementing Entity will implement actions to maintain or increase the acreage of valley foothill riparian at or above the Planning Unit objectives indicated in Table 5-28. Actions to maintain valley foothill riparian acreage may include but are not limited to the following.

- Providing financial incentives to private landowners to implement management practices that will maintain existing valley foothill riparian on private lands.
- Provide financial incentives to private landowners to allow riparian habitat to naturally establish and be retained on sites with suitable soils and hydrology.
- Restoring valley foothill riparian (e.g., through funding of Yolo County’s Climate Action Plan actions for riparian reforestation [Yolo County 2011]).
- Other appropriate mechanisms that may become available over the term of the NHP.

In addition, the valley foothill riparian maintenance acreage objectives will be reduced if riparian natural community protection targets are exceeded during implementation of the NHP Conservation Strategy because the proportion of unprotected valley foothill riparian in the Plan Area will be commensurately reduced.

5.9.4 Conservation of Local Concern Species

Local concern species were identified by the Steering Advisory Committee (Section 1.4.4, Local Concern Species) and both the NHP conservation measures (Section 5.4, Conservation Measures) and the local conservation measures (Section 5.9.2, Agricultural Habitat Strategy, and Section 5.9.3, Riparian Habitat Strategy) provide conservation benefits for these species. The conservation actions that benefit local concern species and the expected conservation
outcome for each of these species are described in Section 5.7, Conservation Provided for Local Concern Species.

5.9.5 Conservation of Covered Species

Implementation of the local conservation strategy measures are expected to benefit covered species that use valley foothill riparian and agricultural habitats. The Local Conservation Strategy includes implementation of actions that are designed to maintain 90 percent of the riparian habitat present in Planning Units 6, 7, and 9–16 following implementation of the covered activities. Implementation of LCM5, Maintain Valley Foothill Riparian Acreage in the Agricultural Planning Units will maintain at least 3,629 acres of existing riparian woodland and scrub in the Plan Area (see Table 5-28). Maintaining at least 90 percent of the existing valley foothill riparian habitat in the Plan Area is expected to ensure that the existing distribution, abundance, and production of valley elderberry longhorn beetle, western pond turtle (nesting and overwintering habitat), Swainson’s hawk (nesting habitat), white-tailed kite (nesting habitat), western yellow-billed cuckoo, loggerhead shrike (nesting/perching habitat), least Bell’s vireo, yellow-breasted chat, and Townsend’s big-eared bat (foraging and roosting habitat) is maintained in Planning Units 6, 7, and 9–16 over the term of NHP implementation.

The Local Conservation Strategy includes implementation of actions that are designed to maintain the production agricultural crop types that support western pond turtle (aquatic), giant garter snake (active season aquatic), Swainson’s hawk (foraging), northern harrier (secondary nesting/foraging), white-tailed kite (foraging), black tern (rice), western burrowing owl, and tricolored blackbird (foraging) habitat outside of and in addition to the NHP conservation lands system. As indicated in Table 5-27, implementation of LCM1, Maintain Agricultural Habitat Units will ensure that a substantial proportion of the existing habitat values provided for these species by agricultural lands will be maintained in Planning Units 6, 7, and 9–22 over the term of the NHP. In addition to maintaining specified levels of agricultural foraging habitat units, implementation of LCM2, Maintain Agricultural Lands that Support Giant Garter Snake and Swainson’s Hawk Habitat will maintain at least 17,430 acres of land in rice production in Planning Units 11–13 to maintain rice habitat occupied by the giant garter snake Colusa Basin and Willow Slough/Yolo Bypass subpopulations and will maintain at least 82,144 acres of Swainson’s hawk agricultural foraging habitat, at least 29,500 acres of which will be maintained in crop types that provide very high value foraging habitat (e.g., alfalfa). The establishment and enhancement of at least 230 acres of field edge habitats under LCM3, Establish Field Edge Habitat Areas along margins of cultivated fields will also provide habitat to support production of Swainson’s hawk, northern harrier, white-tailed kite, western burrowing owl, and loggerhead shrike prey species (e.g., rodents), which serves provides important habitat to maintain prey production during periods adjacent cultivated fields are largely cleared of vegetation and support minimal habitat for these species.