1 INTRODUCTION

1.1 Overview

The South Sacramento Habitat Conservation Plan (SSHCP or Plan) ensures preservation of species, natural communities, and aquatic resources in the Plan Area; while providing an improved environmental permitting process for Covered Activity projects that impact listed species, listed species habitats, or aquatic resources. The SSHCP is intended to preserve 28 species of plants and wildlife, including 11 that are listed as threatened or endangered under the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), or both. In addition, because so many of the Covered Species live part or all of their lives in water bodies, the SSHCP also provides additional avoidance and minimization of Covered Activity impacts to wetlands, streams, and other aquatic resources that are also subject to regulation under the federal Clean Water Act (CWA), the California Fish and Game Code, and California's Porter-Cologne Water Quality Control Act.

The SSHCP was prepared by five local agencies, including the County of Sacramento (County), City of Galt, City of Rancho Cordova, Sacramento County Water Agency (SCWA), and the Southeast Connector Joint Powers Authority (Connector JPA). These five local agencies, plus the future SSHCP Implementing Entity (to be named the South Sacramento Conservation Agency), are collectively applying for Incidental Take Permits and are referred to as the "Plan Permittees" in this document.

The SSHCP Preserve System will conserve habitat that will be managed and monitored to demonstrate achievement of the Biological Goals and Measurable Objectives for Covered Species (see Chapter 7 for a complete discussion of the Plan's Conservation Strategy). In exchange for habitat conservation and other commitments, the United States Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) (the Wildlife Agencies) will each issue an Incidental Take Permit (ITP) that grants take for Covered Species resulting from the implementation of Covered Activities, including urban development and infrastructure construction and maintenance activities (see Chapter 5 for a definition of the SSHCP Covered Activities). The entities that receive take coverage under the ITPs are exempt from take prohibitions of Section 9 of the federal ESA for "take" of Covered Species incidental to otherwise legal activities.

An important component of the SSHCP Conservation Strategy is an Aquatic Resources Program (ARP). As discussed in Chapter 7, the ARP describes how the SSHCP strategy for the conservation of aquatic habitat in this Plan Area will avoid and minimize Covered Activity impacts on the Plan Area's aquatic resources, and provide adequate compensatory mitigation for unavoidable Covered Activity impacts. In exchange for conservation of wetlands streams, riparian, and other Plan Area aquatic resources, the United States Army Corps of Engineers (USACE) plans to develop a multi-level permitting strategy under Section 404 of the CWA (CWA 404) for future Covered Activities that are consistent with all SSHCP requirements. This

permit strategy is contained in Appendix C of the SSHCP Environmental Impact Statement/Environmental Impact Report (EIS/EIR).

The Plan Permittees have requested that the Regional Water Quality Control Board (RWQCB) use the ARP document to develop a parallel program to issue Water Quality Certifications under Section 401 of the CWA (CWA 401), and a program to issue a Report of Waste Discharge under the California Porter-Cologne Water Quality Control Act. The Plan Permittees will also request that CDFW use the ARP document to develop a Master Streambed Alteration Agreement under Section 1600 of the California Fish and Game Code for Plan Permittee Covered Activities and to streamline permitting for all Covered Activities described with the SSHCP.

Shortly after the Natural Community Conservation Plan (NCCP) Act of 2003 was authorized by the state legislature, CDFW requested that the County convert the SSHCP from a stand-alone Habitat Conservation Plan (HCP) to a joint HCP/NCCP. Because the NCCP Act requires the protection of natural communities beyond what is required to mitigate species impacts, there were concerns that the preparation of a joint HCP/NCCP would not be feasible due to the Plan Area's already limited inventory of land available for mitigation. However, recognizing the benefits that the NCCP Act provides for protection of natural communities, the Plan Permittees elected to include additional voluntary conservation (Appendix J) as a supplement to the SSHCP Conservation Strategy that, where feasible, would encourage preservation of additional acreage of natural communities and species habitat beyond what is required to mitigate effects of the Covered Activities to the maximum extent practicable. In so doing, the SSHCP includes some of the beneficial properties of an NCCP. However, take under CESA will be issued under California Fish and Game Code Section 2081.

Three of the Plan Permittees are also local jurisdictions with authority to permit or approve projects and activities within their jurisdictional boundary. Under the Plan, the three local Land Use Authority Permittees (Sacramento County, the City of Galt, and the City of Rancho Cordova) have the ability to extend incidental take coverage provided by the SSHCP ITPs to Covered Activities implemented by Third-Party Project Proponents that are under the jurisdiction of that Land Use Authority Permittee. This will allow Third-Party Project Proponents to avoid the extensive negotiation and processing currently required to obtain individual project permits under CESA from CDFW and project ESA compliance from USFWS. As discussed in Chapter 9, Third-Party Project Proponents are private project applicants proposing to implement an SSHCP Covered Activity and are seeking ministerial[1] or discretionary[2] project permits from a Land Use Authority Permittee.

[1] A ministerial permit is a permit that requires little to no judgment on behalf of the Land Use Authority Permittee. An example of a ministerial permit is a building permit that states that, as long as a parcel is zoned to allow the building of a structure, the applicant only needs to follow building codes to construct their project.

In addition, Covered Activities implemented by Third-Party Project Proponents can avoid the extensive negotiation and processing currently required to obtain CWA 404 permits from the USACE and U.S. Environmental Protection Agency (USEPA), as well as extensive negotiation and processing currently required to obtain CWA 401 approvals from the RWQCB and to issue Reports of Waste Discharge under the California Porter-Cologne Act.

The future South Sacramento Conservation Agency (the SSHCP Implementing Entity) also has the ability to extend incidental take coverage provided by the ITPs to third-party Participating Special Entities. As discussed in Chapter 9, Participating Special Entities are third-party entities that may wish to implement a Covered Activity allowed by the SSHCP permits, but the entity is not under the jurisdiction of a Land Use Authority Permittee. Participating Special Entities might include school districts, reclamation districts, irrigation or water districts, utilities, or other organizations that are not subject to the regulatory authority of a local jurisdiction.

1.1.1 SSHCP Mission Statement

The Plan Permittees and key stakeholders, participating in a goal-setting process, developed a set of broad program goals that collectively serve as the mission statement for this Plan. The goals developed are to:

- Ensure long-term viability of Covered Species in the Plan Area by preserving an adequate quality and quantity of habitat in an integrated regional manner and further contribute to species recovery.
- Protect, maintain, and restore the functions and services of waters of the United States and maintain the integrity of watersheds throughout the Plan Area.
- Accommodate development in sites consistent with Land Use Authority Permittee plans (County and the Cities of Galt and Rancho Cordova) in exchange for payment of a development fee and other mitigation.
- Promote the long-term viability of agricultural uses consistent with the Plan, and ensure that agricultural lands and operations are not unduly impacted by the SSHCP's implementation.
- Promote awareness and appreciation of the Plan Area's natural history and provide environmental education opportunities for local residents.
- Create a standardized and predictable permitting process without unforeseen mitigation obligations.

[2] A discretionary permit is a permit that requires the use of judgement by a Land Use Permittee before the permit can be issued. An example of a discretionary permit is a permit for a general plan amendment.

- Provide a comprehensive framework for land use by linking plant and animal conservation with local land use programs, consistent with the goals and policies of each local Land Use Authority Permittee.
- Provide for stakeholder involvement and public input during the preparation of Plan documents.

1.1.2 Purpose and Benefits of the SSHCP

The purpose of the SSHCP is to ensure the long-term survival of the species covered in this Plan by preserving and establishing/re-establishing the habitats, natural communities, and ecosystem functions that they rely on, while allowing appropriate and compatible urban growth and development. The Plan also requires measures that will avoid, minimize, and mitigate impacts to the species, thereby addressing the permitting requirements relevant to these species for activities conducted by or under the jurisdiction of the Plan Permittees. These activities (i.e., the SSHCP Covered Activities, see Chapter 5) include urban development and infrastructure projects, such as roadway improvements and sewer and water line construction. The Plan also describes activities associated with operating and maintaining a new SSHCP Preserve System, which will be created to mitigate anticipated impacts resulting from urban development and infrastructure activities.

This Plan is an HCP intended to fulfill the requirements of CESA and the federal ESA. The Plan also addresses Covered Activity permitting requirements for the federal CWA, California's Porter-Cologne Water Quality Control Act, and Fish and Game Code streambed alternation agreement requirements. In addition to providing impact mitigation, this Plan is intended to aid in the recovery and possible delisting of listed species. The Plan's Conservation Strategy (Chapter 7) may help preclude the need to list additional species in the future through the preservation of habitat that benefits species.

The SSHCP will offer numerous benefits, including the following:

- Provides County, City of Galt, and City of Rancho Cordova residents with an interconnected Preserve System that maintains natural communities and species habitat at a regional scale including aquatic resources and other biological resources and maintains open space and intact watersheds for future generations.
- Conservation of native species that live in or move through the Plan Area.
- Offers protection for a broad range of native species and species habitats in a regionally coordinated manner to provide greater opportunity for long-term viability of native species populations; conserves and enhances ecosystem functions; and establishes a substantial system of interconnected Preserves that are located in areas with the highest-quality species habitat. The SSHCP will provide landscape-level Preserves and will

connect the existing patchwork of mostly small, isolated, and noncontiguous Preserves throughout the Plan Area that resulted from past project permitting.

- Provides for the protection and enhancement of stream, riparian, and aquatic resources, which are expected to help maintain water quality throughout the region.
- Re-establishes species habitat where habitat once occurred in the Plan Area.
- Affords an opportunity for landowners to voluntarily sell conservation easements that will preserve existing agricultural practices and uses for future generations.
- Allows for an expedited and predictable process for project permitting under the federal ESA, CESA, and 404 of the CWA. Because the requirements to obtain incidental take coverage are standardized in the SSHCP, the Plan makes the requirements and their associated costs more predictable.
- Allows for an expedited and predictable process for project permitting under Sections 401 of the CWA and Porter-Cologne Water Quality Control Act as well as Section 1600 of the California Fish and Game Code.
- Provides a means to preserve habitat resources that occur within designated Critical Habitat and Core Recovery Areas.
- Provides future incidental take authorization of currently non-listed federal species that may become listed during the Permit Term.
- Allows a reasonable amount of development to occur that supports economic growth.

Incidental take authorization will be granted to the Plan Permittees by the USFWS and CDFW ITPs. The Plan Permittees are asking the USFWS and CDFW to issue permits that allow incidental take of Covered Species when the take is consistent with the provisions of this Plan, the Implementing Agreement[3] (see Appendix C), and the terms and conditions of the ITPs. The Plan includes a Conservation Strategy to compensate for impacts to the Covered Species. The Conservation Strategy also provides for the conservation and management of Covered Species and their habitats.

It is expected that each of the Plan Permittees (including the Plan's future Implementing Entity) will be a permittee on the federal ESA Section 10(a)(1)(B) ITP and a permittee on the California Fish and Game Section 2081 ITP that will authorize species take that results from implementation of SSHCP Covered Activities (Chapter 5). The Plan Permittees will also receive a Master Streambed Alteration Agreement. Finally, the Plan will address federal CWA and California

[3] The purpose of an HCP Implementing Agreement, when used, is to ensure that each permittee and all other parties understand their roles and responsibilities under the HCP, the Endangered Species Act Section 10(a)(1)(B) ITP, and the California Endangered Species Act ITP and to provide remedies should any party fail to fulfill its obligations (USFWS and NOAA 1996).

Porter-Cologne Water Quality Control Act permitting requirements through an ARP and subsequent permitting strategy prepared by the USACE and RWQCB. While the Plan Permittees will not hold permits to address CWA and California Porter-Cologne Water Quality Control Act permitting requirements (with some exceptions as discussed in the ARP) the CWA and California Porter-Cologne Water Quality Control Act permitting strategy prepared by the USACE and RWQCB specifically for the SSHCP will significantly streamline the permitting process.

In addition to their own Covered Activities, the three local Land Use Authority Permittees (County, City of Galt, and City of Rancho Cordova) can also extend incidental take coverage provided by the ITPs to third-party projects that are Covered Activities and under their jurisdiction.[4] The USFWS will also provide "no surprises" assurances to the Plan Permittees, where the USFWS will not require the commitment of additional land, water, or financial compensation (or additional restrictions on the use of land, water, or other natural resources) for impacts to Covered Species beyond the level agreed upon and described in the Plan—as long as the Plan Permittees are adequately implementing the Plan (see Chapter 9). Compliance with the Plan will also satisfy CEQA mitigation requirements for impacts to biological resources.

It should be noted that the SSHCP is not a land use document. All land use decisions will continue to be made by the respective jurisdictions consistent with their existing authority, regulations, and policies. Neither implementation of the SSHCP nor issuance of the ITPs constitutes approval of the activities or projects that could obtain federal ESA and CESA coverage under the SSHCP permits. Such land use approvals can only be obtained from the relevant jurisdiction (the relevant Land Use Authority Permittee) through the existing land use approval processes.

1.1.3 Background

The SSHCP was first initiated to implement Sacramento County General Plan Policies that promote the protection of natural resources while providing an alternative means to comply with ESA permitting processes. In 2011, the County updated its General Plan and incorporated several policies designed to mirror objectives from the SSHCP. The SSHCP provides a means to implement several of those County policies (see Chapter 4, Land Use), including, but not limited to, Policy CO-58, which ensures no-net-loss of wetlands, riparian woodlands, and oak woodlands, and Policy CO-65, which requires the creation of a network of Preserves linked by Wildlife Movement Corridors.

[4] Note that the USFWS and CDFW permits will only authorize the incidental take of Covered Species. Most projects will also require additional local authorization (e.g., California Environmental Quality Act (CEQA)), and some projects will also require additional state or federal authorizations.

The SSHCP also provides a means to comply with two completed Biological Opinions (BOs) issued by the USFWS in response to an ESA consultation regarding water contracts for Sacramento County. In March of 1999, the Zone 40 BO (USFWS 1999) was issued by USFWS regarding water contracts for portions of Sacramento County under Public Law (P.L. 101-514). The Zone 40 BO requires U.S. Bureau of Reclamation, San Juan Water District (District), the County, and SCWA to implement various habitat conservation measures. One such measure requires the Bureau of Reclamation, District, County, and SCWA to identify goals for habitat conservation in their respective jurisdictions to conserve vernal pool species and associated upland habitats; a goal that could be achieved through the preparation of a regional HCP. The Zone 40 BO further specifies that the County shall diligently pursue completion of an HCP to obtain an ITP for indirect effects of the water contracts on federally listed species. In September of 2004, the County, SCWA, SRCSD, and USFWS signed a Memorandum of Agreement that set forth several agreements and courses of action that would allow projects in Sacramento County to proceed through construction permitting, including federal ESA Section 7 consultations, in a reasoned and legally permissible manner (County of Sacramento et al. 2004). The Memorandum of Agreement states that future development projects in Zone 40 will incur direct and indirect effects under the federal ESA, and further outlines the means by which those species effects could be addressed. The four parties agreed that the County will proceed with completion of the SSHCP as the most efficient means to address those future effects.

In December of 2004, the Freeport Regional Water Project BO was issued (USFWS 2004) to cover the Bureau of Reclamation's (1) authorization for East Bay Municipal Utility District (EBMUD) and SCWA to use the new water diversion facility on the Sacramento River at Freeport; (2) authorization for the Freeport Regional Water Agency and EBMUD to use the Folsom South Canal to convey EBMUD's Central Valley Project water; (3) fulfillment of EBMUD contract to complete federal ESA compliance before delivering any water to EBMUD; and (4) approval of an assignment of 30,000 acre-feet annually of water from Sacramento Municipal Utilities District to SCWA. The Freeport Regional Water Project Freeport Regional Water Project BO also reinitiated consultation on the Bureau of Reclamation's long-term Central Valley Project water contract with SCWA. The Freeport Regional Water Project BO heavily references both the Zone 40 BO and the County of Sacramento agencies Memorandum of Agreement (County of Sacramento et al. 2004), including County completion of a regional HCP. Future development projects that would receive water service provided through the new Freeport Regional Water Project facilities must comply with the federal ESA before the receiving entitlements from the County, and before water can be delivered. Projects must first demonstrate compliance with the federal ESA or the County will withhold approval of final maps, improvement plans, or building permits, and the SCWA will not issue a will-serve letter. The County and SCWA have determined that the most efficient means to comply with the 2004 Memorandum of Agreement is through preparing and implementing the SSHCP.

1.2 Scope of the Habitat Plan

This section describes the Plan's geographic scope, Covered Activities, Permit Term, and Covered Species.

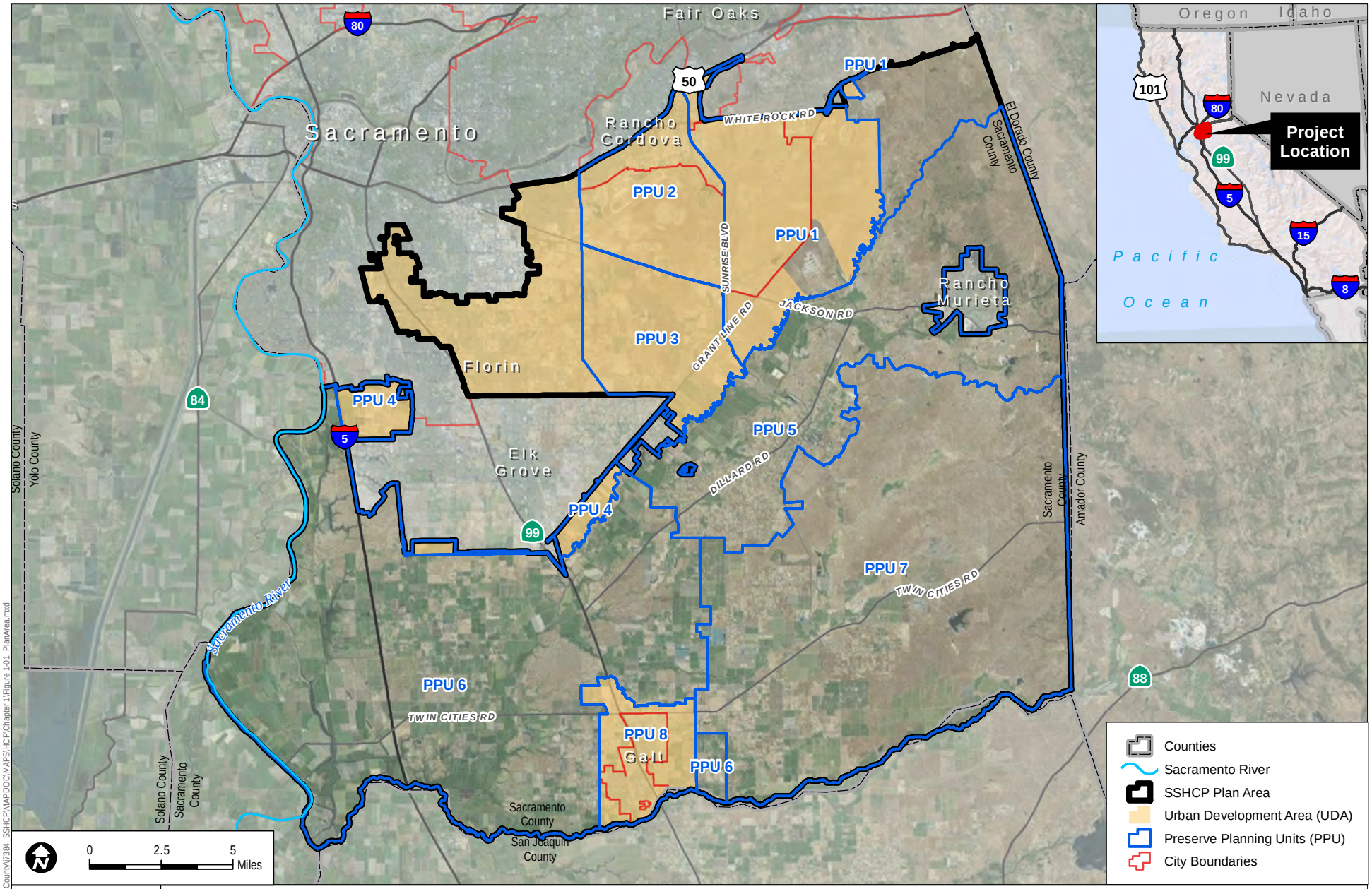
1.2.1 Geographic Scope of the Plan Area

The Plan Area includes 317,656 acres within south Sacramento County, including the City of Galt and most of the City of Rancho Cordova (see Figure 1-1, SSHCP Plan Area). The Plan Area is defined as the area in which all Conservation Actions will be implemented and where all incidental take will occur. The boundary of the Plan Area was defined using political and ecological factors. The geographical boundaries are U.S. Highway 50 to the north, the Sacramento River levee and County Road J11 (Walnut Grove-Thornton Road) to the west, the Sacramento County line with El Dorado and Amador Counties to the east, and the San Joaquin County line to the south.

The Plan Area excludes the northern portion of Sacramento County, the northern portions of the City of Rancho Cordova, the City of Sacramento, the City of Elk Grove, the City of Folsom, the sovereign lands of the Miwok Tribe, and the Sacramento County community of Rancho Murieta (see Figure 1-1). These areas were excluded from the Plan Area because they were either significantly built out, would not use the SSHCP, or were not likely to benefit from the SSHCP due to the absence of listed species or their habitats. The sovereign lands of the Miwok Tribe are not included as the tribe is not a proposed Plan Permittee.

SSHCP Urban Development Area

The Plan Area is functionally divided into two components: inside and outside of an Urban Development Area (UDA). Inside the UDA is where all proposed urbanization will occur, and therefore, where most incidental take will occur. There will also be some habitat preservation within the UDA. The "inside the UDA" component totals 67,618 acres within the Plan Area. Geographically, the UDA is the portion of the Sacramento County Urban Services Boundary (USB), the incorporated Cities of Rancho Cordova and Galt, and Galt's Sphere of Influence that are also within the Plan Area (see Figure 1-1). The Plan Area component located outside of the UDA totals 250,038 acres. No urban development is covered under the SSHCP outside of the UDA. A limited amount of incidental take is requested for specific infrastructure projects and for species conservation activities proposed outside of the UDA.



SOURCE: ESRI, County of Sacramento 2014

FIGURE 1-1

SSHCP Plan Area

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

Path: Z:\Projects\Sacramento_County\73384_SSHCP\MAPDOC\MAPS\HCP\Chapter 1\Figure 1-0 1_PlanArea.mxd

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SSHCP Preserve Planning Units

To assist with development of the SSHCP Conservation Strategy, the Plan Area was further divided into eight Preserve Planning Units (PPUs) that encompass areas where important Covered Species resources are present, and where habitat preservation will be planned (see Figure 1-1). These eight SSHCP PPUs are geographic subdivisions of the Plan Area designed to ensure that adequate Biological Goals and Measurable Objectives (see Chapter 7) were developed for all biological resources located within the Plan Area.

PPUs were delineated to capture specific habitat or agricultural land cover types or areas identified as being important for a specific suite of species. For instance, PPU 7, which is located in the southeastern portion of the Plan Area, was delineated to encompass the vast majority of vernal pool grasslands remaining in the County. PPU 7 also contains the designated Cosumnes/Rancho-Seco Core Recovery Area (C/RS) (USFWS 2005). PPU 2 contains the designated Mather Core Recovery Area (USFWS 2005). PPU 6, located in the southwestern portion of the Plan Area, was delineated to encompass a vast majority of agricultural cover types that provide foraging habitat for many covered raptor species. While geopolitical or physical landmarks were used to delineate some PPU boundaries, this was done for ease of mapping and to make locating PPU boundaries in the field easier.

PPUs 1 through 4 and 8 are within the UDA. However, a small portion of PPU 1 (2,156 acres near the County landfill) is located outside of the UDA. PPUs 5, 6, and 7 are outside the UDA.

A portion of the Plan Area in the middle of the UDA (14,085 acres) and a small portion of the area outside of the UDA in the extreme northeastern portion of the Plan Area (9,245 acres) are not within a PPU (see Figure 1-1). These areas are not within a PPU as there are no resources identified for protection in these locations. A complete description of each PPU, including species occurrences and land cover types within each PPU, can be found in Chapter 3, Biological Resources Setting.

1.2.2 Covered Activities

As discussed in Chapter 5, SSHCP Covered Activities are projects or activities that were evaluated during development of the Plan and are allowable under the Plan's ITPs. The Covered Activities provide for the expansion of the urbanizing areas within the County's existing USB, within the current city limits of Galt and Rancho Cordova, and within the extra territorial Sphere of Influence for the City of Galt (i.e., within the SSHCP's UDA, as defined in Section 1.2.1). Covered Activities within the UDA include activities and projects related to urban development and associated infrastructure that are consistent with the General Plans of the three Land Use Authority Permittees, as well as specific activities and projects related to transportation, water, and wastewater

development. In-stream maintenance occurring within the UDA (e.g., vegetation and sediment removal) will also be a Covered Activity under the Plan. Covered Activities outside of the UDA are limited to specific infrastructure projects related to roadway improvements and recycled water delivery. The SSHCP Covered Activities also include actions within the proposed SSHCP Preserve System related to the management and monitoring of preserved habitats, the enhancement of habitat, and the re-establishment of habitat within the SSHCP Preserve System. Chapter 5, Covered Activities, describes the proposed Covered Activities by type, with lists of anticipated covered activities and projects, if currently known.

1.2.3 Permit Term

The Permit Term defines the length of time in which ITPs issued by the Wildlife Agencies (USFWS and CDFW) can be used by the Plan Permittees for incidental take resulting from Covered Activities, and the timeframe in which all Conservation Actions outlined in the SSHCP Conservation Strategy must be completed. The Plan Permittees are seeking ITPs that are valid for a term of 50 years. The Plan Permittees can request a permit extension upon or prior to expiration of the original permit by applying to the state and federal Wildlife Agencies. The ITP term is based on the projected timeframe for buildout to occur within the Plan's UDA, as well as the timeframe to complete proposed capital improvement projects. While it is difficult to predict trends in urban development beyond a 15- to 20-year timeframe, a 50-year permit is believed to be reasonable and necessary to provide sufficient time to implement Covered Activities and to complete the establishment of the Preserve System. For purposes of the SSHCP, the term "full buildout" is defined as the total development of the UDA, with the exception of planned UDA Preserves as described in Chapter 7.

A summary of major local planning documents and their respective time horizons is provided in Table 1-1. Urban development consistent with County and City General Plans accounts for a vast majority of the take that will occur from Covered Activities addressed under the Plan (City of Galt 2009; City of Rancho Cordova 2006; County of Sacramento 2011). The County has a designated USB that acts as a de-facto urban growth line. The County will not provide water or sewer services to projects located outside of the USB. The County predicts that the USB contains enough land to support at least 50 years of urban development (County of Sacramento 2011).

Table 1-1
Local Planning Documents and Time Horizons Relevant to the Permit Term

Document	Date Produced	Projection/Time Horizon	Plan Duration
City of Galt General Plan	2009	2030	16 years
City of Rancho Cordova General Plan	2006	2030/2050	16–36 years
County of Sacramento General Plan	1993; updated 2011	2030	16 years
County of Sacramento General Plan USB	1993	At least until 2060	46 years

Sources: City of Galt 2009; City of Rancho Cordova 2006; County of Sacramento 2011.

In addition, timelines for funding and completing capital improvement projects often extend for decades. A Permit Term that allows for the completion of Covered Activities that are associated with construction of planned capital improvement projects, such as the Southeast Connector and recycled water projects, will likely take more than four decades to complete. Other planned Covered Activity projects (see Chapter 5) may take several decades to receive the funding needed to implement them, such as safety improvements proposed for many roadways within the Plan Area.

Some Covered Activities are not expected to be implemented until later in the 50-year Permit Term. Such activities include the many bridge replacement projects and several road-widening projects, as described in Chapter 5. Therefore, a longer Permit Term is necessary to anticipate and adequately mitigate the impacts of these projects on the Covered Species.

Recurring maintenance activities are expected to continue in perpetuity; consequently, take authorization for these activities is needed for as long a period as is feasible. As described in Chapter 5, these recurring Covered Activities might affect the Covered Species throughout the proposed 50-year Permit Term. For example, road maintenance performed by the County occurs annually. Maintenance on rural roads might affect habitat for many Covered Species, including California tiger salamander (*Ambystoma californiense*), western spadefoot (*Spea hammondii*), western burrowing owl (*Athene cunicularia hypogea*), and many covered plant species. Similarly, recurring maintenance on flood control and storm drainage facilities by SCWA are covered in this Plan (see Chapter 5), and might affect aquatic Covered Species for the duration of the Permit Term. For example, maintenance of waterways has the potential to affect giant gartersnake (*Thamnophis gigas*) and western pond turtle (*Actinemys marmorata)*.

A 50-year Permit Term is also necessary to establish the operational SSHCP Preserve System described in Chapter 7, and to develop and test the Preserve System Management and Monitoring programs described in Chapter 8. Because the Plan only acquires conservation easements or land in fee title from willing sellers (see Chapter 9), it is anticipated that it could take several decades to acquire enough land to complete the SSHCP Preserve System. Many landowners, who may be interested in selling an easement or land, may not be willing to do so now for estate planning and/or tax purposes. A 50-year Permit Term provides adequate time for willing landowners to become available and for the Plan's Implementing Entity to negotiate fee title or conservation easement acquisitions.

Monitoring and assuring the success of habitat re-establishment/establishment actions (described in Chapter 8) is expected to take 5–10 years for each re-establishment/establishment project. Most habitat re-establishment/establishment actions cannot be initiated until land is acquired for the Preserve System. A Permit Term of 50 years is necessary to allow enough time to complete land acquisition with at least 5 years remaining on the permit in which to successfully initiate or complete (and possibly remediate if necessary) all re-establishment/establishment actions. The

Plan Permittees have committed to installing all habitat re-establishment/establishment projects by year 40. Therefore, a 50-year Permit Term is necessary to complete these actions and to leave sufficient time for monitoring the effectiveness of these actions before the Permit Term ends.

A 50-year Permit Term also allows sufficient time to generate the necessary funding for Plan implementation. As described in Chapter 12, Economic Analysis and Funding Program, the Plan will primarily be funded by development fees collected when Covered Activities and projects are approved by the Plan Permittees. Many of the Plan's Covered Activities will not occur for decades, as explained above. A 50-year Permit Term provides the time necessary to ensure adequate funding for Preserve acquisition and to establish the non-wasting endowment that is required to fund monitoring and management in perpetuity.

Based on the implementation horizon for Covered Activities, the recurring operation and maintenance activities, the need to acquire lands and develop a successful Preserve System, and the need for adequate funding, the Plan Permittees have determined that a 50-year Permit Term would best address regulatory and biological considerations. In summary, the 50-year Permit Term provides sufficient time to accomplish the following critical elements of the Plan:

- Fully implement the current general plans of the cities and the County;
- Fully implement the Plan Permittees' capital projects that are covered by the Plan;
- Implement the Plan Permittees' ongoing maintenance activities as long as feasible;
- Allow sufficient time to assemble the SSHCP Preserve System from willing sellers and partnerships with local agencies and private landowners;
- Secure all necessary funding for Plan implementation during the Permit Term and secure funds during the Permit Term to fund the Plan's Conservation Strategy in perpetuity;
- Develop an effective Preserve System maintenance, monitoring, and adaptive management program (Chapter 8) that will be implemented in perpetuity (as discussed in Chapter 8, an adaptive management program will be included in the SSHCP); and
- Provide sufficient incentive for the Plan Permittees to commit the substantial resources necessary to complete the SSHCP (i.e., the Permit Term covers enough projects and activities to make the large up-front investment in the Conservation Strategy cost-effective).

1.2.4 Covered Species

Covered Species are species that will be listed on the CESA and federal ESA ITPs issued by the two Wildlife Agencies (USFWS and CDFW). The Plan addresses 28 Covered Species (20 wildlife species and 8 plants), of which, 11 are currently listed as threatened or endangered under CESA or the federal ESA (see Table 1-2 for a complete list of species covered under this

Plan). The 28 species were identified through a species evaluation and selection process, as discussed below.

Table 1-2
SSHCP Covered Species and Their Current Listing Status

Scientific Name Common Name	Status		
	Federal	*State*	*CRPR*
Invertebrates			
Lepidurus packardi Vernal pool tadpole shrimp	E*	—	—
Branchinecta lynchi Vernal pool fairy shrimp	T*	—	—
Branchinecta mesovallensis Mid-valley fairy shrimp	—	—	—
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	T	—	—
*Hydrochara ricksecker*i Ricksecker's water scavenger beetle	—	—	—
Amphibians			
Ambystoma californiense California tiger salamander, (Central Valley population)	T*	T	—
Spea hammondii Western spadefoot	—	CSC	—
Reptiles			
Actinemys marmorata Western pond turtle	—	CSC	—
Thamnophis gigas Giant gartersnake	T	T	—
Birds			
Accipiter cooperii Cooper's hawk	—	WL	—
Agelaius tricolor Tricolored blackbird	BCC	T (Emergency Listed)	—
Athene cunicularia hypugaea Western burrowing owl	BCC	CSC	—
Buteo regalis Ferruginous hawk	BCC	—	—
Buteo swainsoni Swainson's hawk	BCC	T	—
Circus cyaneus Northern harrier	—	CSC	—
Elanus leucurus White-tailed kite	—	CFP	—
Grus canadensis tabida Greater sandhill crane	—	T; CFP	—
Lanius ludovicianus Loggerhead shrike	BCC	CSC	—
Mammals			
Lasiurus blossevillii Western red bat	—	CSC	—

Table 1-2
SSHCP Covered Species and Their Current Listing Status

Scientific Name Common Name	Status		
	Federal	*State*	*CRPR*
Taxidea taxus American badger	—	CSC	—
Plants			
Downingia pusilla Dwarf downingia	—	—	2.2
Gratiola heterosepala Boggs Lake hedge-hyssop	—	E	1B.2
Juncus leiospermus var. *ahartii* Ahart's dwarf rush	—	—	1B.2
Legenere limosa Legenere	—	—	1B.1
Navarretia myersii Pincushion navarretia	—	—	1B.1
Orcuttia tenuis Slender Orcutt grass	T*	E	1B.1
Orcuttia viscida Sacramento Orcutt grass	E*	E	1B.1
Sagittaria sanfordii Sanford's arrowhead	—	—	1B.2

Status Definitions

Federal:

E = Listed as endangered under the federal ESA
T = Listed as threatened under the federal ESA
* = Species has designated Critical Habitat located within the Plan Area.
— = No federal ESA listing
BCC = Bird of Conservation Concern, USFWS 2008.

State:

E = Listed as endangered under CESA
T = Listed as threatened under CESA
CFP = Fully protected under the California Fish and Game Code
CSC = Species of special concern in California
WL = Watch List
— = No state status

California Native Plant Society California Rare Plant Rank (CRPR)

1B = Rare, threatened, or endangered in California and elsewhere
2 = Rare, threatened, or endangered in California but more common elsewhere

CRPR Threat Ranks

0.1 = Seriously threatened in California (high degree/immediacy of threat)
0.2 = Fairly threatened in California (moderate degree/immediacy of threat)
0.3 = Not very threatened in California (low degree/immediacy of threats or no current threats known)

Species Evaluation

A Technical Advisory Committee (TAC) composed of local species experts compiled an initial list of 90 species to be considered for coverage under the Plan. The TAC identified all special-status species that also had the potential to occur within the Plan Area using data from a variety of sources, including CDFW's California Natural Diversity Database (CNDDB), USFWS files and databases, California Native Plant Society (CNPS) plant inventories, Sacramento County Audubon files, and solicited opinions from local experts, university researchers, and resource agency staff.

The initial list of 90 special-status species was compiled for the Plan Area. "Special status" is defined using the following criteria:

- Listed as Threatened or Endangered by the USFWS (50 CFR 17.11 [listed animals] 50 CFR 17.12 [listed plants], and various notices in the Federal Register [proposed and candidate species]);
- Listed or candidate for listing as Rare, Threatened, or Endangered under CESA (14 California Code of Regulations [CCR] 670.5);
- Designated as a "bird species of concern" by the USFWS;
- Designated as a species of special concern by the CDFW;
- Subject to protection under California Fish and Game Code Section 3503.5 (breeding raptors);
- Designated as Fully Protected under California Fish and Game Code Section 3511(birds), Section 4700 (mammals), Section 5515 (fish), and Section 5050 (reptiles and amphibians);
- Determined to meet the definition of rare or endangered under CEQA (CEQA Guidelines, Section 15380);
- Designated as a California Rare Plant Rank (CRPR) 1B (rare, threatened, or endangered throughout its range) or CRPR 2 (rare, threatened, or endangered in California but more common elsewhere) in the CNPS inventory; or
- No special status but are believed by local experts to be rare enough to merit listing within the timeframe of this Plan.

The initial list of 90 species was eventually reduced to 28 proposed Covered Species (Table 1-2). Species were eliminated from consideration as Covered Species if the TAC determined the species would not be adversely affected by Covered Activities, if the TAC determined that there was not enough information available to adequately evaluate impacts to the species or to identify adequate conservation measures to offset those impacts.

The Plan includes Conservation Actions to protect all 28 Covered Species whether or not they are currently listed under the ESA or the CESA. As SSHCP Covered Species, any currently non-listed species that is covered under the Plan will not require additional conservation within the Plan Area should the species become listed under the federal ESA during the Plan's Permit Term. As discussed in Chapter 11, the USFWS ITP will include "no surprises" assurances to the Plan Permittees for all Covered Species, regardless of their ESA listing status (Chapter 11). However, Covered Species that are currently not listed but become listed under CESA will require an amendment to the CDFW ITP to be covered by CESA.

Owing to the rarity of slender Orcutt grass (*Orcuttia tenuis)* and Sacramento Orcutt grass (*Orcuttia viscida)*, the Plan Permittees are not requesting incidental take coverage for those Covered Species (see Chapter 5); rather the SSHCP Conservation Strategy (Chapter 7) will fully avoid and protect all slender Orcutt grass and Sacramento Orcutt grass occurrences within the Plan Area.

Two of the proposed SSHCP Covered Species (white-tailed kite [*Elanus leucurus*] and greater sandhill crane [*Grus canadensis tabida*]) are designated as Fully Protected Species under the California Fish and Game Code Section 3511 and thus direct injury or mortality of those Covered Species will not be included in the state or federal ITPs . Therefore, this Plan also includes Avoidance and Minimization Measures (AMMs) to avoid direct death or injury of white-tailed kite and greater sandhill crane during the implementation of any SSHCP Covered Activity.

1.3 Regulatory Setting

The Plan is designed to comply with the federal ESA and the CESA, as well as the federal CWA, the California Porter-Cologne Water Quality Control Act, and the California Fish and Game Code Sections 1600–1616. The Plan is also consistent with other federal and state wildlife and natural resource–related laws and regulations, listed here and described in greater detail below:

- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act
- California Fish and Game Code, Sections 3511, 4700, 5050, and 5515 (fully protected species)
- California Fish and Game Code, Section 3503 (bird nests)
- California Fish and Game Code, Section 3503.5 (birds of prey)
- National Environmental Policy Act of 1969 (NEPA)
- California Environmental Quality Act of 1970 (CEQA)
- National Historic Preservation Act (NHPA).

1.3.1 Federal and State Endangered Species Laws

Federal Endangered Species Act

USFWS and the National Marine Fisheries Service (NMFS) administer the federal ESA. The federal ESA requires USFWS and NMFS to maintain lists of threatened and endangered species and affords substantial protection to listed species. NMFS' jurisdiction under the ESA is limited to the protection of marine mammals, marine fishes, and anadromous fishes; all other listed species are subject to USFWS jurisdiction. USFWS and NMFS can list species as either endangered or threatened. An endangered species is at risk of extinction throughout all or a significant portion of its range (16 U.S.C. 1532). A threatened species is likely to become endangered within the foreseeable future (16 U.S.C. 1533). Seven SSHCP Covered Species are listed under the federal ESA: Sacramento Orcutt grass, slender Orcutt grass, vernal pool tadpole shrimp (*Lepidurus packardi*), vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), California tiger salamander, and giant gartersnake (Table 1-2).

Section 9

Section 9 of the federal ESA prohibits the "take" of any fish or wildlife species listed under the ESA as endangered or threatened.[5] "Take," as defined by the federal ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. 1533). "Harm" in the definition of "Take" means "an act that kills or injures the species, including significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3). "Harass" in the definition of "Take" means "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding, or sheltering" (50 CFR 17.3). Section 9 also prohibits the "removal or reduction to possession" of any listed plant species "under federal jurisdiction" (e.g., on federal land, where federal funding is provided, or where federal authorization is required). The take prohibition for listed plants is more limited than for listed fish and wildlife. Under Section 9(a)(2)(B) of the ESA, listed plants are protected from "removal, reduction to possession, and malicious damage or destruction" in areas that are under federal jurisdiction. Section 9(a)(2)(B) of the ESA also provides protection to plants from removal, cutting, digging up, damage, or destruction where the action takes place in knowing violation of any state law or

[5] The protection of threatened species under Section 9 is discretionary through a rule issued under Section 4(d) of the federal ESA. By regulation, the USFWS automatically affords Section 9 protections to threatened species at the time of listing.

regulation or in violation of a state criminal trespass law. Thus, the ESA does not prohibit the incidental take of federally listed plants on private or other nonfederal lands unless the action requires federal authorization or is in violation of state law or regulation.

Even though under the ESA there is limited prohibition for incidental take of plants on nonfederal lands, the SSHCP includes many plant Covered Species (see Table 1-2), and the Plan Permittees are requesting that the plant Covered Species be included on the ITPs when they are issued. Some plants are Covered Species to meet regulatory obligations under ESA Section 7—the USFWS must review the effects of its own actions on federally listed plants, even when those listed plants are found on private lands. Also, all plant species protected by state law (e.g., CESA) are also subject to the ESA Section 9 take prohibition. Incidental take authorization is also requested for the eight plant Covered Species to provide the Plan Permittees with ESA Section 10 "no surprises" assurances for the plant Covered Species.

The federal ESA includes mechanisms that provide exceptions to the Section 9 take prohibitions. These exemption mechanisms are addressed in Section 7 for federal actions and Section 10 for nonfederal actions.

Section 7

Section 7 of the federal ESA requires all federal agencies to ensure that any action they permit, authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat critical to such species' survival. To ensure that its actions do not result in jeopardy to listed species or in the adverse modification of Critical Habitat,[6] each federal agency must consult with USFWS or NMFS or both regarding federal agency actions that may affect listed species. Consultation begins when the federal agency submits a written request for initiation to USFWS or NMFS, along with the agency's biological assessment of its proposed action, and when USFWS or NMFS accepts that biological assessment as complete. If USFWS or NMFS concludes that the action is not likely to adversely affect a listed species, the action may be conducted without further review under the federal ESA. Otherwise, USFWS or NMFS must prepare a written BO under ESA Section 7 describing how the agency's action will affect the listed species and its Critical Habitat.

If a BO concludes that the proposed action would jeopardize the continued existence of a listed species or adversely modify its designated Critical Habitat, the opinion will suggest "reasonable and prudent alternatives" that would avoid that result. If a BO concludes that the proposed action

[6] Critical Habitat is defined as specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described and designated in the Federal Register.

would take a listed species but would not jeopardize its continued existence, the BO will include an incidental take statement. Incidental take is take that is "incidental to, and not intended as part of, an otherwise lawful activity" (50 CFR 402.02). The incidental take statement specifies an amount of species take that is allowed to occur as a result of the proposed action, and may require reasonable and prudent measures to minimize the impact of the take.

Projects with a federal lead agency or a federal nexus (e.g., requires a federal permit or federal funding, is carried out by a federal agency, or is a project on federal land) can obtain species take authorization through ESA Section 7 rather than ESA Section 10. The proposed issuance of an ITP by the USFWS for the SSHCP is a federal action, and therefore, requires the USFWS to consult under Section 7 of the ESA. To comply with Section 7 of the ESA, the USFWS Sacramento Field Office would conduct an internal Section 7 consultation with the USFWS Region 8 office concerning the region's decision to issue ITPs to the Plan. The results of this internal consultation would be documented in a BO, which would be prepared prior to the ITP decision for the SSHCP.

Section 10

Until 1982, state, local, and private entities had no means to acquire incidental take authorization as could federal agencies under Section 7. Private landowners and local and state agencies risked violation of the federal ESA no matter how carefully their projects were implemented. This statutory dilemma led Congress to amend Section 10 of the ESA in 1982 to authorize the issuance of an ITP to nonfederal project proponents upon completion of an approved conservation plan. The term "conservation plan" has evolved into "habitat conservation plan."

In cases where federal land, funding, or authorization is not required for an action by a nonfederal entity, the take of listed fish and wildlife species can be permitted by USFWS and/or NMFS through the Section 10 process. Private landowners, corporations, state agencies, local agencies, and other nonfederal entities must obtain a Section 10(a)(1)(B) ITP for "take" of federally listed fish and wildlife species "that is incidental to, but not the purpose of, otherwise lawful activities."

All HCPs must specify the following mandatory elements:

- The impact that will likely result from the taking of Covered Species;
- The steps the Plan Permittees will take to monitor, minimize, and mitigate such impacts to the maximum extent practicable;
- The funding that will be available to implement such steps;

- The procedures to be used to deal with unforeseen circumstances;[7]
- The alternative actions to such taking the Plan Permittees considered and the reasons why such alternatives are not proposed to be utilized; and
- Such other measures that the Director [of the Department of Interior or Commerce] may require as being necessary or appropriate for purposes of the plan (50 CFR 17.22[b]).

The SSHCP is intended to satisfy these requirements. To receive an ITP, Section 10(a)(2)(B) of the federal ESA and permit regulations 50 CFR 17.22(b)(2) and 17.32(b)(2) require that the following permit issuance criteria be met:

- The taking will be incidental to otherwise lawful activities;
- The Plan Permittees will minimize and mitigate the impacts of such taking to the maximum extent practicable;
- The Plan Permittees will ensure adequate funding for the HCP and for procedures to deal with unforeseen circumstances;
- The taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild (i.e., will not cause jeopardy under Section 7(a)(2) of the ESA);
- The Plan Permittees will ensure that other measures that the USFWS may require as being necessary or appropriate will be provided; and
- The USFWS has received such other assurances as may be required that the HCP will be implemented.

Prior to the approval of an HCP, USFWS is required to undertake an internal Section 7 consultation because issuance of an ITP is a federal action. [8] (See the prior discussion of ESA Section 7.) Elements specific to the Section 7 process that are not required under the Section 10 process (e.g., analysis of impacts on designated Critical Habitat, analysis of impacts on listed plant species, and analysis of indirect and cumulative impacts on listed species) are included in this Plan in part to meet the requirements of Section 7.

In June 2000, USFWS and NMFS adopted the "Five-Point Policy" designed to clarify elements of the national HCP program as it relates to biological goals, monitoring, adaptive management,

[7] "Unforeseen circumstances" are changes in circumstances affecting a Covered Species or geographic area covered by the HCP that could not reasonably have been anticipated by the plan developers, and that result in a substantial and adverse change in the status of a Covered Species.

[8] When USFWS issues a permit, they will consult with themselves and the National Marine Fisheries Service (NMFS), if necessary.

permit duration, and public participation (USFWS and NOAA 2000). The Five-Point Policy directs that the following five elements be addressed in the development of all HCPs:

1. **Biological Goals and Measurable Objectives:** HCPs are required to define the Biological Goals and Measurable Objectives that the plan is intended to achieve. Biological Goals and Measurable Objectives clarify the purpose and direction of the plan's Conservation Strategy, including specific measurable targets that the plan is intended to meet. The Biological Goals and Measurable Objectives of the SSHCP are described in Chapter 7, Conservation Strategy.
2. **Monitoring:** Monitoring is a mandatory element of all HCPs. HCPs are required to include provisions for monitoring actual effects, monitoring to gauge the effectiveness of the plan in meeting the Biological Goals and Measurable Objectives, and verification that the terms and conditions of the plan are being implemented properly. Each HCP's monitoring program should be customized to reflect the biological goals, the scope, and the particular implementation tasks of the HCP. The project proponent should structure the monitoring methods and standards so results can be compared from one reporting period to another period, or to compare different areas. Monitoring protocols and units should reflect the biological objectives' measurable units, and be based on sound science. Standard survey or other previously established monitoring protocols should be used. The SSHCP monitoring plan is described in Chapter 8.
3. **Adaptive Management:** The Five-Point Policy encourages the inclusion of adaptive management strategies in HCPs in appropriate circumstances to address uncertainty about species covered by a plan. The USFWS describes adaptive management as a "method for examining alternative strategies for meeting Biological Goals and Measurable Objectives, and then, if necessary, adjusting future conservation management actions according to what is learned" (USFWS and NOAA 2000). As described in Chapter 8, the SSHCP will include an adaptive management plan as part of each Preserve Management Plan.
4. **Permit Duration:** Consistent with the Five-Point Policy, the USFWS considers several factors in determining the term of an ITP. For instance, the agency takes into account the expected duration of the activities proposed for coverage and the anticipated positive and negative effects on Covered Species that would likely occur during the course of Plan implementation. The agency also factors in the level of scientific and commercial data underlying the proposed Conservation Strategy, the length of time necessary to implement and achieve the benefits of the Conservation Strategy, and the extent to which the program incorporates adaptive management strategies. As described in Section 1.2.3, the proposed duration of the SSHCP ITP is 50 years.
5. **Public Participation:** Under the Five-Point Policy, the USFWS and NOAA have sought to increase public participation in the HCP process, including greater opportunities for

the public to assess, review, and analyze HCPs and associated NEPA documentation. As provided by the Five-Point Policy, a minimum 90-day public comment period is appropriate for large-scale, regional, or complex HCPs that include an Environmental Impact Statement (EIS). The Five-Point Policy also encourages applicants for large-scale regional HCP efforts to provide extensive opportunities for public involvement during the HCP planning and implementation processes. The Five-Point Policy encourages the integration of a science advisory committee and other stakeholders during the development and implementation of an HCP, especially HCPs that include an adaptive management strategy. Advisory committees can assist the USFWS and the applicants in identifying key components of uncertainty and determining alternative strategies for addressing that uncertainty. An applicant, with guidance from the USFWS, may seek independent scientific review of specific sections of an HCP and its operating Conservation Strategy to ensure the use of the best scientific information.

California Endangered Species Act

CESA (California Fish and Game Code, Section 2050 et seq.) prohibits the taking of species listed as threatened or endangered under that act, or candidates for listing, except as authorized by state law. "Take" is defined under the California Fish and Game Code (more narrowly than under ESA) as any action or attempt to "hunt, pursue, catch, capture, or kill." Therefore, take under CESA does not include "the taking of habitat alone or the impacts of the taking" rather, the courts have affirmed that under CESA, "taking involves mortality" (*Environmental Council of Sacramento v. City of Sacramento* 2006). In addition, "harass" in the federal ESA definition of "take" is not included in the CESA definition of "take."

Section 2081 of CESA states that the incidental take of an endangered, threatened, or candidate species may be authorized by the CDFW if the impacts of the take are incidental to an otherwise lawful activity, are "minimized and fully mitigated," and do not "jeopardize the continued existence of [the] species." Any mitigation measures imposed under CESA must be measures "roughly proportional in extent to the impact of the authorized taking on the species." The requirements of an application for incidental take under CESA are described in Section 2081 of the California Fish and Game Code.

Plant Covered Species within the Plan Area that are listed by the State of California as endangered are Sacramento Orcutt grass, and plant species listed as threatened are slender Orcutt grass and Boggs Lake hedge-hyssop (*Gratiola heterosepala*). Bird Covered Species protected under the CESA are the state-threatened greater sandhill crane and Swainson's hawk (*Buteo swainsoni*). Other CESA listed animal species in the Plan Area are the state-threatened California tiger salamander and the giant gartersnake (see Table 1-2).

1.3.2 Other Federal and State Wildlife Laws and Regulations

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful, as is taking of any parts, nests, or eggs of such birds (16 U.S.C. 703 et seq.). "Take" is defined more narrowly under the MBTA than under the federal ESA and includes only the death or injury of individuals of a migratory bird species or their eggs, or the removal of active nests. As such, take under the MBTA does not include the concepts of habitat modification/degradation or harassment as defined under ESA take. The MBTA defines migratory birds broadly; all bird Covered Species in this Plan are migratory birds under the MBTA.

The USFWS provides guidance regarding take of federally listed migratory birds (Appendix 5 in the HCP Handbook [USFWS 1996]). According to these guidelines, a federal ITP can function as a Special Purpose Permit under the MBTA (50 CFR 21.27) for the take of all ESA-listed bird Covered Species in the amount and/or number and subject to the terms and conditions specified in an HCP. Any such permitted incidental take will not be in violation of the MBTA (16 U.S.C. 703 et seq.). All bird species covered under this Plan are protected by the MBTA (Table 1-2).

Should any of the covered birds become listed under ESA during the Permit Term, the ESA ITP would constitute a Special Purpose Permit under the MBTA for that species for a 3-year term as specified under 50 CFR 21.27, subject to renewal by the Plan Permittees.

Non-listed bird Covered Species as well as other migratory birds not covered by the permit will benefit from seasonal restrictions on construction and other Covered Activity AMMs described in this Plan. The creation of the SSHCP Preserve System and subsequent habitat restoration and management of each preserve will also be a significant "benefit to the migratory bird resource," as required by the Special Purpose Permit. Compliance with the conditions on Covered Activities described in Chapter 5 is consistent with the requirements of the MBTA for the covered migratory birds. As discussed in Chapter 9, it will remain the responsibility of individual Third-Party Project Proponents to fully comply with the MBTA for non-covered migratory birds.

California Fully Protected Species

In the 1960s, before CESA was enacted, the California legislature identified specific species for protection under the California Fish and Game Code. These fully protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take except for

collecting these species for necessary scientific research and relocation of bird species for the protection of livestock. Fully protected species are described in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code. These protections state that "…no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected [bird], [mammal], [reptile or amphibian], [fish]." This Plan requires all Covered Activities to implement AMMs that avoid taking CESA fully protected species (see Chapter 5). Fully protected Covered Species are white-tailed kite and greater sandhill crane.

California Fish and Game Code, Section 3503

Section 3503 of the California Fish and Game Code makes it "unlawful to take, possess, or needlessly destroy the nests or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto." Therefore, CDFW may issue permits authorizing take. The Plan contains conservation measures to avoid and minimize such take to the maximum extent practicable in order to comply with Section 3503. However, some take to covered birds may still occur; the 2081 permit will serve as the authorization for take of nests or eggs of covered birds pursuant to Section 3503.

California Fish and Game Code, Section 3503.5

Section 3503.5 of the California Fish and Game Code prohibits the take, possession, or destruction of any birds of prey or their nests or eggs "except as otherwise provided by this code or any regulation adopted pursuant thereto." CDFW may issue permits authorizing take of birds of prey or their nests or eggs pursuant to CESA. The Plan requires all Covered Activities to implement AMMs that avoid and minimize take of birds of prey and comply with Section 3503.5.

The 2081 permit will serve as the authorization for take of birds, eggs, or nests that cannot be avoided pursuant to Section 3503.5.

1.3.3 National Environmental Policy Act

NEPA requires federal agencies to include in their decision-making process appropriate and careful consideration of all environmental effects of a proposed action and of possible alternatives, and ensure the environmental information is available to public officials and citizens before decisions are made and before actions are taken. Documentation of the environmental impact analysis and efforts to avoid or minimize the adverse effects of proposed actions must be made available for public notice and review. This analysis is documented in either an environmental assessment or an EIS. NEPA requires full disclosure of environmental effects. The issuance by USFWS of an ITP under Section 10 of the ESA constitutes a federal action. Therefore, a USFWS decision on the proposed SSHCP ITP must comply with NEPA.

NEPA regulations require, in part, that federal agencies eliminate duplication between NEPA and comparable state or local requirements (40 CFR 1500.4, 1506.2, and 43 CFR 46.430). These regulations require that federal agencies conduct: (1) joint planning processes; (2) joint environmental research and studies; (3) joint public meetings and hearings (except where otherwise provided by statute); (4) joint environmental analysis; and (5) to the fullest extent possible, preparation of joint environmental documents. In such cases, the federal agency and a state or local agency can be joint lead agencies on the environmental document. The USFWS and Sacramento County have prepared a joint EIS/EIR so that one environmental document will jointly comply with the federal NEPA and the state CEQA.

1.3.4 California Environmental Quality Act

CEQA requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CEQA applies to discretionary activities that may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment and that are proposed to be carried out or approved by a California public agency, including state, regional, county, or local agencies. Adoption of the Plan by the Plan Permittees is an activity that is subject to CEQA. The County of Sacramento will serve as the lead agency under CEQA. The County and USFWS will jointly prepare an EIS/EIR so that one environmental document will comply with both NEPA and CEQA. All of the Project Proponents are either a CEQA lead agency (Sacramento County) or CEQA responsible agencies (City of Galt, City of Rancho Cordova, the SCWA, and the Connector JPA), and all are responsible for discretionary approvals of the SSHCP and associated ordinances and would be responsible for the future implementation of the SSHCP.

1.3.5 Federal and State Wetland Laws and Regulations

Federal Clean Water Act, Section 404

The CWA is the primary federal law that protects the physical, chemical, and biological integrity of the nation's waters, including lakes, rivers, wetlands, and coastal waters. Programs conducted under the CWA are directed at both point source pollution (e.g., waste discharged from outfalls and filling of waters) and nonpoint source pollution (e.g., runoff from parking lots). Under the CWA, the USEPA and state agencies set effluent limitations and issue permits under CWA Section 402 governing point-source discharges of wastes to waters. The USACE, applying its regulations and guidelines issued by USEPA, issues permits under CWA Section 404 for discharges of dredged or fill material into waters of the U.S.

The USACE issues two types of permits under Section 404: general permits (either nationwide permits, regional general permits, or programmatic general permits) and individual permits

(either letters of permission or standard permits). General permits are issued by the USACE to streamline the Section 404 process for activities that have minimal environmental impacts, individually and cumulatively. Individual permits are issued for activities that do not qualify for a general permit (i.e., that may have more than a minimal adverse environmental impacts).

The Sacramento District of the USACE is considering development of a Section 404 permitting strategy for future SSHCP Covered Activities (USACE 2015). It is likely that the Section 404 permitting strategy would include some type of general permit for Covered Activities with minimal impacts, and an individual permitting process for other proposed Covered Activities. The USACE's future CWA 404 permit decision for Covered Activities would benefit from the extensive analysis completed as part of the SSHCP and associated EIS/EIR.

When a Section 404 permitting strategy for the SSHCP is developed, the USACE would request a programmatic consultation with USFWS under Section 7 of the federal ESA for potential impacts of all Covered Activities permitted under a SSHCP permitting strategy. It is expected that USFWS will not require future Covered Activities to provide species or habitat avoidance, minimization, or compensatory mitigation beyond that already required by the SSHCP. The Conservation Actions required by the SSHCP to avoid, minimize, and mitigate Covered Activity impacts to aquatic habitat are expected to also satisfy CWA 404 requirements for aquatic resources avoidance, minimization, and mitigation.

State of California Porter-Cologne Water Quality Control Act

Under CWA Section 401, the State of California has been granted the authority to certify that proposed activities requiring federal permits for discharges to waters comply with state water quality standards. The USACE cannot issue a permit under CWA Section 404 if the state denies certification under CWA Section 401. In California, the State Water Resources Control Board (SWRCB) and the RWQCBs are responsible for the review of applications for Section 401 certifications. The Central Valley RWQCB has jurisdiction over all watersheds within the Plan Area.

The Porter-Cologne Water Quality Control Act is the primary state law regulating water quality. It authorizes the SWRCB and RWQCBs to prepare management plans such as regional water quality plans to address the quality of groundwater and surface water. The Porter-Cologne Water Quality Control Act also authorizes the RWQCBs to issue waste discharge requirements defining limitations on allowable discharge to waters of the state. In addition to issuing Section 401 certifications on Section 404 applications to place fill-in waters, the RWQCBs may also issue waste discharge requirements for such activities. Because the authority for waste discharge requirements is derived from the state Porter-Cologne Water Quality Control Act and not the federal CWA, waste discharge requirements apply to somewhat different aquatic resources than does Section 404. Several recent court cases have resulted in restrictions on the USACE's

jurisdiction under Section 404. Consequently, waters of the state, subject to Porter-Cologne, constitute a larger suite of aquatic resources, including groundwater, which is not regulated under the CWA. Moreover, some actions may require waste discharge requirements, but not authorization by Section 404. The Plan includes a process for projects that are also SSHCP Covered Activities to comply with Section 401 requirements and waste discharge requirements under the Porter-Cologne Water Quality Control Act.

Streambed Alteration Agreement

CDFW has jurisdictional authority over streams, lakes, and wetland resources associated with these aquatic systems under California Fish and Game Code Section 1600 et seq. California Fish and Game Code Section 1600 et seq. was repealed and replaced with new Sections 1600–1616 that took effect on January 1, 2004. CDFW has the authority to regulate work that will "substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake." Activities of any person, state, or local governmental agency or public utility are regulated by CDFW under Section 1602 of the code. CDFW enters into a streambed or lakebed alteration agreement with the project proponent and can impose conditions on the agreement to ensure no net loss of values or acreage of the stream, lake, associated wetlands, and associated riparian habitat. The lake or streambed alteration agreement is not a permit, but rather a mutual agreement between CDFW and the project proponent. Because CDFW includes under its jurisdiction streamside habitats that may not qualify as wetlands under the CWA definition, CDFW jurisdiction may be broader than USACE jurisdiction. A project proponent must submit a notification of streambed alteration to CDFW before construction. The notification requires an application fee for streambed alteration agreements, with a specific fee schedule to be determined by CDFW. Many of the concerns raised by CDFW during streambed alteration agreement negotiations are related to special-status species.

1.3.6 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et seq.), requires federal agencies to take into account the effects of their actions proposed on properties eligible for inclusion in the National Register of Historic Places. "Properties" are defined as "cultural resources," which includes prehistoric and historic sites, buildings, and structures that are listed on or eligible for listing on the National Register of Historic Places. An undertaking is defined by the NHPA as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a

federal permit, license, or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency.

The issuance of an ITP by the USFWS would be a federal undertaking subject to Section 106 of the NHPA. USACE approval of a Section 404 permitting strategy for future SSHCP Covered Activities is also a federal undertaking subject to Section 106 of the NHPA. The process by which the USFWS and USACE decisions on SSHCP permits would comply with the NHPA are discussed in detail in the SSHCP EIS/EIR.

1.4 Plan Development Process

1.4.1 Organization of the Planning Process

The SSHCP was a coordinated effort of six local agencies (i.e., the Plan Permittees) led by the County. Development of the SSHCP was overseen by a Local Agency Working Group that included staff from each of the Plan Permittees. The focus of this group was to guide work products and provide direction to consultants who were assisting with the preparation of the SSHCP document. An interdisciplinary Regulatory Agency Working Group that included staff from each Plan Permittee, USFWS, CDFW, USACE, USEPA, and the RWQCB reviewed SSHCP work products approved by the Local Agency Working Group. The focus of this group was to ensure that SSHCP components prepared at the direction of the Local Agency Working Group met the needs of the Permitting Agencies. Coordination and management of the Plan's development was overseen by a dedicated project manager and by staff from the County. In addition to the Plan Permittees and Permitting Agencies, Plan development was heavily influenced by local stakeholder groups representing varied interests. Several committees were formed to allow for stakeholder input, as described below. All SSHCP meetings were open to the public.

Steering Committee

The development of the SSHCP was assisted by a Steering Committee consisting of stakeholder representatives from the development, environmental, agricultural, landowner, and regulatory communities. While the Steering Committee was formed at the request of the Board of Supervisors, committee members did not have the authority to act on behalf of elected officials. The committee's primary responsibility was to review work products, plan elements, and provide advice to consultants and government agencies who were preparing the Plan. The committee was scheduled to meet monthly, but was convened only when work products needed review or when discussion was needed to resolve key issues. All meetings were open to the public and were often attended by interested parties. This committee was instrumental in crafting the Preliminary Draft HCP.

Biological Subcommittee

The Biological Subcommittee was formed to focus on review of scientifically rigorous documents that the Steering Committee felt were too technical for their review. The subcommittee was made up of members of the Steering Committee, and included biological experts specializing in local species or other biological sciences. These meetings, as with all SSHCP meetings, were open to the public.

Economic Subcommittee

Much like the Biological Subcommittee, the Economic Subcommittee was formed to address complex economic issues and report back to the Steering Committee with their findings.

Biological Advisory Committee

The Biological Advisory Committee was formed to evaluate and establish species lists, habitat cover types, and Biological Goals and Measurable Objectives. Members included professional scientists from relevant disciplines and resource agency specialists.

Science Advisors

Early in the process of crafting the SSHCP, the Steering Committee recognized the need for an independent scientific review of Plan documents. They recommended an approach that differs from "normal" HCP or NCCP Scientific Advisory Panels. Instead of hiring a group of scientists to craft a Preserve design strategy at the onset of Plan development and possibly provide generic guidelines not well tailored to the Plan Area, the County chose to use local experts with local knowledge as they were needed. This approach proved to be beneficial as it enabled consultants and planners to seek answers to specific questions regarding local habitats and species populations throughout the Plan development process.

Public Outreach

The Plan Permittees strived to ensure that the public were afforded every opportunity to be part of the SSHCP planning process and to provide comments and feedback as the SSHCP was developed. To ensure public participation, every meeting of the Steering Committee, Biological Subcommittee, and Economic Subcommittee was open to the public. The Plan Permittees maintained an email list of interested individuals and posted meeting notes and draft materials on a website that was dedicated to the SSHCP. The Plan Permittees also held a number of public outreach meetings and made presentations to organizations upon request. In addition, public scoping meetings were conducted by the Permitting Agencies and the Plan Permittees during the preparation of the draft EIS/EIR for the SSHCP, as required under NEPA, CEQA, and HCP regulations. Public scoping and outreach for the SSHCP EIS/EIR is summarized in the EIS/EIR document.

1.5 Document Organization

The SSHCP includes the following chapters and appendices:

Chapter 1: Introduction provides an overview of the SSHCP, the principles and goals used to guide Plan development, the process associated with preparing the document, and the regulatory setting.

Chapter 2: Physical Setting describes the geologic history and composition of the Plan Area, the natural resources, and associated environmental concerns.

Chapter 3: Biological Resources Setting describes the biological resources baseline condition of the Plan Area, including a description of land cover types in the Plan Area, description and maps of modeled habitat for each Covered Species and methodologies employed for establishing these baseline conditions.

Chapter 4: Land Use provides an overview of existing land use conditions and examines future trends in development that could occur over the next 50 years throughout the Plan Area.

Chapter 5: Covered Activities describes the activities for which authorization for the incidental take of SSHCP Covered Species is being sought through the issuance of an ESA Section 10(a)(1)(B) ITP and CESA Section 2081 (b) permit. Chapter 5 also presents conditions on the Covered Activities, including a description of each SSHCP AMM.

Chapter 6: Effects Assessment and Level of Take quantifies effects of the future Covered Activities on each SSHCP Land Cover Type, modeled habitat for each Covered Species, and designated Critical Habitat, and estimates expected take of each Covered Species.

Chapter 7: Conservation Strategy describes the SSHCP Biological Goals, and identifies measurable Biological Objectives and SSHCP Conservation Actions that will achieve each Biological Goal; also describes the proposed SSHCP Preserve System and the associated Preserve acquisition process.

Chapter 8: SSHCP Monitoring and Management Programs describes the required compliance and effectiveness monitoring, the SSHCP reporting schedule, and development of individual preserve management strategies.

Chapter 9: Implementation outlines the structure of the SSHCP Implementing Entity and processes by which the Plan Permittees will implement the SSHCP requirements.

Chapter 10: SSHCP Permit Application Process explains the future process for private (third-party) development or infrastructure Covered Activity projects to obtain project approvals from one of the Land Use Authority Permittees, explains the required components of the project

application to a Land Use Authority Permittee, and explains conditions that must be met in order for a private project to be covered under the SSHCP ITPs.

Chapter 11: Changed and Unforeseen Circumstances – Assurances Describes procedures to deal with future Changed Circumstances. Chapter 11 also describes the No Surprises protections for Plan Permittees in the event of unforeseen circumstances. Chapter 11 includes a description of potential climate change effects on the Plan Area, and describes how the SSHCP Conservation Strategy accounts for these potential climate change effects.

Chapter 12: Economics Analysis and Funding Program presents the costs associated with Plan implementation and the various mechanisms for funding those costs, and provides assurances to the USFWS that they can provide adequate funding for the SSHCP Conservation Strategy over the term of the permit.

Chapter 13: Alternatives to Avoid or Reduce Take presents the required analysis of alternatives to the take of Covered Species presented in Chapter 5.

1.6 Appendices

Appendix A: Glossary and Acronyms
Appendix B: Species Accounts
Appendix C: Implementing Agreement
Appendix D: Sample Easement
Appendix E: Land Cover Type Report/Vernal Pool Watershed Mapping
Appendix F: Preserve Documentation Report Template
Appendix G: Preserve Management and Monitoring Details
Appendix H: Implementation Ordinance/Resolution
Appendix I: SSHCP Economic Model
Appendix J: Voluntary Additional Conservation
Appendix K: Project-Specific Avoidance and Minimization Measures
Appendix L: SSHCP Preserve Design

1.7 References

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16 U.S.C. 703–712. Migratory Bird Treaty Act, as amended.

16 U.S.C. 1531–1544. Endangered Species Act of 1973, as amended.

50 CFR 17.1–17.108. Endangered and Threatened Wildlife and Plants.

50 CFR 402.1–402.48. Interagency Cooperation—Endangered Species Act of 1973, as amended.

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3 BIOLOGICAL RESOURCES SETTING

3.1 Introduction

This chapter summarizes the baseline condition of the biological resources in the Plan Area, including South Sacramento Habitat Conservation Plan (SSHCP or Plan) definitions and descriptions of land cover types in the Plan Area, species addressed by the SSHCP, and a description of species habitat models used to quantify impacts and to prepare the SSHCP Conservation Strategy. Methodologies used to map land cover baseline conditions and map species suitable habitat (habitat models) are also discussed in this chapter.

3.2 SSHCP Land Cover Type Definitions

The land cover classification system developed for the SSHCP is a modification of the California Natural Communities classification system developed by the California Department of Fish and Wildlife (CDFW) (Sayer and Keeler-Wolf 1995). See Section 3.3 for information on the process used to define and map the SSHCP land covers.

There are 24 SSHCP land cover types in the Plan Area. Seventeen land cover types are classified as "natural land covers," which includes native and naturalized environments and agricultural lands that have habitat value for SSHCP Covered Species (Sections 3.2.1 and 3.2.2). Seven SSHCP land cover types are classified as "developed/non-habitat land covers" and provide minimal habitat value for native species, including the SSHCP Covered Species (Section 3.2.3). Table 3-1 lists the SSHCP land cover types within the Plan Area. Figure 3-1 shows the distribution of SSHCP land cover types in the Plan Area. As discussed in Section 1.2.1, the Plan Permittees divided the Plan Area into eight geographic subdivisions called Preserve Planning Units (PPUs) to assist with their development of an adequate SSHCP Conservation Strategy. The acres of each SSHCP land cover type in each SSHCP PPU are outlined in

Table 3-1
SSHCP Land Cover Types within the Plan Area

SSHCP Land Cover Type	Area (Acres) in Plan Area	Percentage of Total Plan Area
Natural Land Cover Category (have habitat value)		
Wetland Waters		
Vernal Pool	4,536	1.4
Swale	1,252	0.4
Seasonal Wetland	2,600	0.8
Freshwater Marsh	2,954	0.9
Non-Wetland Waters		
Stream/Creek (Vernal Pool Invertebrate Habitat)*	73	0.02
Stream/Creek	2,778	0.9

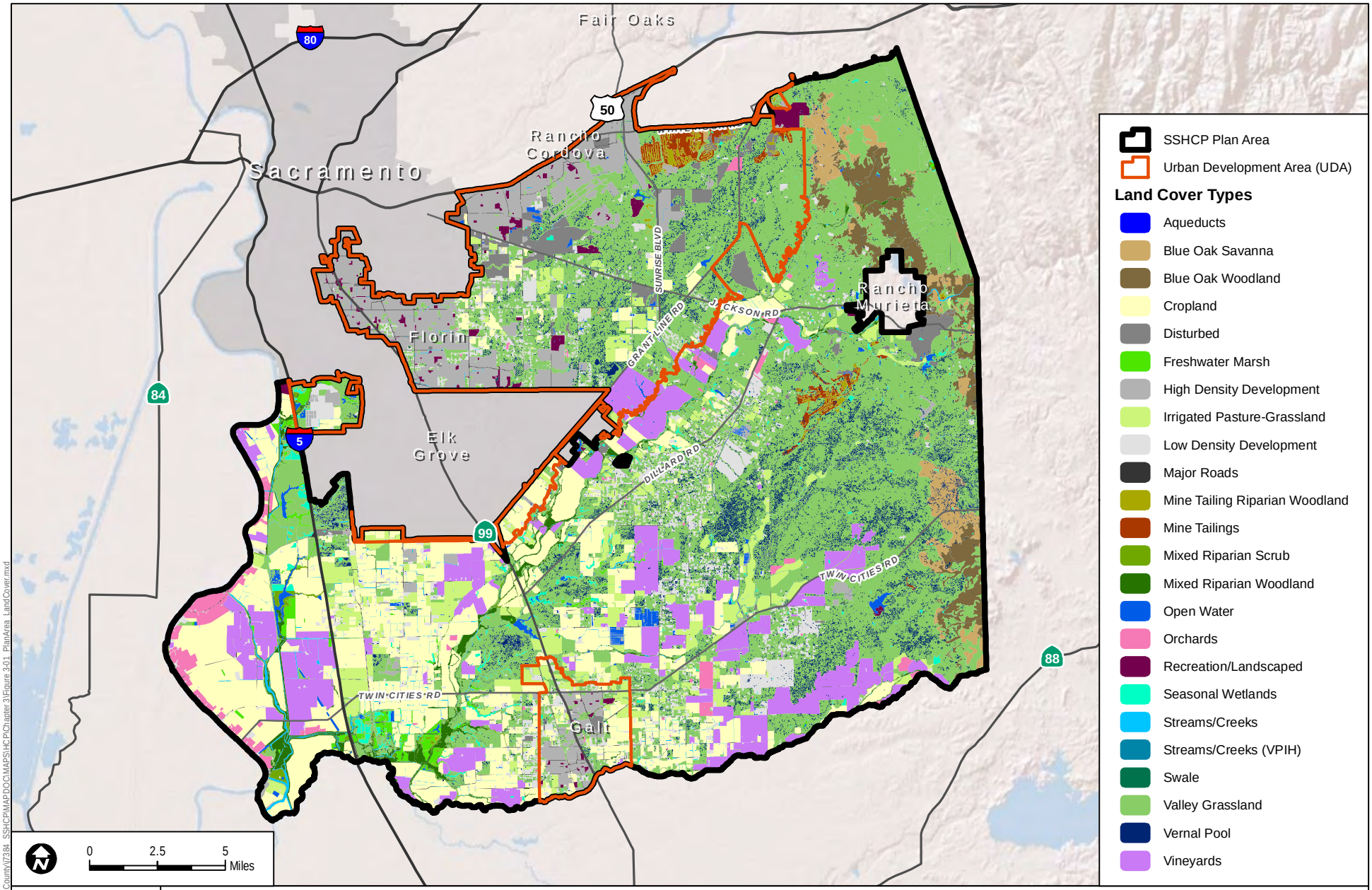
Table 3-1
SSHCP Land Cover Types within the Plan Area

SSHCP Land Cover Type	Area (Acres) in Plan Area	Percentage of Total Plan Area
Open Water	2,344	0.7
Riparian		
Mixed Riparian Woodland	5,856	0.2
Mixed Riparian Scrub	1,454	0.5
Mine Tailings Riparian Woodland	641	0.2
Terrestrial		
Valley Grassland	135,152	42.5
Blue Oak Savanna	5,637	1.8
Blue Oak Woodland	9,132	2.9
Cropland	51,829	16.3
Orchard	3,907	1.2
Vineyard	26,460	8.3
Irrigated Pasture	15,991	5.0
Developed / Non-Habitat		
Aqueduct	264	0.1
Disturbed	6,288	2.0
High-Density Development	13,073	4.1
Low-Density Development	18,608	5.9
Major Roads	2,764	0.9
Mine Tailings	1,098	0.3
Recreation/Landscaped	2,180	0.7
Not Mapped**	784	0.2
Total	**317,655**	**—**

Notes:

* Within the Urban Development Area portion of this Plan Area, occurrences of vernal pool tadpole shrimp (*Lepidurus packardi),* vernal pool fairy shrimp (*Branchinecta lynchi*), and mid-valley fairy shrimp (*Branchinecta mesovallensis*) have been found in certain intermittent streams, creek, and drainages. The SSHCP maps these streams, creeks, and drainages as Vernal Pool Invertebrate Habitat (VPIH).

Sections 3.2.1 and 3.2.2 present descriptions of each of the 17 SSHCP natural land cover types that provide habitat for SSHCP Covered Species and habitat for numerous other native species in the Plan Area.



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SOURCE: USGS 2012; ESRI 2014; County of Sacramento 2014

FIGURE 3-1

Plan Area Land Cover Types

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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3.2.1 SSHCP Aquatic Land Cover Types

Vernal Pool Land Cover

Vernal pools are seasonal ephemeral wetlands that fill and dry each year. In Central Valley annual grasslands, they form in shallow depressions that are underlain with a soil or a soil layer impermeable to water. In California's Mediterranean climate (rainy winter months followed by a hot, dry season), vernal pool soils typically become wetted in November. Water collects in the depressions and stands during late winter and early spring, then recedes as temperatures rise and rainfall diminishes. The soil, however, remains moist through April and May, then it desiccates and stays dry until the cycle begins again. The specific hydrological regime of vernal pool inundation—too short and unpredictable to support most aquatic species but long enough to eliminate upland species—is what characterizes vernal pools as ephemeral wetlands and differentiates them from other aquatic ecosystems such as alkali meadows and seasonally flooded emergent bulrush or tule marshes (Solomeshch et al. 2007).

Vernal pools support unique assemblages of highly specialized plants and animals that are adapted to the annual cycle of winter inundation and summer drought. Consequently, vernal pools are one of the few habitats in California still dominated by native plant and animal species (Rains et al. 2008). Many vernal pool plant genera and species are endemic to California, and their presence indicates the specific hydrology and water chemistry of the vernal pool. Vernal pools were once a very common element of the Central Valley landscape, but only a small portion has not been converted to agricultural and urban developments; consequently, many vernal pool taxa are now rare and endangered.

Vernal pools provide habitat for rare and endangered animals such as vernal pool tadpole shrimp (*Lepidurus packardi*), vernal pool fairy shrimp (*Branchinecta lynchi*), conservancy fairy shrimp, Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*), and several amphibians (e.g., western spadefoot toad (*Spea hammondii*), California tiger salamander (*Ambystoma californiense*)), and vernal pools support a number of migratory birds in the winter (Alexander 1976; Helm 1998; Silveira 1998; Solomeshch et al. 2007; USFWS 2004b). A specific group of plant taxa occupies vernal pools, most of which are annuals capable of slow underwater growth in winter and rapid development and reproduction in spring after the water is gone but before soils dry. Plant species are not distributed evenly through the pools, but grow in concentric zones that reflect different lengths of inundation as the pool dries (Solomeshch et al. 2007). As discussed in Chapter 2, Central Valley vernal pools occur on many geological surfaces, but in all cases, vernal pools are underlain by a low-permeability layer such as claypans, hardpans (e.g., silica-cemented duripans), mudflows, or bedrock (Rains et al. 2008). Because vernal pools are associated with specific landforms, geologic formations, and soils (Smith and Verrill 1998), vernal pools tend to be clustered at the landscape scale, forming vernal pool complexes (Rains et

al. 2006). Based on a vernal pool's landform, underlying geology, nature of the soil's water-restricting layer, frequency of ponding, and ponding duration, Sawyer and Keeler-Wolf (1995) have identified five vernal pool types in northern California. As discussed in Section 2.3, most vernal pools in the Plan Area are broadly classified as Northern Hardpan vernal pools and Northern Volcanic Mudflow vernal pools (Jones and Stokes 1990). In addition, a less specialized vernal pool type with generally lower species richness is found on Drainageway formation soils in the Plan Area.

Northern Volcanic Mudflow vernal pools occur on ancient mudflows called lahars (see Section 2.3). These pools are small, form in irregular depressions in gently sloping surfaces, and are often rocky and shallow. Water chemistry is mixo-saline, fresh (Sawyer and Keeler-Wolf 1995). In the Plan Area, Northern Volcanic Mudflow vernal pools are found on the Mehrten and Valley Springs formation in rocky soil series and complexes such as Hadselville-Pentz, Red Bluff-Redding, Corning-Redding, Amador-Gillender, and Pardee-Rancho Seco (Jones and Stokes 1990). Mudflow pools in the Plan Area are hydrologically complex; in some areas, vernal pools are in complex reticulated drainage networks with a high density of interconnected pools, swales, and ephemeral drainages (Jones and Stokes 1990). The seasonal hydrology of Northern Volcanic Mudflow vernal pools includes a perched water table (see Section 3.2.3), but pool hydrology is relatively "flashy" (i.e., pools fill and drain relatively rapidly). Northern Volcanic Mudflow vernal pools contain relatively rich flora that includes several vernal pool obligate species. The species richness and ecological complexity of Northern Mudflow pools in the Plan Area exceed that of the Young-Terrace Northern Hardpan pools and the Drainageway vernal pools in the Plan Area. Possible explanations of the rich (less specialized) flora of Northern Mudflow pools include the recent origin of the pools and their quickly changing or "flashy" hydrology. Mudflow pools fill and drain rapidly, and may be less stressful to most plant life than pools that remain flooded for extended periods, such as the Old-Terrace Northern Hardpan vernal pools (Jokerst 1990; Jones and Stokes 1990).

Northern Hardpan vernal pools form on alluvial terraces in old, acidic, nutrient-depleted soils with iron-silicate cemented soil layer. These soils often exhibit well-developed mound-intermound topography to form aggregations of pools and "mima mounds." Water chemistry is mixo-saline fresh (Sawyer and Keeler-Wolf 1995). Northern Hardpan vernal pools typically have a conductivity of 40 to 70 mhos per 1 centimeter, which is similar to an oligotrophic high Sierran lake (Keeley and Zedler 1998; Williamson et al. 2005). Water in hardpan vernal pools is not only low in dissolved salts, but also in dissolved nitrogen. For example, Rains et al. (2006) reported that, during the growing season, nitrate and phosphate concentrations were below detection limits (i.e., 0.006 milligrams per liter (mg/L) and 0.03 mg/L, respectively), and the amount of ammonium was negligible (0.1 mg/L). Within the Plan Area, Northern Hardpan vernal pools occur on the low (younger) terrace Riverbank Formation soil series (e.g., San Joaquin, Galt,

Madera, Tehama), as well as on the high (older) terrace Laguna Formation and Arroyo Seco gravels (e.g. Corning, Redding, Red Bluff, Mokelumne soil series). Vernal pools occur extensively on both landforms types (Jones and Stokes 1990).

The Plan Area's Low-Terrace Northern Hardpan vernal pools (e.g., on San Joaquin soils) are of recent geologic origin, which may explain their relatively unspecialized flora that often includes non-native plants, low species richness, scarcity of vernal pool obligates, and low numbers of special-status plants. Most young terrace sites in the Plan Area have been plowed, graded, or heavily grazed because of their arable soils and proximity to reliable water; this may also account for their less specialized flora. Low-Terrace Northern Hardpan vernal pools also serve an important function as habitat for shorebirds, waterfowl, and raptors because of their location in the central portion of the valley along the Sacramento River (Jones and Stokes 1990; Silveira 1998).

High-Terrace Northern Hardpan vernal pools (e.g., on Corning and Redding soil series) are the most complex type of vernal pool in the Plan Area because of their rich and varied flora, presence of special-status plant and invertebrate species, and complex hydrology, and because they often occur in areas with complex, highly convoluted interspersions of several soil types. Soils on high-terrace landform sites varies over short distances such that sites in proximity to each other may have entirely different restricting layer types, depth, and vernal pool plant community. High-Terrace Northern Hardpan vernal pools are floristically rich and dominated by vernal pool obligate plant species (true "specialists"), and typically support special-status species. The tremendous age and geographic location of High-Terrace Northern Hardpan pools may account for their rich and highly specialized flora (Jones and Stokes 1990). Little of the high-terrace landform has been farmed in the Plan Area because irrigation water is lacking and many sites are not arable. Some high-terrace vernal pool areas were dryland farmed in the past with wheat or oats; this type of farming appears to have had little effect on high-terrace vernal pools, while on other formations, this disrupted vernal pool surface hydrology. Consequently, High-Terrace Northern Hardpan vernal pools are relatively abundant in the Plan Area (Jones and Stokes 1990).

Drainageway vernal pools are located on no particular Plan Area geologic formation, but formed on recent alluvial deposits adjacent to the incised channels of active watercourses. Consequently, Drainageway vernal pools are interspersed throughout the other three vernal pool types present in the Plan Area. Drainageway vernal pools fill and drain rapidly, and may depend on overland runoff and direct precipitation to maintain their hydrology relative to the other vernal pool types (Jones and Stokes 1990). Additionally, the basins of Drainageway vernal pools are often shallow and susceptible to evaporation, or slightly sloped, which encourages drainage. Drainageway vernal pools have an unspecialized flora relative to the other three vernal pool types in the Plan Area (Jones and Stokes 1990).

The four types of vernal pools present in the Plan Area can be further classified by the presence or absence of certain dominant or less abundant vernal pool plant species (Sawyer et al. 2009). Vernal pool community structure (i.e., the type, number, and relative abundance of species) is largely determined by the pool's physical makeup (e.g., size, depth, substrate, water chemistry) and the pool's hydrology; different patterns of species dominance and the presence or absence of certain species can be indicative of physical and hydrology differences among vernal pools (Holland and Jain 1988). Vernal pools in the Plan Area exhibit a great variety of size, depth, soil, and water chemistry. Key physical parameters may include pool drainage area, slope, soil type, soil structure and depth, pool size and depth, timing of the pool hydrologic cycle, and pool interconnectivity. In particular, several SSHCP vernal pool Covered Species require large, deep pools that are long lasting to successfully complete their life cycles, including Boggs Lake hedge-hyssop (*Gratiola heterosepala*), Sacramento Orcutt grass (*Orcuttia viscida*), slender Orcutt grass (*Orcuttia tenuis*), vernal pool tadpole shrimp, California tiger salamander, and western spadefoot toad. Other vernal pool Covered Species are found in small to medium-sized "flashy" pools that dry out relatively quickly, but may inundate and dry out several times during the wet season, including Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*), dwarf downingia (*Downingia pusilla*), and pincushion navarretia (*Navarretia myersii*). For some plants in the latter category, the edges of larger vernal pools may provide conditions equivalent to the smaller, flashy pools. Other Covered Species associated with vernal pools include legenere (*Legenere limosa*), vernal pool fairy shrimp, Ricksecker's water scavenger beetle, most of the bird Covered Species (mostly as foraging habitat), American badger (*Taxidea taxus*), and western red bat (*Lasiurus blossevillii*) (see Table 3-2).

Preserving the full range of physical and hydrologic conditions found in Plan Area vernal pools is necessary to ensure that all vernal pool Covered Species and representative examples of the different Plan Area vernal pool types and existing variation in vernal pool plant and animal associations are considered and protected (Jones and Stokes 1990). By protecting the range of diversity in vernal pool types, the SSHCP can ensure that the entire range of known and unknown ecological and biological values is represented in a Preserve System, and that the intrinsic values of this facet of the region's natural heritage are considered. Preserving the range of plant and animal associations also provides natural laboratories to study the factors influencing the presence or absence of species, migration, and establishment of species, patterns of species dominance, and other phenomena (Jones and Stokes 1990).

Plan Area vernal pools occur in complexes of pools interconnected by intermittent surface swales and by the seasonal perched aquifer that forms between the soil surface and the sub-surface restricting layer. Consequently, the Vernal Pool land covers in the Plan Area cannot be described or analyzed in isolation of their ecologically and hydrologically connected SSHCP land covers of Swale, Valley Grassland, and Stream/Creek (Vernal Pool Invertebrate Habitat [VPIH]). Therefore, in addition to discussing the Vernal Pool land cover individually in SSHCP

Chapters 3, 6, and 7, the Plan Permittees also define and discuss an SSHCP Vernal Pool Ecosystem (see Section 3.2.3).

Seasonal Wetland Land Cover

Seasonal Wetland is a wetland that ponds for an extended period during a portion of the year. Seasonal Wetlands generally fill during the rainy winter season then dry relatively slowly, typically in the summer or early fall. Seasonal Wetlands tend to be isolated wetlands that occur within moderate to large depressional features along streams, creeks, and rivers; along the edges of open water, or scattered within the Valley Grassland land cover. In addition, some impounded drainages, excavated stock ponds, and graded or excavated former vernal pools can also be Seasonal Wetland. The Seasonal Wetland land cover is often characterized by herbaceous annual and perennial species such as curly dock (*Rumex crispus*), sedges (*Carex* spp.), nutsedges (*Cyperus* spp.), spikerushes (*Eleocharis* spp), and occasionally cattail (*Typha* spp.).Seasonal Wetland provides habitat for some Covered Species (Table 3-2). The SSHCP does not consider Seasonal Wetland to be suitable habitat for vernal pool crustaceans.

Covered Species associated with the Seasonal Wetland land cover include Boggs Lake hedge-hyssop, legenere, Sanford's arrowhead (*Sagittaria sanfordi*), California tiger salamander, western spadefoot, giant gartersnake (*Thamnophis gigas*), all of the bird Covered Species (mostly as foraging habitat) except Cooper's hawk (*Accipiter cooperii*), American badger, and western red bat.

Swale Land Cover

The movement of surface water between vernal pools can occur in a network of narrow and intermittent surface "swales" (Solomeshch et al. 2007). Swales are shallow ephemeral drainages found in flat to gently rolling Valley Grassland in association with vernal pool complexes, on soils with an impermeable layer (see Section 2.3). Swales convey runoff as shallow, gently sloping ephemeral wetlands during, and for short periods after, winter rainstorms. Soils within the Swale land cover type may remain saturated during the winter and early spring, but dry by summer. Swales are associated with vernal pools and provide intermittent conduits between vernal pools for movement of surface water and propagules of vernal pool plant and animal Covered Species (seeds, cysts, eggs, and spores), and movement of adult California tiger salamanders and western spadefoots. Swales support several native plant species commonly found in vernal pools. Swales also often include smaller shallow depressional features that may pond during the rainy season to provide suitable reproductive habitat for some vernal pool Covered Species, and may be considered vernal pools. Generally, the Swale land cover provides suitable habitat for portions or all of the life cycle of many of the Covered Species that occur in the Vernal Pool land cover types, including Ahart's dwarf rush, dwarf downingia, pincushion navarretia, mid-valley fairy shrimp (*Branchinecta mesovallensis*), vernal pool fairy shrimp, vernal pool tadpole shrimp, Ricksecker's water scavenger beetle, and western spadefoot. In

addition, all of the bird Covered Species (except Cooper's hawk and greater sandhill crane (*Grus canadensis tabida*)) use Swale land cover (primarily as foraging habitat), along with American badger and western red bat (see Table 3-2).

The Swale land cover type cannot be adequately described or analyzed separately or in isolation of other ecologically and hydrologically connected SSHCP land covers (i.e., Vernal Pool, Valley Grassland, and Stream/Creek VPIH). Therefore, in addition to discussing the Swale land cover individually in SSHCP Chapters 3, 6, and 7, the Plan Permittees also define, discuss, and analyze a combined SSHCP Vernal Pool Ecosystem (see Section 3.2.3).

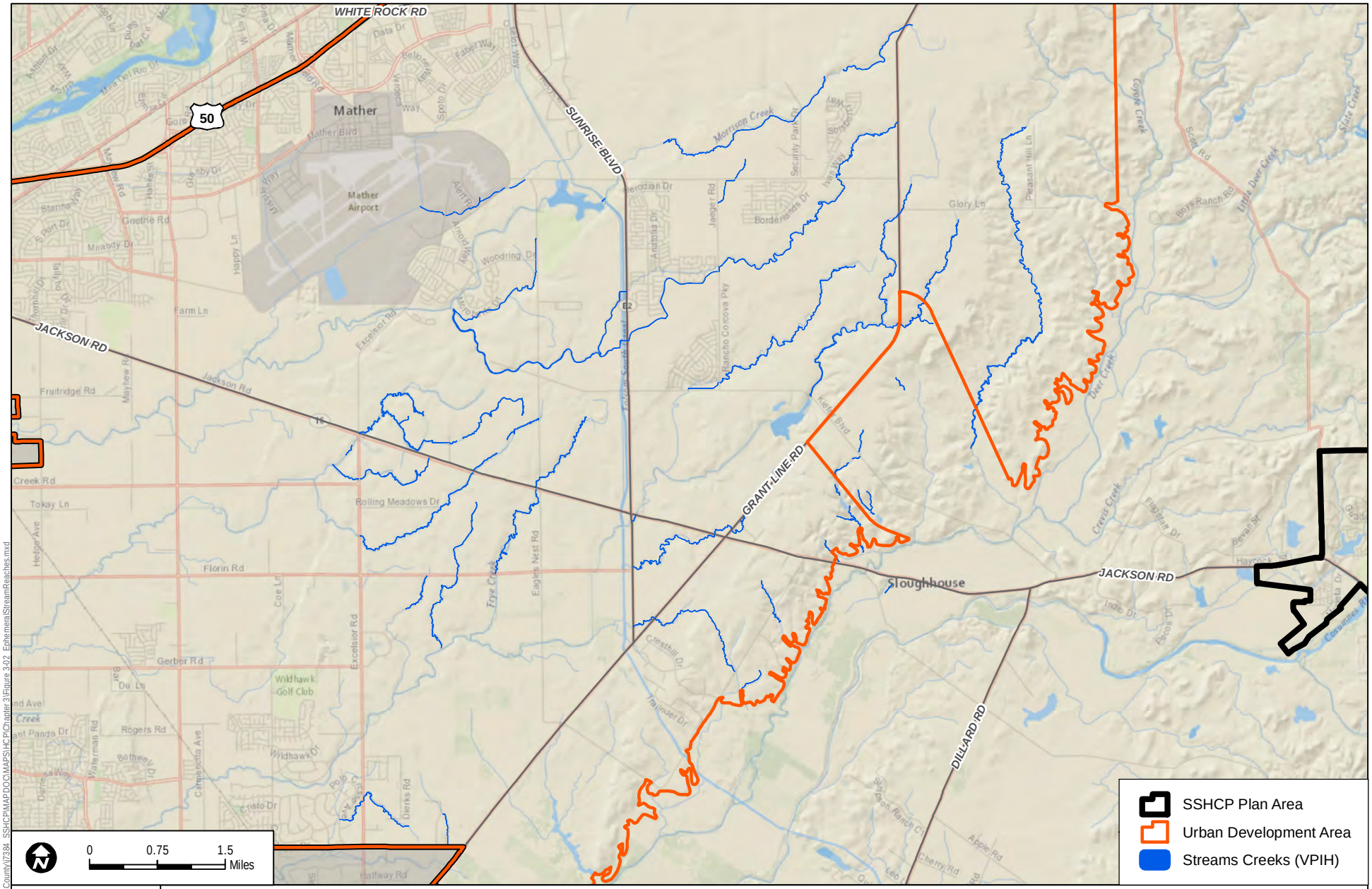
Stream/Creek Vernal Pool Invertebrate Habitat Land Cover

As discussed below, the larger SSHCP Stream/Creek land cover type includes intermittent and perennial linear water features such as rivers, streams, creeks, and drainages. The SSHCP Stream/Creek VPIH land cover type is typically an intermittent drainage that is vegetated with Valley Grassland plant species and conveys water after rain events (is ephemeral). Unlike the Swale land cover type, the Stream/Creek (VPIH) land cover is less likely to support vegetation characteristic of vernal pools, and the SSHCP does not consider the Stream/Creek (VPIH) land cover habitat for vernal pool plant Covered Species. However, the Stream/Creek (VPIH) land cover is known to provide movement corridors, and may provide suitable habitat for vernal pool crustaceans, including mid-valley fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp, within depressional features of the drainage that pond water between storm events. Western burrowing owl (*Athene cunicularia hypugaea*) may also use Stream/Creek (VPIH) habitat. See Figure 3-2 for locations of Stream/Creek (VPIH) habitat.

The Stream/Creek (VPIH) land cover cannot be adequately described or analyzed separately or in isolation of other ecologically and hydrologically connected SSHCP land covers (i.e., the Vernal Pool, Valley Grassland, and Swale land covers). Therefore, in addition to discussing Stream/Creek (VPIH) individually in SSHCP Chapters 3, 6, and 7, the Plan Permittees also define, discuss, and analyze a combined SSHCP Vernal Pool Ecosystem (see Section 3.2.3).

Freshwater Marsh Land Cover

Most of California's freshwater marshes occur in the Sacramento Valley and San Joaquin Delta regions. The majority of Freshwater Marsh in the Plan Area occurs along the perennial Cosumnes River and Deer Creek, and along the margins of streams and open water in the Plan Area. Freshwater Marsh is typically dominated by perennial herbaceous plant species such as cattails, tules (*Scirpus* spp.), and other emergent plant species, and is generally found along the edges of aquatic habitats such as ponds, lakes, and rivers. It is important habitat for western pond turtle (*Actinemys marmorata*), giant gartersnake, northern harrier (*Circus cyaneus*), tricolored blackbird (*Agelaius tricolor*), and western red bat (Table 3-2).



Path: Z:\Projects\Sacramento_County\7384_SSHCP\MAPDOC\MAPS\HCP\Chapter 3\Figure 3-02_EphemeralStreamReaches.mxd

SOURCE: USGS 2012; ESRI 2013; County of Sacramento 2013

FIGURE 3-2

Streams/Creeks Vernal Pool Invertebrate Habitat (VPIH)

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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Open Water Land Cover

Open Water includes perennial or features, such as natural or built ponds, lakes, and reservoirs. Open Water may contain no vegetation, or non-rooted aquatic vegetation, such as algae, floating pondweeds, and other plants. Along shorelines, rooted, emergent vegetation may occur, forming Freshwater Marsh. Like Freshwater Marsh, Open Water habitat is used by numerous bird, mammal, amphibian, and reptile species, including several Covered Species, such as western pond turtle, giant gartersnake, tricolored blackbird, and western red bat. The marshy shorelines may be used by tricolored blackbird for nesting colonies (Table 3-2).

The Open Water land cover type is found throughout the SSHCP Plan Area. Open Water features are largely unnamed with the exception of Blodgett Reservoir located inside the Urban Development Area (UDA) and Rancho Seco Lake outside the UDA.

Stream/Creek Land Cover

Outside of the UDA, the Stream/Creek land cover type includes intermittent and perennial linear water features such as rivers, streams, creeks, drainages, and roadside and irrigation ditches. Within the UDA, this land cover type includes streams identified by the U.S. Army Corps of Engineers. A separate category was created for aqueducts throughout the Plan Area.

The SSHCP Stream/Creek land cover includes rivers such as the Cosumnes River, streams such as Laguna Creek, and smaller intermittent or perennial creeks. The Stream/Creek land cover type was mapped from aerial photographs. Where a river or stream channel was not discernable because of dense over story cover, the centerline of the channel has been approximated and buffered by a width of 6 feet. Polygons of the Stream and Creek land cover occur in Valley Grassland, Blue Oak Woodland, Blue Oak Savanna, Agriculture, and Developed land cover types.

Covered species associated with the Stream/Creek land cover type include Sanford's arrowhead, giant gartersnake, western pond turtle, and western red bat (Table 3-2).

Mixed Riparian Woodland Land Cover

Riparian land covers are associated with Plan Area streams and creeks and typically occur in the zone between the active stream channel and adjacent upland land covers. While "riparian" has various definitions, the SSHCP uses the National Research Council's 2002 definition: "Riparian areas are transitional between terrestrial and aquatic ecosystems and are distinguished by gradients in biophysical conditions, ecological processes, and biota. They are areas through which surface and subsurface hydrology connect water bodies with their adjacent uplands. They include those portions of terrestrial ecosystems that significantly influence exchanges of energy

and matter with aquatic ecosystems (i.e., a zone of influence). Riparian areas in the Plan Area are adjacent to perennial, intermittent, and ephemeral streams, lakes."

Riparian ecosystems are highly dependent on landscape setting and numerous physical and biotic interactions. Riparian ecosystems provide essential foraging, shelter, and breeding habitat for several of the Covered Species and other native plant and animal species, including both resident and migratory species.

The Mixed Riparian Woodland land cover type is distinguishable by an open canopy layer dominated by tall Fremont cottonwood trees. Beneath this open layer, a moderately dense mid-canopy layer is composed of tree species such as Oregon ash (*Fraxinus latifolia*), Goodding's willow (*Salix gooddingii*), California black walnut (*Juglans californica* var. *hindsii*), valley oak (*Quercus lobata*), and box elder (*Acer negundo*). In some areas, a subcanopy of dense Riparian Scrub dominated by willow species, including arroyo willow and sandbar willow, is present. A discontinuous shrub layer is also present, particularly along the northern boundary of the Plan Area, and includes species such as blue elderberry, Himalayan blackberry, coyote-brush, wild rose, and wild grape. The understory is sparsely to densely vegetated with herbaceous species. Invasive weeds that have colonized portions of the Mixed Riparian Woodland in the Plan Area include tamarisk (*Tamarix* spp.) and giant European reed (*Arundo donax*).

Included in the Mixed Riparian Woodland Land Cover Type are valley oak riparian woodlands. Although they are not a separate land cover type, owing to an inability to distinguish them from other riparian communities, valley oak riparian woodlands are notable as they were once a dominate community along waterways in the Plan Area. Valley oak riparian woodland intergrades with the Valley Grassland land cover type and wooded borders along streams and agricultural fields in the Plan Area. Tree associates in the Plan Area include California sycamore (*Platanus racemosa*), California black walnut, interior live oak (*Quercus wislizeni*), box elder, and blue oak. The shrub understory consists of western poison-oak, blue elderberry, California wild grape, toyon (*Heteromeles arbutifolia*), California coffeeberry, and California blackberry (*Rubus ursinus*). Various sorts of wild oats (*Avena* spp.), brome (*Bromus* spp.), barley (*Hordeum* spp.), ryegrass (*Lolium* spp.), and needlegrass (*Nassella* spp.) dominate the ground cover.

Covered species associated with the Mixed Riparian Woodland land cover type include valley elderberry longhorn beetle, western pond turtle, Cooper's hawk, Swainson's hawk, white-tailed kite, and western red bat (Table 3-2).

Mixed Riparian Scrub Land Cover

Mixed Riparian Scrub land cover type is interspersed with Mixed Riparian Woodland in the floodplains of waterways throughout Sacramento County. In the Plan Area, this land cover type

consists of an open to dense shrubby thicket dominated by a mixture of sandbar willow (*Salix exigua*), arroyo willow (*S. lasiolepis*), red willow (*S. laevigata*), and immature stands of mixed riparian woodland tree species (see description below). This plant community can also be a subcanopy community in Mixed Riparian Woodland. Though dense stands of Riparian Scrub in the Plan Area typically lack an understory, some of the more open canopy mixed Riparian Scrub stands do support an understory of native and non-native species, including wild rose (*Rosa californica*), wild grape (*Vitis californica*), perennial pepperweed (*Lepidium latifolium*), Himalayan blackberry (*Rubus discolor*), curly dock, and various non-native grasses.

Covered species associated with the Mixed Riparian Scrub land cover type include valley elderberry longhorn beetle, giant gartersnake, western pond turtle, Cooper's hawk, loggerhead shrike, Swainson's hawk, white-tailed kite, and western red bat (Table 3-2).

Mine Tailing Riparian Woodland Land Cover

The Mine Tailings Riparian Woodland land cover type is distributed within areas of mine tailings. This land cover type contains species commonly found in Riparian Woodlands and Riparian Scrub habitats, such as Fremont cottonwood (*Populus fremontii*), blue elderberry (*Sambucus mexicana*), willow (*Salix* spp.), and coyote-brush (*Baccharis pilularis*). In the Plan Area, this land cover type can also intergrade with mixed riparian forest along bodies of water.

Covered species associated with the Mine Tailing Riparian Woodland land cover type include valley elderberry longhorn beetle, western pond turtle, Cooper's hawk, loggerhead shrike, white-tailed kite, and western red bat (Table 3-2).

3.2.2 SSHCP Terrestrial Land Cover Types

SSHCP includes seven terrestrial land cover types. One are dominated by herbaceous vegetation (Valley Grassland), two have oak trees (Blue Oak Woodland and Blue Oak Savanna), and four are farming land covers (Cropland, Irrigated Pasture-Grassland, Orchard, and Vineyard).

Valley Grassland Land Cover

Valley Grassland is by far the most common single land cover in the Plan Area. Including non-habitat land covers, it accounts for about 43% of the land covers in the Plan Area. Valley Grassland, being so widespread throughout the Plan Area, is essential for both the long-term survival of many of the Covered Species and for conserving ecological functions of other land cover types within the Plan Area.

Valley Grassland in the SSHCP Plan Area is an annual herbaceous plant community now characterized mostly by naturalized annual grasses. Generally, its composition in the Plan Area

varies with geographic, and land use factors, such as rainfall, temperature, elevation, slope, aspect, grazing, and other herbivory (e.g., livestock, wildlife, rodent, songbird, and insect use), and fire frequency and duration. In the Plan Area, Valley Grassland is dominated by naturalized herbaceous annual forbs, and patches with relatively high proportions of native grasses and forbs.

Valley Grassland in the Plan Area is associated with several natural communities, including vernal pools, and occurs as an understory within Valley Oak Riparian Woodland, Blue Oak Woodland, and Blue Oak Savanna. Valley Grassland also may occur as a co-dominant with perennial grasses within some of the areas mapped as Valley Grassland in the Plan Area. For example, purple needlegrass (*Stipa pulchra*) can be found as the dominant grass (i.e., comprising greater than 20% cover) in small patches along ridgetops of low-lying hills in the eastern portion of Sacramento County.

Valley Grassland supports numerous wildlife species, including several Covered Species. Covered Species associated with Valley Grassland included California tiger salamander, western spadefoot giant gartersnake, western pond turtle, all of the bird Covered Species (except Cooper's hawk), American badger, and western red bat (Table 3-2).

As a critical element of the Vernal Pool Ecosystem, much of the Valley Grassland land cover within the Plan Area also supports vernal wetlands (i.e., Vernal Pools, Swales, and Stream/Creek-VPIH), and vernal pool-dependent species (vernal pool crustaceans and plants) (see Section 3.2.3).

Cropland Land Cover (Row and Field Crops)

Most of the Plan Area's Cropland is concentrated in the western part of the Plan Area in the Sacramento River and Cosumnes River floodplains. Cropland includes annual row and field crops (e.g., small grains, corn, tomatoes, melons, peppers, safflower, sunflower) and short-term perennial crops (e.g., asparagus). Rice is a row crop grown in Sacramento County, but is seldom grown in the Plan Area. Small fields of rice have recently been planted on the existing Cosumnes River Preserve.

An important ecological function of Cropland in the Plan Area is to provide rodent and insect prey and plant material forage for a number of the bird Covered Species. Small rodents are important prey for raptors, such as Swainson's hawks, white-tailed kite, and Cooper's hawk. Western burrowing owls consume a mix of small rodents, arthropods, and other small animals. Loggerhead shrikes primarily prey on ground-dwelling insects but also take small rodents. Swainson's hawks switch to a diet of insects after the breeding season. Greater sandhill crane is a winter visitor to the Plan Area and forages for seeds and small animals. Tricolored blackbird forages on invertebrates during the nesting season and plant material during the non-nesting season (Table 3-2).

Irrigated Pasture-Grassland Land Cover

Irrigated Pasture-Grassland is fairly common, but occurs in a scattered distribution generally in the central portion of the Plan Area. The Irrigated Pasture-Grassland land cover includes hay production (alfalfa, clovers, and mixed grasses), seasonal summer pasture for livestock (primarily cattle), and year-round pasture for livestock (primarily cattle or horses). Seasonal pasture appears to be the most common use. Irrigated Pasture-Grassland is typically seeded, cut/grazed, and reseeded on a regular basis on an approximately 5- to 7-year cycle before the fields are left fallow to rest, and the cycle is started over again.

Within the Irrigated Pasture-Grassland land cover type, alfalfa fields provide by far the most productive foraging habitat for raptors and are used by other Covered Species, such as greater sandhill crane, and tricolored blackbird (Table 3-2). As a perennial crop grown for several years before removal and replacement, alfalfa provides good cover for rodents and time for establishment of a good prey base. Farming operations during the growing season consist of periodic flood irrigation and four to six mowings. Both types of operations result in temporary increases in prey availability.

Many of the Covered Species that use Cropland also use Irrigated Pasture-Grassland. Pasture is suitable tricolored blackbird foraging habitat if it is within two miles of a colony nesting site. Greater sandhill cranes use Irrigated Pasture-Grassland for roosting and foraging (Table 3-2).

Orchard Land Cover (Fruit and Nut Orchards)

Orchards are scattered throughout the Plan Area, with the largest concentration along the western boundary of the Plan Area. The Orchard land cover has limited wildlife habitat value (Table 3-2), but provides perches for raptors foraging in adjacent Cropland and Valley Grassland. In particular, larger nut trees and other trees at these edge areas may be used by "sight predators" such as Swainson's hawk for perches to find prey in adjacent fields. Western red bat is known to roost in orchards, including apricot, peach, pear, almond, walnut, and orange trees (Constantine 1959; Pierson et al. 2006) (Table 3-2).

Vineyard Land Cover

Vineyard land cover is located mostly in the southern portion of the Plan Area outside of the UDA. In Sacramento County, vineyards are primarily established for wine grape production, with some minor table grape producers. Vineyards are primarily "clean cultivated," meaning no other vegetation is allowed to grow between the rows or on the edges of fields and irrigation ditches. As such, vineyards typically provide only limited habitat for native plants and wildlife (Table 3-2). However, vineyards using "environmentally friendly" management practices may

provide habitat value through use of bat boxes, raptor perches, and owl boxes to encourage presence of these species and reduce insect and predation damage.

Blue Oak Woodland Land Cover and Blue Oak Savanna Land Cover

Blue Oak Woodland and Blue Oak Savanna comprise approximately 5% of the Plan Area, a majority of which is located in the far eastern portion of the Plan Area.

Blue oaks are typically drought-tolerant, and unlike interior live oaks, are deciduous, dropping their leaves during periods of extreme moisture stress. This survival trait may explain the observed patterns of blue oak distribution, with blue oaks occupying drier, shallower, and well-drained soils than interior live oaks or valley oaks (McDonald 1985).

In general, the SSHCP differentiated and mapped Blue Oak Woodland land cover and Blue Oak Woodland Savanna by their tree-cover densities.

Blue Oak Woodland is characterized by greater than 10% tree cover formed primarily by blue oak with other foothill tree species mixed in. Blue Oak Woodland generally has a sparse shrub layer and well-developed Valley Grassland layer, sometimes including vernal pools and other wetland features. Other tree species that may occur in Blue Oak Woodland include foothill pine (*Pinus sabiniana*), interior live oak (*Quercus wislizenii*), valley oak (*Quercus lobata*), and California buckeye (*Aesculus californica*). The shrub layer, where present, only includes scattered individuals of poison oak (*Toxicodendron diversilobum*), and coyote brush (*Baccharis pilularis*). Blue Oak Woodland often has a relatively open canopy, when compared to the riparian land covers present in the Plan Area.

Blue Oak Savanna land cover type is characterized by a sparse (less than 10%) tree canopy structure that ranges from scattered blue oak trees and small clusters of blue oaks, to small areas of blue oak stands. Like Blue Oak Woodland, it generally has little to no shrub layer, but has a well-developed Valley Grassland layer. Blue Oak Savanna is typically transitional between Valley Grassland and Blue Oak Woodland.

Oak Woodland and Savanna provide important cover, nesting, and roosting sites for native bird species, as well as caching sites for acorn storage, for a variety of birds, mammals, and other native species. Covered Species that use Blue Oak Woodland and/or Savanna include American badger, western red bat, Cooper's hawk, western burrowing owl, and white-tailed kite. Where suitable aquatic land cover occurs in association with Blue Oak Woodland and Blue Oak Savanna land cover, California tiger salamander, western spadefoot, and western pond turtle may also occur. Old, large oak trees are of particular habitat value, providing an array of living and dead branches as sites for woodpeckers to excavate cavities and for insect-eaters to forage for larvae and adult insects. Dead branches and trunks are critically important

for cavity nesting birds, for mammals as storage sites for acorns, and as perches for sight-dependent predators, such as raptors (Gutierrez and Koenig 1978). The fallen logs of dead oaks provide sustenance and cover for arthropods, fungi, and wildlife, and may potentially extend activity periods for these species in drier climates by retaining soil moisture and providing shade (Giusti et al. 2004).Oak trees produce a critically important food crop, acorns. Acorn production is typically episodic, some years with copious acorn production and other years with minimal acorn production. High yield acorn years appear critical in triggering pulses in invertebrate and vertebrate population sizes (McShea and Rappole 2000; McShea and Schwede 1993). Blue Oak Woodland and Blue Oak Savanna provide different habitat functions for some of the Covered Species. For example, western burrowing owl and American badger may occur in the open savannas but not denser woodlands. White-tailed kites may nest in woodlands and forage in savannas.

3.2.3 SSHCP Vernal Pool Ecosystem

One of the stated goals of the SSHCP is to protect several Plan Area vernal pool species (see Chapter 7). To accomplish protection of vernal pool species, the SSHCP focuses on the preservation of seasonal vernal-wetlands, such as Vernal Pools, Swales, and Streams/Creeks VPIH, where vernal pool invertebrates and plant species spend their entire life cycle and where amphibians such as California tiger salamander and spadefoot toad breed and forage. However, as discussed in Section 2.3.1, and in Section 3.2.1, these seasonal wetlands cannot exist absent the adjacent uplands. Essential vernal pool ecology and functions (such as the seasonal hydrologic cycle, nutrient cycling, water chemistry, and food chain support) are closely tied to the surrounding uplands. To ensure that the Plan achieves its goal of protecting vernal pool species, the Plan must protect both the vernal wetlands and the adjacent upland valley grassland that support and maintain the vernal wetlands. To that end, the SSHCP identified areas where the SSHCP vernal-wetland land cover types (i.e. Vernal Pool, Swale, and Stream/Creek-VPIH) are ecologically connected with the adjacent Valley Grassland land cover. Taken together, the Valley Grassland and Vernal Pool, Swale, and Stream/Creek VPIH land cover types in these areas comprise the Vernal Pool Ecosystem. This Vernal Pool Ecosystem approach allowed the Plan Permittees to consider the ecological interconnectivity that occurs between Swale and Vernal Pool, between Valley Grassland and Vernal Pool, and between vernal pool complexes and adjacent Stream/Creek habitat. This ecosystem approach was used by the Plan Permittees when developing the SSHCP Conservation Strategy (see Chapter 7), and will be used to establish the SSHCP Preserve System (Chapter 7).

Hydrology

An intact vernal pool ecosystem is necessary to maintain the soil perched aquifer and hydrological functions of vernal wetlands. Plan Area vernal pools receive water from three

sources: direct precipitation, water in the soil's sub-surface "perched aquifer," and surface rainwater flow. As discussed in Sections 2.3, the importance of each water source to a vernal pool's hydrology changes between geologic landform and vernal pool type, which affects pool water chemistry and the species community composition.

Hydrologic connectivity between individual vernal pools and between vernal pool complexes can occur from subsurface lateral flows where soil-restrictive layers form seasonal perched aquifers, and hydrologic connectivity can occur from surface flows through seasonal swales or seasonal drainages. In addition to its role in a seasonal wetland's hydrologic regime, hydrologic connectivity via surface swales and drainages allow dispersal of vernal pool organisms between vernal pools and between vernal pool complexes, including several SSHCP plant and animal vernal pool Covered Species.

Hydrology studies conducted within the Plan Area indicate that most Plan Area Vernal Pools receive winter rainwater from subsurface lateral flows (Hanes et al. 1990; Hanes and Stromberg 1998; Rains et al. 2006; Williamson et al. 2005). This occurs when a soil-restrictive layer prevents percolation of rainwater into the deeper groundwater aquifer, causing a seasonal sub-surface perched aquifer (a perched water table) to form. Once the soils that are above the soil-restrictive layer have become saturated, water can move laterally above the impervious restrictive layer from upland into vernal pools and vice-versa, and ultimately drain down the slope within a single watershed to exit as late-season riverine flow in downslope streams and creeks (Hanes et al. 1990; Hanes and Stromberg 1998; Rains et al. 2006; Williamson et al. 2005). Because water in the perched aquifer discharges from uplands into vernal pools, it causes the vernal pools to hold water for longer periods than would be the case if the pools were recharged only by precipitation and/or surface flows. Within the Plan Area, the perched aquifer can supply as much as 60% or more of the water needed to fill a vernal pool completely (Williamson et al. 2005). However, individual vernal pools display markedly different hydrology due to variations in topography and soil properties near each pool (Leibowitz and Brooks 2008).

The movement of winter rainwater between vernal pools also travels via surface swales, and in such a situation, the hydrologic connection between pools is obvious (Solomeshch et al. 2007). Overland rainwater runoff occurs after soils are fully saturated and the subsurface seasonal perched water table has formed. When rainwater runoff reaches pools in which ponding or saturation by the perched aquifer has already occurred, the vernal pools overflow into adjacent surface swales (Jones and Stokes 1990). In the vernal pool landscapes remaining within the Plan Area, vernal pools overflow through seasonal swales to other vernal pools, which may then overflow into other vernal pools or vernal pool complexes, and ultimately flow to seasonal streams and creeks (Rains et al. 2006).

Water Chemistry and Other Abiotic Factors

An intact vernal pool ecosystem is also necessary to maintain water chemistry and other abiotic factors that support biodiversity and abundance of vernal pool aquatic plants and aquatic animals (Kneitel and Lessin 2010; Poirier 2012). Vernal pools within altered watersheds may no longer have adequate surface and/or subsurface flows for the pool to function adequately as suitable habitat for certain vernal pool species. In addition, where human activities have significantly affected upland watersheds, the abiotic aquatic habitat components (such as vernal pool water chemistry, which is determined by subsurface and surface flows through the watershed's soils) may be altered, further reducing suitability of the vernal pool to support certain vernal pool species (Rains et al. 2008). For example, permanently removing or truncating the associated upland watershed that forms the seasonal perched aquifer could convert a perched-aquifer vernal pool system into a direct-precipitation/surface-runoff-driven system. These vernal pools may continue to pond to some extent from the direct precipitation, but the vernal pool's normal hydrologic regime and natural water chemistry would be fundamentally and permanently altered.

Ecological Interconnectivity

Ecological interconnectivity between pools and pool complexes is an important consideration for life-history needs and dispersal of covered vernal pool plant and animal species. Amphibians, including western spadefoot toad and California tiger salamander, require contiguous uplands for refugia and for terrestrial migration of adults between upland refugia habitat and wetland habitats to maintain larger meta-populations. Plant seeds and invertebrate cysts and eggs may also be transported between vernal pools by animals that cross uplands. Solitary bees that are obligate vernal pool plant pollinators depend on the uplands surrounding vernal pools as well. To maintain adequate biological interconnectivity, the SSHCP must acquire enough Valley Grassland within the vernal pool ecosystem to support movement and dispersal of individuals between larger meta-populations, and to provide habitat needs for the entire life history of each vernal pool Covered Species.

3.2.4 Developed and Other Non-Habitat Land Cover Types

Seven SSHCP cover types provide little or no Covered Species habitat value, and are not a focus of the SSHCP Conservation Strategy (Chapter 7); these are: aqueducts, disturbed, low- and high-density development, major roads, mine tailings, and recreation/landscaped areas.

Aqueduct Land Cover

The aqueduct land cover type in the Plan Area is represented by the Folsom South Canal.

Disturbed Land Cover

The disturbed land cover type is defined as open-space areas that have been subject to previous or ongoing disturbances such as along roadsides, trails, and parking lots. Scraped or graded land, gravel mining, and waste disposal sites are included in this land cover type. Disturbed land cover type is vegetated with diverse weedy flora. These areas are of special concern as they tend to harbor and facilitate the spread of invasive plant species. Vascular plant species associated with the disturbed land cover typically include Johnson grass, Canadian horseweed (*Conyza canadensis*), milk thistle (*Silybum marianum*), yellow-star thistle (*Centaurea solstitialis*), stinkwort (*Dittrichia graveolens*) and field bindweed (*Convolvulus arvensis*).

High-Density Development Land Cover

The high-density development land cover type includes urban and suburban residential neighborhoods, urban centers, industrial areas, airports, and wastewater treatment plants. Most of this high-density development occurs in the SSHCP UDA in the northwestern portion of the Plan Area.

Low-Density Development Land Cover

The low-density development land cover type consists of relatively sparse residences and other structures, such as farm buildings, and small rural neighborhoods with large individual property sizes per house. Plant nurseries are also included in this category. While the majority of low-density development occurs outside of the UDA, it is found throughout the Plan Area.

Major Roads Land Cover

The major roads land cover type includes linear features with paved surfaces and can vary from large freeways to smaller arterial roads found within urban settings. Smaller roads not mapped as Major Roads were mapped as an element of High-Density or Low-Density Development.

Mine Tailings Land Cover

Mine Tailings Land Cover is defined by the large tailing piles that rise significantly above the surrounding landscape as a result of gold dredging occurring in the early 1900s through approximately 1960. The large tailing piles are composed almost entirely of rounded river rock that was excavated from ancient riverbeds. Most of the mine tailings are associated with historic gold mining are located in the northeastern portion of the Plan Area. Smaller outcroppings of tailings in are often the result of current and recent gravel mining activities. The mine tailings are unvegetated; the SSHCP mapped any woody vegetation observed between tailings piles as the Mine Tailing Riparian Woodland land cover type (see Section 3.2.1).

Recreation/Landscaped Land Cover

The recreation/landscaped land cover type includes gardens, parks, golf courses, off-highway vehicle (OHV) parks, and greenbelts. Most landscaped and recreation areas are planted with non-native grasses, shrubs, and trees. Species composition in urban habitats varies with planting design and climate. Monoculture is commonly observed in tree groves and street tree strips. For example, many of the windbreaks in south Sacramento County are planted with pure stands of eucalyptus, olive (*Olea europaea*) trees, or other hardwoods. Most recreation and landscaped areas are regularly maintained by irrigation, mowing, pruning, or other management techniques.

3.3 Land Cover and Vernal Pool Watershed Mapping

3.3.1 Land Cover Mapping

A principal component of the Plan Area biological resources baseline is the composition and distribution of the SSHCP land cover types throughout the Plan Area. SSHCP land cover types represent classifications of land surface interpreted from aerial photographic signatures. SSHCP land cover types generally represent vegetation associations, water, or specific human land uses.

SSHCP land cover mapping occurred in several stages. Vernal Pool and Swale land cover type mapping occurred early in the SSHCP planning process and was accomplished through interpretation of black-and-white aerial imagery dated March 2001 and mapped at a scale of 1 inch = 200 feet (1:2,400) and interpretation of color aerial imagery dated November 2002 and mapped at a scale of 1 inch = 400 feet (1:4,800). See Appendix E for more information on the process used to map Vernal Pool and Swale in the Plan Area. The primary mapping of all other SSHCP land cover types was completed in 2004 and was developed from the interpretation of color aerial imagery dated November 2002 and mapped at a scale of 1 inch = 400 feet (1:4,800).

These initial mapping efforts were periodically updated and refined during the development of the SSHCP to reflect subsequent modifications of SSHCP land covers (such as land cover conversion), to expand the initial Plan Area boundaries, and to verify the original 2001 and 2004 aerial imagery interpretation based on field visits or other site specific information. The baseline SSHCP land cover map (Figure 3-1) also reflects final mapping refinements that occurred in 2012–2014 based on interpretations of various recent color aerial photos. See Appendix E for more information.

3.3.2 Vernal Pool Mocro-Watershed Mapping

As discussed in Sections 3.2.1 and 3.2.3, habitat for vernal pool plants and animals may be impacted if the adjacent upland and watershed of the individual vernal pool or the vernal pool complex is altered. For this reason, it is important to understand if a Covered Activity will

directly or indirectly impact an individual vernal pool's watershed. Beginning is 2013, the SSHCP mapped the individual watershed of select vernal pools inside the UDA using the following five-step approach: (1) acquire high-resolution classified LIDAR data; (2) develop a digital terrain model (DTM) of the Urban Development Area (UDA); (3) use industry-standard hydrologic assessment tools to determine the hydrologic characteristics of the UDA; (4) divide the UDA into subareas to facilitate a faster model run time; and (5) identify the hydrologic boundaries of the contributing area for each vernal pool feature. These terms and the process used by the SSHCP to map of individual vernal pool watersheds are discussed in greater detail in Appendix E.

The maps of individual vernal pool watersheds were used in SSHCP Chapter 6 to estimate the total acres of Vernal Pool that could be indirectly impacted by implementing SSHCP Covered Activities over the proposed 50-year ITP permit term. In addition, the maps of each individual vernal pool watershed will be used during SSHCP implementation to help plan individual Covered Activities, and to help adjust any on-site SSHCP Preserve boundaries to reduce the Covered Activity's indirect impacts to vernal wetlands and vernal pool species. The individual vernal pool watershed maps will also be used during implementation of the SSHCP to determine if any indirect impacts will result from the construction and implementation of an individual Covered Activity project or activity.

As discussed in Appendix E, the digital terrain model was specifically designed only for use in the portion of the Southeastern Sacramento Valley Vernal Pool Region (Keeler-Wolf et al. 1998) that is located within south Sacramento County.

3.4 Covered Species Habitat Models

Habitat models were prepared for all 28 Covered Species to define suitable habitat and to map where suitable habitat for each Covered Species is likely to be present in the Plan Area. The species habitat models were used to map locations and to estimate total acres of suitable species habitat within the Plan Area.

In addition, the Covered Species habitat models were used by the Plan Permittees to estimate potential effects of all SSHCP Covered Activity projects and activities on each Covered Species (see Chapter 6), and were used by the Plan Permittees to develop the SSHCP Conservation Strategy (see Chapter 7).

The following section explains the process used to define and then delineate Covered Species modeled habitat within the Plan Area. Each species habitat discussion below includes a brief description of the available literature about habitat requirements of each Covered Species during each life history stage, followed by a list of SSHCP land cover types that are expected to provide

life history habitat requirements for that species. Each species model discussion presents the number and locations of documented species occurrences within the Plan Area. In addition, any assumptions used by the Plan Permittees to define or map a Covered Species' habitat model for this Plan Area are discussed and explained.

Methodology Used to Create Each Covered Species Habitat Model

The Plan Permittees worked with local species experts and wildlife agency biologists to define and map Covered Species suitable habitat in this Plan Area by using the best available information about the life history and biology of each Covered Species and locations in the Plan Area known to support the species or where the species has been observed (see SSHCP Appendix B, Species Accounts).

Specifically, information concerning the species' needs for breeding, feeding, and sheltering at each life history stage; information from Plan Area species-surveys; documented species-occurrences within the Plan Area; and information on species range, including soil type associations and elevation limits were used to build the habitat models.

This information was compiled using GIS to generate a map-based model of suitable habitat within the Plan Area for each SSHCP Covered Species. Table 3-2 lists land cover types that are known to provide Covered Species' habitat. Note that Covered Species may associate with a land cover at varying degrees of frequency over its lifetime due to seasonal habitat changes (i.e., wet and dry season, crop rotations, irrigation/flooding, food availability), and seasonal changes in a Covered Species life history and habitat needs.

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Table 3-2
SSHCP Covered Species/SSHCP Land Cover Relationships

SSHCP Natural Land Covers		Terrestrial Land Cover Types							Aquatic Land Cover Types									
Covered Species	*Habitat Use*	*Valley Grassland*	*Blue Oak Woodland*	*Blue Oak Savanna*	*Cropland*	*Vineyard*	*Orchard*	*Irrigated Pasture Grassland*	*Mine Tailing Riparian Woodland*	*Mixed Riparian Woodland*	*Mixed Riparian Scrub*	*Vernal Pool*	*Seasonal Wetland*	*Swale*	*Freshwater Marsh*	*Open Water*	*Stream/ Creek*	*Stream/ Creek (VPIH)*
Ahart's Dwarf Rush	Entire Lifecycle[1]											X		X				
Boggs Lake Hedge-Hyssop	Entire Lifecycle[2]											X	X					
Dwarf Downingia	Entire Lifecycle[3]											X		X				
Legenere	Entire Lifecycle[4,5]											X[i]	X[ii]					
Pincushion Navarretia	Entire Lifecycle[6]											X		X				
Sacramento Orcutt Grass	Entire Lifecycle[7]											X						
Slender Orcutt Grass	Entire Lifecycle[8]											X						
Sanford's Arrowhead	Entire Lifecycle[9]												X		X	X	X	
Mid-Valley Fairy Shrimp	Entire Lifecycle[10]											X		X				
Ricksecker's Water Scavenger Beetle	Entire Lifecycle[11]											X		X				
Valley Elderberry Longhorn Beetle	Entire Lifecycle[12]								X	X	X							
Vernal Pool Fairy Shrimp	Entire Lifecycle[13]											X		X				X
Vernal Pool Tadpole Shrimp	Entire Lifecycle[14]											X		X				X
California Tiger Salamander	Aquatic[15]											X	X					
	Upland[16]	X	X	X														
Western Spadefoot	Aquatic[17]											X	X	X		X	X[iii]	
	Upland[18]	X	X	X														
Giant Gartersnake	Aquatic[19]				X[iv]								X		X	X	X	
	Upland[20]	X									X							
Western Pond Turtle	Aquatic[21]														X	X	X	
	Upland[22]	X	X	X					X	X	X							
Cooper's Hawk	Foraging[23]		X	X					X	X	X							
	Nesting[24]		X						X	X	X							
Ferruginous Hawk	Foraging[25]	X						X				X	X	X				
Greater Sandhill Crane	Foraging[26]	X			X			X					X		X			
	Roosting[27]											X	X		X			
Loggerhead Shrike	Foraging[28]	X			X			X				X	X	X				
	Nesting[29]	X							X		X							
Northern Harrier	Foraging[30]	X			X			X				X	X	X	X			
	Nesting[31]	X			X			X										
Swainson's Hawk	Foraging[32]	X			X			X				X	X	X				
	Nesting[33]									X	X							
Tricolored Blackbird	Foraging[34]	X			X			X				X	X	X	X	X		
	Nesting[35]	X			X								X		X			
Western Burrowing Owl	Wintering[36]	X		X	X			X				X	X	X				X
	Nesting[37]				X			X										

Table 3-2
SSHCP Covered Species/SSHCP Land Cover Relationships

SSHCP Natural Land Covers		Terrestrial Land Cover Types							Aquatic Land Cover Types									
Covered Species	*Habitat Use*	*Valley Grassland*	*Blue Oak Woodland*	*Blue Oak Savanna*	*Cropland*	*Vineyard*	*Orchard*	*Irrigated Pasture Grassland*	*Mine Tailing Riparian Woodland*	*Mixed Riparian Woodland*	*Mixed Riparian Scrub*	*Vernal Pool*	*Seasonal Wetland*	*Swale*	*Freshwater Marsh*	*Open Water*	*Stream/ Creek*	*Stream/ Creek (VPIH)*
White-Tailed Kite	Foraging[38]	X		X	X			X			X	X	X	X				
	Nesting[39]		X						X	X	X							
American Badger	Entire Lifecycle[40]	X		X								X	X	X				
Western Red Bat	Foraging[41]	X	X	X			X		X	X	X	X	X	X	X	X	X	
	Roosting[42]		X	X			X		X	X								

VPIH = Vernal Pool Invertebrate Habitat

1 Ahart's Dwarf Rush – Dittes & Guardino Consulting, as cited in SSHCP Appendix B
2 Boggs Lake Hedge-Hyssop – Dittes & Guardino Consulting, as cited in SSHCP Appendix B; CNPS 2001
3 Dwarf Downingia – Dittes & Guardino Consulting, as cited in SSHCP Appendix B; CDFG 2002
4 Legenere – Dittes & Guardino Consulting, as cited in SSHCP Appendix B; Holland 1986
5 Legenere – Dittes & Guardino Consulting, as cited in SSHCP Appendix B; CDFG 2002
6 Pincushion Navarretia – Dittes & Guardino Consulting, as cited in SSHCP Appendix B
7 Sacramento Orcutt Grass – Dittes & Guardino Consulting, as cited in SSHCP Appendix B[8] Slender Orcutt Grass – Dittes & Guardino Consulting, as cited in SSHCP Appendix B
9 Sanford's Arrowhead – Dittes & Guardino Consulting, as cited in SSHCP Appendix B[10] Mid-Valley Fairy Shrimp – D.C. Rodgers, as cited in SSHCP Appendix B
11 Ricksecker's Hydrochara – D.C. Rodgers, as cited in SSHCP Appendix B
12 Valley Elderberry Longhorn Beetle – D.C. Rogers, as cited in SSHCP Appendix B; Barr 1991; Collinge et al. 2001; Eng 1984; Linsley & Chemsak 1972, 1997; USFWS 1999a
13 Vernal Pool Fairy Shrimp – D.C. Rodgers, as cited in SSHCP Appendix B
14 Vernal Pool Tadpole Shrimp – D.C. Rodgers, as cited in SSHCP Appendix B[15] California Tiger Salamander – Jamison Watts, as cited in SSHCP Appendix B; Bobzien 2003; CNDDB 2003; Jennings and Hayes 1994; Petranka 1998; Shaffer et al. 1993; Stebbins 1989, 2003; USFWS 2004a
16 California Tiger Salamander – Jamison Watts, as cited in SSHCP Appendix B; Bobzien 2003; CNDDB 2003; Jennings and Hayes 1994; Petranka 1998; Shaffer et al. 1993; Stebbins 1989, 2003; USFWS 2004a
17 Western Spadefoot Toad – Jamison Watts, as cited in SSHCP Appendix B; CNDDB 2004
18 Western Spadefoot Toad – Jamison Watts, as cited in SSHCP Appendix B; Stebbins 2003
19 Giant Garter Snake – Jamison Watts, as cited in SSHCP Appendix B; Hansen 1988; USFWS 1999b
20 Hansen 1988: Rice fields provide suitable foraging habitat for giant gartersnake within the Plan Area.
21 Western Pond Turtle – Jamison Watts, as cited in SSHCP Appendix B; Boyer 1965; Holland 1994; Reese and Welsh 1998a
22 Western Pond Turtle – Jamison Watts, as cited in SSHCP Appendix B; Holland 1994
23 Cooper's Hawk – Steve Henderson, as cited in SSHCP Appendix B
24 Cooper's Hawk – Steve Henderson, as cited in SSHCP Appendix B; Asay 1987
25 Ferruginous Hawk – Todd Sloat, as cited in SSHCP Appendix B[26] Greater Sandhill Crane – Todd Sloat, as cited in SSHCP Appendix B; Ivey and Herziger 2003; Littlefield and Ivey 2000
27 Greater Sandhill Crane – Todd Sloat, as cited in SSHCP Appendix B; Littlefield and Ivey 2000
28 Loggerhead Shrike – Steve Henderson, as cited in SSHCP Appendix B; Cade and Woods 1997; Yosef 1996
29 Loggerhead Shrike – Steve Henderson, as cited in SSHCP Appendix B; Cade and Woods 1997; Yosef 1996
30 Northern Harrier – Steve Henderson, as cited in SSHCP Appendix B; California Partners in Flight 2000
31 Northern Harrier – Steve Henderson, as cited in SSHCP Appendix B; California Partners in Flight 2000
32 Swainson's Hawk – Waldo Holt, as cited in SSHCP Appendix B; Estep 1989; Swolgaard 2004
33 Swainson's Hawk – Waldo Holt, as cited in SSHCP Appendix B; Bloom 1980; Schlorff and Bloom 1984; Estep 1989
34 Tricolored Blackbird – Todd Sloat, as cited in SSHCP Appendix B; Beedy and Hamilton 1997; DeHaven 2000
35 Tricolored Blackbird – Todd Sloat, as cited in SSHCP Appendix B; Beedy and Hamilton 1997, 1999; DeHaven et al. 1975; Hamilton et al. 1995; Neff 1937
36 Western Burrowing Owl – Steve Henderson, as cited in SSHCP Appendix B; Butts 1973; Coulombe 1971; Rosenberg et al. 1998
37 Western Burrowing Owl – Steve Henderson, as cited in SSHCP Appendix B; Butts 1973; Coulombe 1971; Rosenberg et al. 1998
38 White-tailed Kite – Todd Sloat, as cited in SSHCP Appendix B; Dunk 1995; Erichsen et al. 1994
39 White-tailed Kite – Todd Sloat, as cited in SSHCP Appendix B; CNDDB 2004; Dixon et al. 1957; Erichsen 1996; Hawbecker 1942; Pickwell 1930
40 American Badger – Steve Henderson, as cited in SSHCP Appendix B; Williams 1986
41 Western Red Bat – Heather Johnson, as cited in SSHCP Appendix B; Pierson et al. 1999, 2002
42 Western Red Bat – Heather Johnson, as cited in SSHCP Appendix B; Harvey et al. 1999; Pierson et al. 1999; WBWG 1998

The process to prepare each species habitat model was initiated with an in-depth literature review to determine specific life history needs for each species (e.g., peer-reviewed scientific literature, published species accounts, survey reports, and other environmental documents). The literature reviews focused on the identification of habitats in which the species has been documented over its range and habitat necessary for the species to complete its lifecycle. Plan Permittees, local species experts, and agency biologists then evaluated each SSHCP land cover type for meeting the habitat requirements of each Covered Species (see Table 3-2). Details on the biology of each Covered Species can be found in Appendix B (Species Accounts), including regulatory status, ecological information, range, threats, population trends, and conservation and management considerations.

After completing the literature review and defining which SSHCP land cover types could provide suitable habitat, the Plan Permittees, local species experts, and agency biologists used available Plan Area occurrence information for each Covered Species, including species survey information in agency files and survey results entered in CDFW's California Natural Diversity Database (CNDDB) to further refine the habitat models. For example, California tiger salamander is known to occupy vernal pool complexes within Valley Grassland. However, the species has never been recorded north of the Cosumnes River despite extensive surveys to locate the species in this part of the Plan Area. Therefore, habitat north of the Cosumnes River was not included in the SSHCP habitat model for this species.

For some Covered Species, especially the plant Covered Species, occurrence-location records in the CNDDB is the only species survey data available for this Plan Area. CNDDB data is based on voluntary submission of records by public and agency biologists. CNDDB survey data has the following limitations: (1) data is geographically biased toward areas that have received greater survey effort; (2) data is not confirmed by independent review and therefore is sometimes inaccurate; (3) data is often less well represented for very rare or cryptic species; and (4) mapping precision for species occurrences varies from specific (points within an 80-meter radius) to non-specific (point within an area defined by a radius between 0.1 and 1.0 mile).

For four Covered Species (giant gartersnake, western pond turtle, Swainson's hawk, and greater sandhill crane) the species modeled habitat also identifies "high-value" habitat within the Plan Area. High-value habitat is defined differently for each of the four species, but refers to areas in the Plan Area considered to be particularly important for that species. High-value habitat is considered in the effects analysis (Section 6) and in the SSHCP Conservation Strategy (Chapter 7).

Habitat models were prepared for each vernal pool plant Covered Species by the process described above; however soil units were also used to help further refine plant species habitat models. Numerous studies have correlated the distribution of vernal pools as well as vernal pool

endemic species with specific geologic surfaces and their associated soils (Helm and Vollmar 2002; Holland and Dains 1990; Metz 2001, as cited in Vollmar et al. 2013). Therefore, the Plan Permittees used soil unit maps from the Soil Survey Geologic Database (SSURGO) for Sacramento County (USDA 2014) to identify correlations between plant Covered Species documented occurrences and soils within the Plan Area. Only SSHCP land cover types that also occurred within a soil unit that is known to be occupied by the plant species, for which the model was being developed, were considered suitable habitat for the species. For instance, Ahart's dwarf rush in only known to occupy vernal pool land cover types that are within Red Bluff loam, Red Bluff-Redding complex and Redding gravelly Loam soil types. So only vernal pools within the Plan Area that occur on these three soil units were considered suitable habitat for Ahart's dwarf rush.

For each documented plant occurrence, the occurrence's "precision-code" size used by the CNDDB was also used to determine suitable modeled habitat. For instance, if a documented plant occurrence was cited by CNDDB to have a location accuracy of 1/10 of a mile, then any soil type within 0.10 mile of the occurrence polygon's "centroid" point was considered a potential suitable soil for the species.

3.4.1 Plant Covered Species Habitat Models

Ahart's Dwarf Rush (*Juncus leiospermus* var. *ahartii*)

Habitat Requirements

Ahart's dwarf rush occupies, shallow vernal pools, the margins of large vernal pools and swales (CDFG 2002; Dittes and Guardino pers. obs., as cited in SSHCP Appendix B). It is frequently associated with recent gopher mounds where, potentially, the lack of competition from other plants allows Ahart's dwarf rush to persist (Dittes and Guardino pers. obs., as cited in SSHCP Appendix B; CDFG 2010).

Plan Permittee analysis of documented occurrences suggests that in Sacramento County, Ahart's dwarf rush is associated with the Red Bluff loam, Red Bluff-Redding complex and Redding gravelly Loam soil types.

Land Cover Types Relevant to Habitat Requirements

SSHCP Land Cover types that provide suitable habitat based on life history descriptions are Vernal Pool and Swale. Vernal pools are their primary habitat in the Plan Area. Swales may also provide suitable habitat as Ahart's dwarf rush appears to prefer short inundation periods (see Table 3-2). Because Vernal Pools and Swales are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Documented Occurrences within the Plan Area

There are two documented occurrences of Ahart's dwarf rush within the Plan Area, one within PPU 1 and the other in PPU 2. Both are within the UDA.

Model Assumptions

- Soil types known to support the single documented occurrence of Ahart's dwarf rush in the Plan Area include Red Bluff loam, 0 to 2% slopes; Red Bluff-Redding complex 0 to 5% slopes; and Redding gravelly loam, 0 to 8% slopes.
- Ahart's dwarf rush occupies shallow vernal pools, vernal pool margins, and swales (Dittes and Guardino pers. obs., as cited in SSHCP Appendix B; CDFG 2002).
- Valley Grasslands are necessary to support the Vernal Pool and Swale land cover types that Ahart's dwarf rush occupies.

Ahart's Dwarf Rush Modeled Habitat

Modeled habitat for Ahart's dwarf rush is all Vernal Pool, Swale, and Valley Grassland land covers on Fiddyment fine sandy loam, 1% to 8% slopes; Red Bluff-Redding complex, 0 to 5% slopes; and Redding gravelly loam, 0 to 8% slopes.

Figure 3-3 illustrates the location of modeled habitat as well as the documented occurrences of Ahart's dwarf rush within the Plan Area.

Boggs Lake Hedge-Hyssop (*Gratiola heterosepala*)

Habitat Requirements

Boggs Lake hedge-hyssop is reported to grow in well-developed vernal pools, and playa lakes, as well as along the seasonally fluctuating margins of more permanent water bodies (small lakes, reservoirs, stock ponds, seasonally saturated clay flats in meadows). Boggs Lake hedge-hyssop often grows in comparatively barren areas within deeper portions of vernal pools, sometimes in barren openings with common spikerush (*Eleocharis macrostachya*) (Dittes and Guardino, as cited in SSHCP Appendix B).

Plan Permittee analysis of documented occurrences suggests that in Sacramento County, known Boggs Lake hedge-hyssop occurrences are associated with Red Bluff loam, Red Bluff-Redding complex, Red Bluff-Xerarents complex, Redding gravelly loam, San Joaquin silt loam, San Joaquin-Durixeralfs complex, and Vleck gravelly loam soil types.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat based on life history descriptions are Vernal Pool and Seasonal Wetland (Table 3-2). Because Vernal Pools and Seasonal Wetlands are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are 31 documented occurrences of Boggs Lake hedge-hyssop within the Plan Area. Twenty occurrences are located within the UDA. Of the 20 occurrences within the UDA, 16 are in PPU 1 and there is one occurrence each in PPUs 2 and 3. Two occurrences are not within a PPU. Eleven occurrences are located outside the UDA, all in PPU 1.

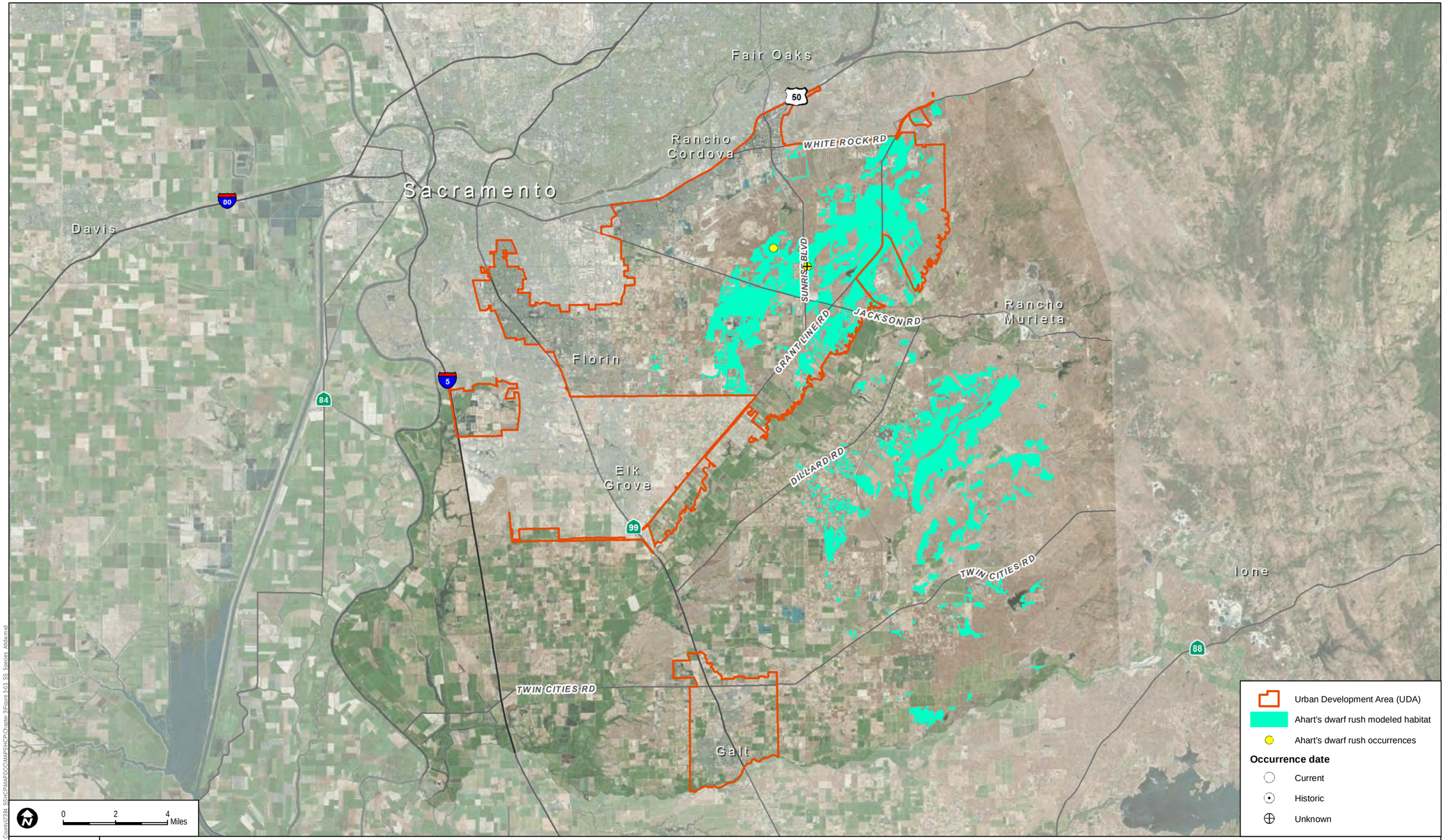
Model Assumptions

- Soil types known to support Boggs Lake hedge-hyssop in the Plan Area include Red Bluff loam, 2% to 5% slopes; Red Bluff-Redding complex, 0 to 5% slopes; Red Bluff-Xerarents complex, 0 to 2% slopes; Redding gravelly loam, 0 to 8% slopes; San Joaquin silt loam, 0 to 3% slopes; San Joaquin-Durixeralfs complex, 0 to 1% slopes; and Vleck gravelly loam, 2% to 15% slopes.
- Boggs Lake hedge-hyssop is known to occupy well-developed vernal pools, and playa lakes, as well as along the seasonally fluctuating margins of more permanent water bodies.
- Valley Grasslands are necessary to support the Vernal Pool and Seasonal Wetland land cover types that Boggs Lake hedge-hyssop occupies.

Boggs Lake Hedge-Hyssop Modeled Habitat

Modeled habitat for Boggs Lake hedge-hyssop is Vernal Pool, Seasonal Wetland, and Valley Grassland land cover types on Red Bluff loam, 2% to 5% slopes; Red Bluff-Redding complex, 0 to 5% slopes; Red Bluff-Xerarents complex, 0 to 2% slopes; Redding gravelly loam, 0 to 8% slopes; San Joaquin silt loam, 0 to 3% slopes; San Joaquin-Durixeralfs complex, 0 to 1% slopes; Sailboat silt loam, drained, 0 to 2% slopes; occasionally flooded, and Vleck gravelly loam, 2% to 15% slopes.

Figure 3-4 illustrates the location of modeled habitat as well as documented occurrences of Boggs Lake hedge-hyssop within the Plan Area.



SOURCE: Bing Maps, County of Sacramento 2015, CNDDB 2012

FIGURE 3-3

Ahart's Dwarf Rush Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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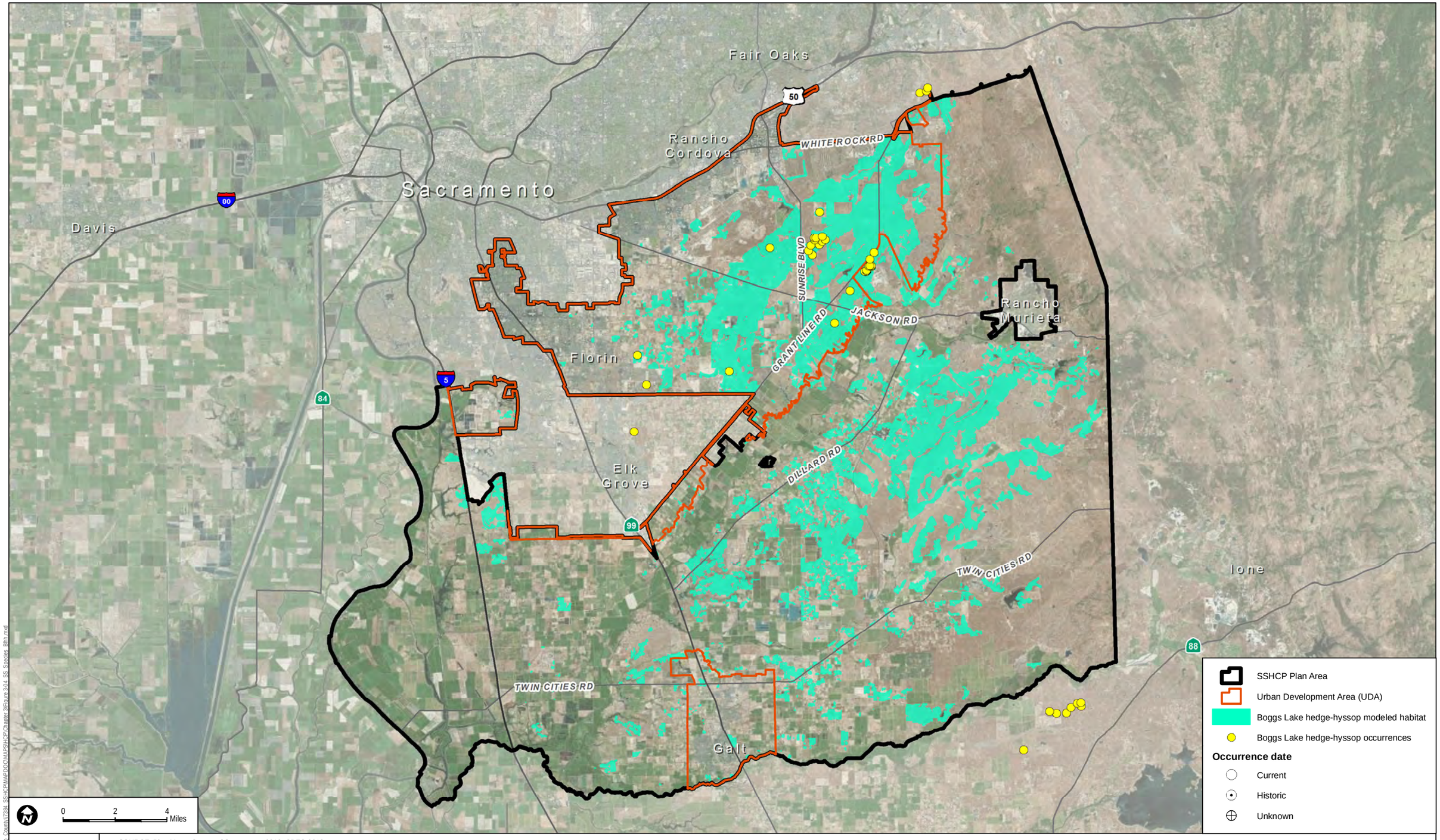

SOURCE: Bing Maps, County of Sacramento 2012, CDFG 2012, Sugnet & Associates 1993, Jones & Stokes 2990

FIGURE 3-4

Boggs Lake Hedge-Hyssop Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Dwarf Downingia (*Downingia pusilla*)

Habitat Requirements

Dwarf downingia occurrences are associated mainly with northern claypan vernal pools in central Sacramento County, with northern hardpan vernal pools in the foothills of the Sierra Nevada, and with vernal pools of the Interior Valleys of the Coast Range in Napa and Sonoma Counties (CDFG 2010). Dwarf downingia occupies more commonly occurring, smaller and/or shallower vernal pools with comparatively more "flashy" hydrology (CDFG 2010; Dittes pers. obs., as cited in SSHCP Appendix B). Dwarf downingia also grows along the margins of vernal pools as well as mesic sites within Valley Grassland (CNPS 2010).

Plan Permittee analysis of documented occurrences suggests that in Sacramento County, documented dwarf downingia occurrences are associated with Amador-Gillender complex, Clear Lake clay, Corning complex, Hadselville-Pentz complex, Redding gravelly loam, San Joaquin silt loam, and San Joaquin-Galt complex soil types.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat based on life history descriptions are Vernal Pool and Swale. Vernal pools are their primary habitat in the Plan Area. Swales may also provide suitable habitat as dwarf downingia prefers short periods of inundation (Table 3-2). Because Vernal Pools and Swales are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are 10 documented occurrences of dwarf downingia within the Plan Area. All occurrences are outside of the UDA, with eight occurrences in PPU 6 and two occurrences in PPU 7.

Model Assumptions

- Soil types known to support dwarf downingia in the Plan Area include Amador-Gillender complex, 2% to 15% slopes; Clear Lake clay, partially drained, 0 to 2% slopes, frequently flooded; Corning complex, 0 to 8% slopes; Hadselville-Pentz complex, 2% to 30% slopes; Redding gravelly loam, 0 to 8% slopes; San Joaquin silt loam, 0 to 3% slopes; and San Joaquin-Galt complex, 0 to 3% slopes.
- Dwarf downingia is known to occupy commonly occurring, smaller and/or shallower vernal pools but has also been found at the margins of larger or deeper vernal pools.

- Valley Grasslands are necessary to support the Vernal Pool and Swale land cover types that dwarf downingia occupies.

Dwarf Downingia Modeled Habitat:

Modeled habitat for dwarf downingia is considered to be all Vernal Pool, Swale, and Valley Grassland land cover on Amador-Gillender complex, 2% to 15% slopes; Clear Lake clay, partially drained, 0 to 2% slopes, frequently flooded; Corning complex, 0 to 8% slopes; Durixeralfs-Galt complex, 0 to 2% slopes; San Joaquin silt loam, 0 to 3% slopes; and San Joaquin-Galt complex, 0 to 3% slopes.

Figure 3-5 illustrates the location of modeled habitat as well as documented occurrences of dwarf downingia within the Plan Area.

Legenere (*Legenere limosa*)

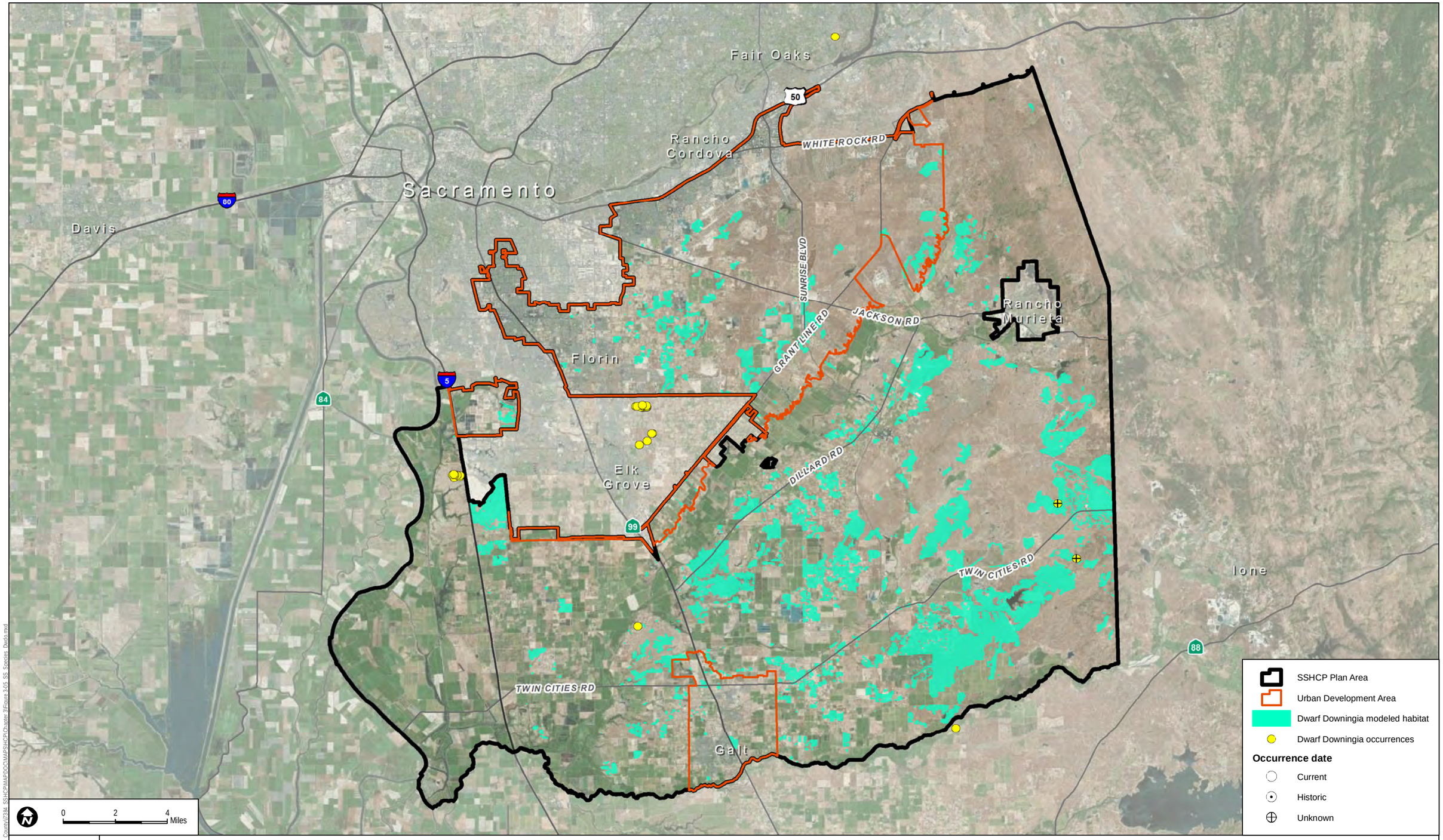
Habitat Requirements

Legenere grows in well-developed vernal pools and playa lakes, as well as along the seasonally fluctuating margins of more permanent water bodies (small lakes, ponds, stock ponds), and basins within seasonal drainages (CDFG 2010; Holland 1983). Topographical position within pools and associated plant species indicate tolerance of, or preference for, the more extreme (longer-duration) inundation regimes encountered in vernal wetlands (Dittes and Guardino, as cited in SSHCP Appendix B).

Plan Permittee analysis of documented occurrences suggests that in Sacramento County, legenere documented occurrences are associated with Clear Lake clay, Corning complex, Creviscreek sandy loam, Dierssen sandy clay loam, Dierssen clay loam, Fiddyment fine sandy loam, Hadselville-Pentz complex, Hedge loam, Hicksville loam, Hicksville gravelly loam, Liveoak sandy clay loam, Madera loam, Natomas loam, Red Bluff loam, Red Bluff-Redding complex, Redding gravelly loam, San Joaquin silt loam, San Joaquin-Galt complex, Xerorthents, and dredge tailings.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat based on life history descriptions are Vernal Pool and Seasonal Wetland (Table 3-2). Because Vernal Pools and Seasonal Wetlands are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.



SOURCE: Bing Maps 2015, County of Sacramento 2015
CDFG 2012, Gibson & Skordal 1994, TNC

FIGURE 3-5

Dwarf Downingia Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Occurrences within the Plan Area

There are 62 documented occurrences of legenere in the Plan Area. Thirty-six are located within the UDA including 20 within PPU 1, seven in PPU 2, seven in PPU 3, one in PPU 4 and one is not within a PPU. There are 26 occurrences outside of the UDA, including 1 in PPU 5, 16 in PPU 6, and 9 in PPU 7.

Model Assumptions

- Soil types at documented legenere occurrences in the Plan Area include Clear Lake clay, partially drained, 0 to 2% slopes, frequently flooded; Corning complex, 0 to 8% slopes; Creviscreek sandy loam, 0 to 3% slopes; Dierssen sandy clay loam, drained, 0 to 2% slopes; Fiddyment fine sandy loam, 1% to 8% slopes; Hedge loam, 0 to 2% slopes; Madera-Galt complex, 0 to 2% slopes; Red Bluff loam, 0 to 2% slopes; Red Bluff loam, 2% to 5% slopes; Red Bluff-Redding complex, 0 to 5% slopes; Redding gravelly loam, 0 to 8% slopes; San Joaquin silt loam, 0 to 3% slopes; and San Joaquin-Galt complex, 0 to 3% slopes.
- Legenere grows in well-developed vernal pools, as well as along the seasonally fluctuating margins of more permanent water bodies and basins within seasonal drainages (Holland 1983; CDFG 2010).
- Legenere has been reported to inhabit vernal wetlands ranging in size from 40 square feet to 100 acres (Holland 1983).
- Valley Grasslands are necessary to support the Vernal Pool and Seasonal Wetland land cover types that legenere occupies.

Legenere Modeled Habitat

Modeled habitat for legenere is considered to be all Vernal Pool, Seasonal Wetland, and Valley Grassland land cover types on Clear Lake clay, partially drained, 0 to 2% slopes; frequently flooded, Corning complex, 0 to 8% slopes; Creviscreek sandy loam, 0 to 3% slopes; Dierssen sandy clay loam, drained, 0 to 2% slopes; Fiddyment fine sandy loam, 1 to 8% slopes; Hedge loam, 0 to 2% slopes; Madera-Galt complex, 0 to 2% slopes; Red Bluff loam, 0 to 2% slopes; Red Bluff loam, 2% to 5% slopes; Red Bluff-Redding complex, 0 to 5% slopes; Redding gravelly loam, 0 to 8% slopes; San Joaquin silt loam, 0 to 3% slopes; and San Joaquin-Galt complex, 0 to 3% slopes.

Figure 3-6 illustrates the location of modeled habitat as well as documented occurrences of legenere within the Plan Area.

Pincushion Navarretia (*Navarretia myersii*)

Habitat Requirements

Pincushion navarretia is a strict vernal pool endemic. Pincushion navarretia occupies more commonly occurring, smaller and/or shallower vernal pools with comparatively more "flashy" hydrology (Dittes and Guardino, as cited in SSHCP Appendix B).

Plan Permittee analysis of documented occurrences suggests that in Sacramento County, documented pincushion navarretia occurrences are associated with Amador-Gillender complex, Corning complex, Corning-Redding complex, Creviscreek sandy loam, Hadselville-Pentz complex, Hicksville sandy clay loam, Pardee-Rancho Seco complex, Pentz-Lithic Xerorthents complex, and Redding gravelly loam soil types.

Land Cover Types Relevant to Habitat Requirements

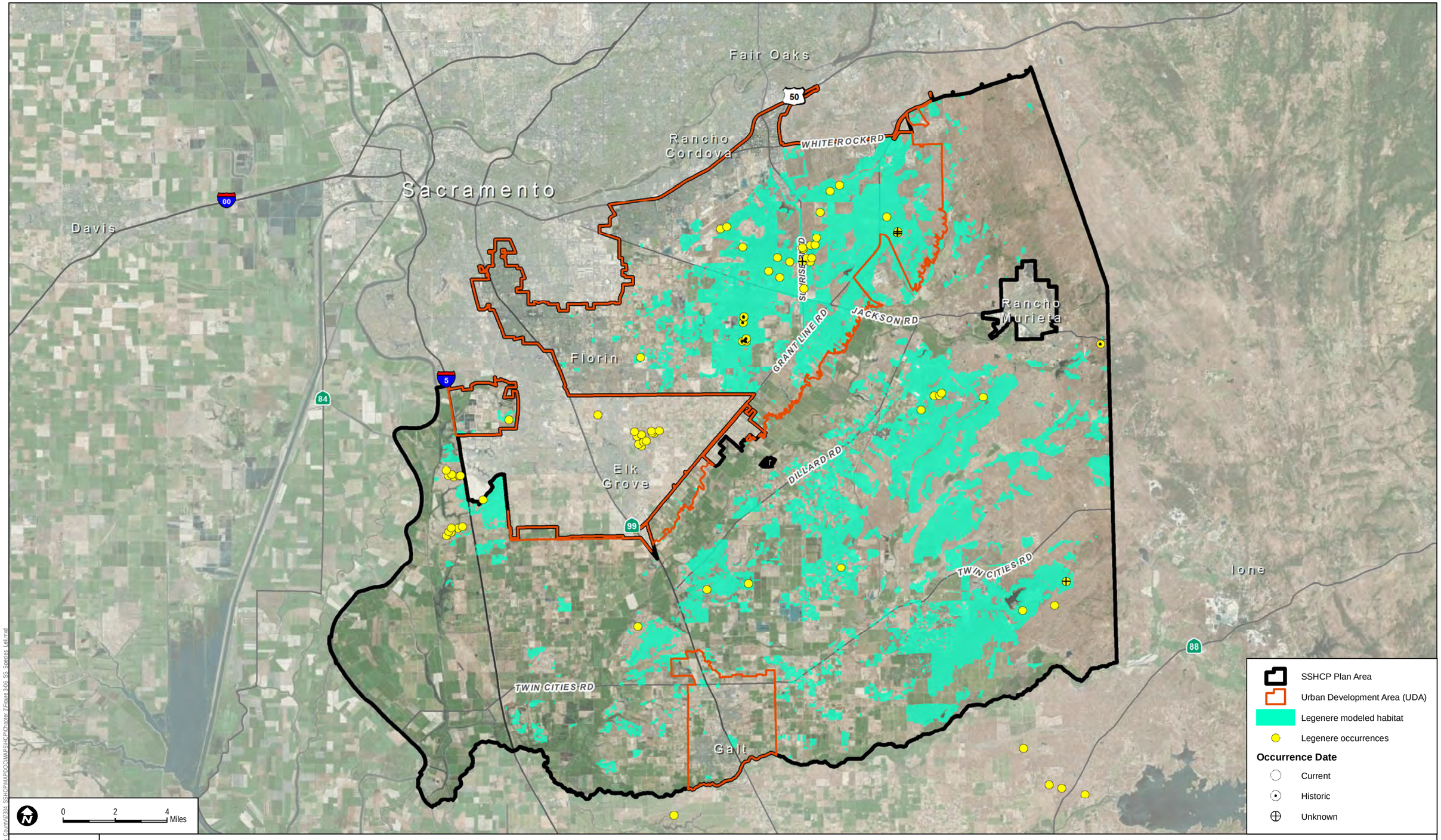
SSHCP land cover types that provide suitable habitat based on life history descriptions are Vernal Pool and Swale. Vernal pools are their primary habitat in the Plan Area. Swales may also provide suitable habitat as pincushion navarretia appears to prefer short inundation periods (Table 3-2). Because Vernal Pools and Swales are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are 48 documented occurrences of pincushion navarretia in the Plan Area. All 48 occurrences are located in PPU 7 outside of the UDA.

Model Assumptions

- Soil types known to support pincushion navarretia occurrences in the Plan Area include Amador-Gillender complex, 2% to 15% slopes; Corning complex, 0 to 8% slopes; Corning-Redding complex, 8 to 30% slopes; Creviscreek sandy loam, 0 to 3% slopes; Hadselville-Pentz complex, 2% to 30% slopes; Hicksville sandy clay loam, 0 to 2% slopes; occasionally flooded, Pardee-Rancho Seco complex, 3% to 15% slopes; Pentz-Lithic Xerorthents complex, 30% to 50% slopes; Peters clay, 1% to 8% slopes; and Redding gravelly loam, 0 to 8% slopes.
- Pincushion navarretia occupies small to medium size vernal pool types and the margins of larger and/or deeper pools.
- Valley Grasslands are necessary to support the Vernal Pool and Swale land cover types that pincushion navarretia occupies.



SOURCE: Bing Maps, County of Sacramento 2015, CDFG 2012

FIGURE 3-6

Legenere Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Pincushion Navarretia Modeled Habitat

Modeled habitat for pincushion navarretia is considered to be all Vernal Pool, Swale, and Valley Grassland land cover types on Amador-Gillender complex, 2% to 15% slopes; Corning complex, 0 to 8% slopes; Corning-Redding complex, 8% to 30% slopes; Creviscreek sandy loam, 0 to 3% slopes; Hadselville-Pentz complex, 2% to 30% slopes; Hicksville sandy clay loam 0 to 2% slopes; Pardee-Ranchoseco complex, 3% to 15% slopes; Pentz-Lithic Xerorthents complex, 30% to 50% slopes; and Redding gravelly loam, 0 to 8% slopes.

Figure 3-7 illustrates the location of modeled habitat as well as documented occurrences of pincushion navarretia within the Plan Area.

Sacramento Orcutt Grass (*Orcuttia viscida*)

Habitat Requirements

Sacramento Orcutt grass is a strict vernal pool endemic. Sacramento Orcutt grass appears to be the most specific of the genus Orcuttia with regard to niche breadth, as indicated by restriction to the largest of pools (Stone et al. 1988).

Plan Permittee analysis of documented occurrences suggests that in Sacramento County, Sacramento Orcutt grass is associated with Corning complex; Hicksville sandy clay loam; Red Bluff-Redding complex; and Redding gravelly loam soil types.

Land Cover Types Relevant to Habitat Requirements

The SSHCP land cover type that provides suitable habitat based on life history descriptions is vernal pool (Table 3-2). Because Vernal Pools are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are 40 documented occurrences of Sacramento Orcutt grass within the Plan Area. Of the 40 documented occurrences in the Plan Area, 10 are located within the UDA, including 8 within PPU 1 and 2 within PPU 3. Thirty are outside of the UDA, including 28 within PPU 1 and two within PPU 7.

Model Assumptions

- Soil types known to support Sacramento Orcutt grass occurrences in the Plan Area include Corning complex, 0 to 8% slopes; Hicksville sandy clay loam, 0 to 2% slopes; Red Bluff-Redding complex, 0 to 5% slopes; and Redding gravelly loam, 0 to 8% slopes soil types.

- Sacramento Orcutt grass occupies medium to large size vernal pool types.
- Valley Grasslands are necessary to support the Vernal Pools that Sacramento Orcutt grass occupies.

Sacramento Orcutt Grass Modeled Habitat

Modeled habitat for Sacramento Orcutt grass is considered to be all Vernal Pools and Valley Grassland land cover types on Corning complex, 0 to 8% slopes; Hicksville sandy clay loam, 0 to 2% slopes; Red Bluff-Redding complex, 0 to 5% slopes; and Redding gravelly loam, 0 to 8% slopes soil types.

Figure 3-8 illustrates the location of modeled habitat as well as documented occurrences of Sacramento Orcutt grass within the Plan Area.

Slender Orcutt Grass (*Orcuttia tenuis*)

Habitat Requirements

Slender Orcutt grass is a strict vernal pool endemic. It is strongly adapted to the hydrologic cycles encountered in the deeper spectrum of vernal pool types, e.g., they are typically associated with larger or deeper vernal pools that tend to possess more extreme regimes of inundation (Crampton 1959; Griggs 1974).

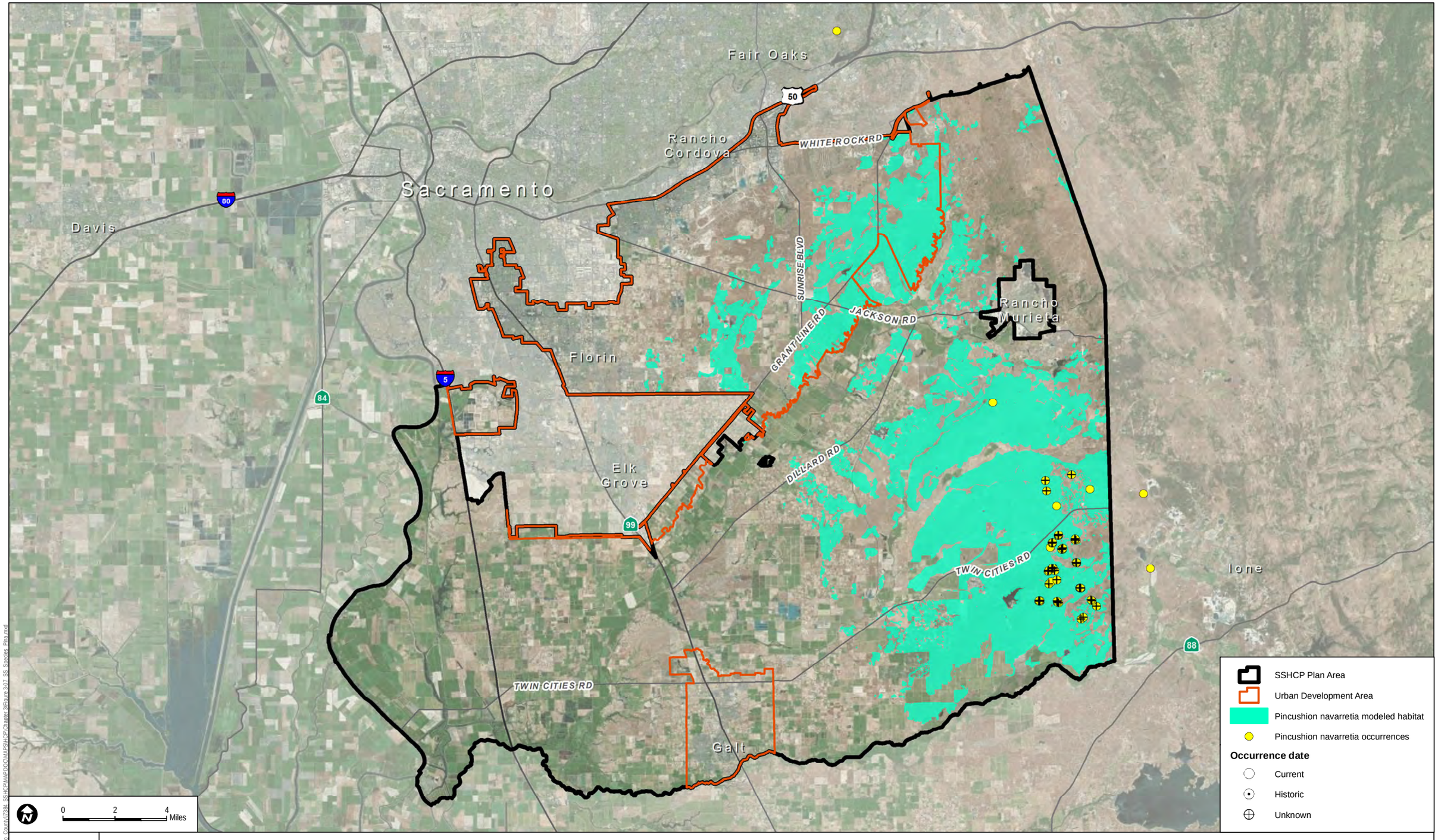
Plan Permittee analysis of documented occurrences suggests that in Sacramento County, documented occurrences of slender Orcutt grass are associated with Redding gravelly loam soil types.

Land Cover Types Relevant to Habitat Requirements

The SSHCP land cover type that provides suitable habitat based on life history descriptions is vernal pool (Table 3-2). Because Vernal Pools are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are four documented occurrences of slender Orcutt grass within the Plan Area. All four occurrences are in the UDA with one in PPU 1 and three in PPU 3.



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SOURCE: Bing Maps, County of Sacramento 2015, CDFG 2012, TNC

FIGURE 3-7

Pincushion Navarretia Modeled Habitat and Documented Occurrences

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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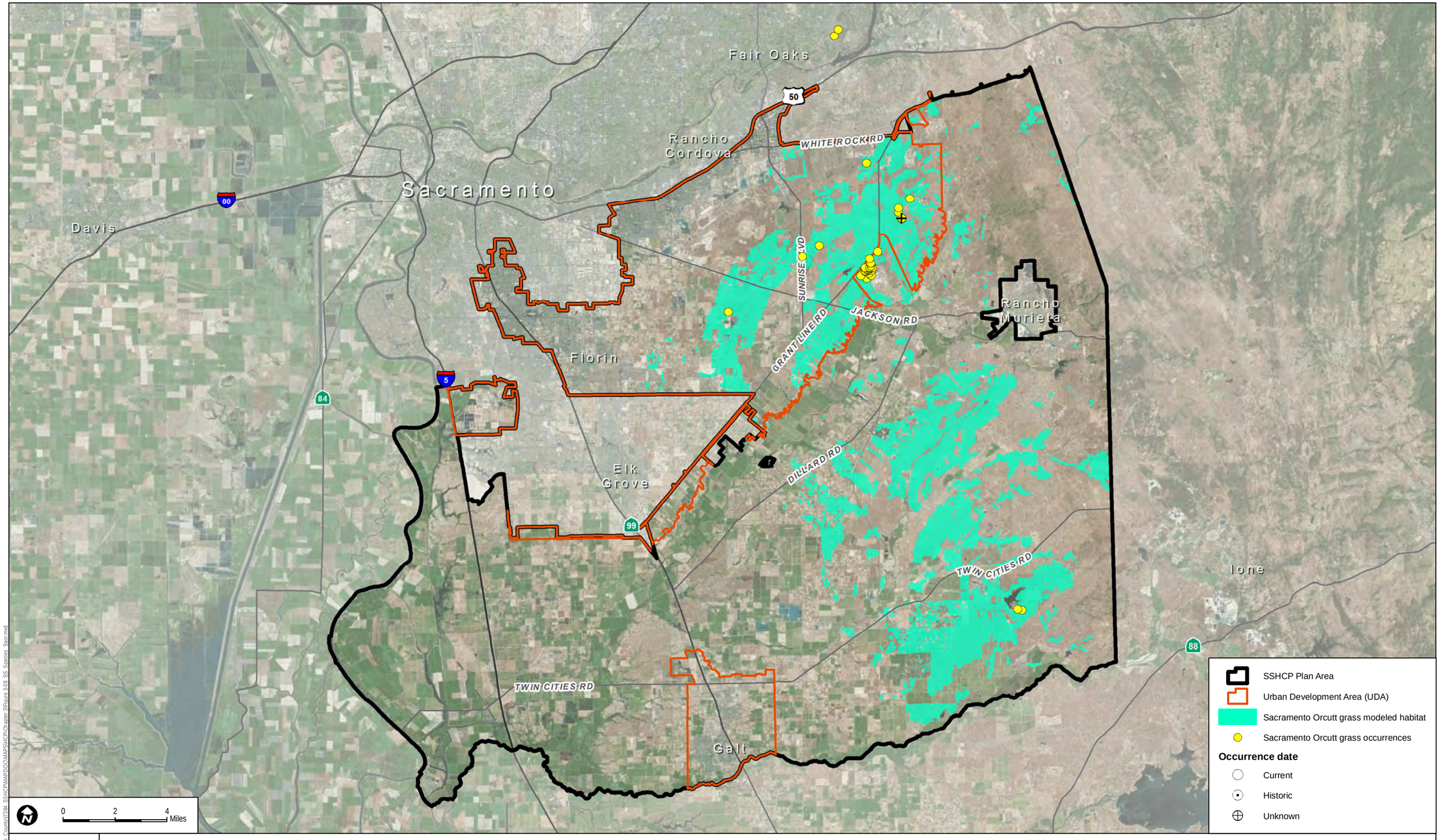

SOURCE: Bing Maps, County of Sacramento 2012

FIGURE 3-8

Sacramento Orcutt Grass Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Model Assumptions

- Soil types known to support slender Orcutt grass in the Plan Area include Redding gravelly loam, 0 to 8% slopes.
- Slender Orcutt grass occupies medium to large size vernal pool types.
- Valley Grasslands are necessary to support the Vernal Pools that slender Orcutt grass occupies.

Slender Orcutt Grass Modeled Habitat

Modeled habitat for slender Orcutt grass is all Vernal Pool and Valley Grassland land cover types on Redding gravelly loam, 0 to 8% slopes.

Figure 3-9 illustrates the location of modeled habitat as well as documented occurrences of slender Orcutt grass within the Plan Area.

Sanford's Arrowhead (*Sagittaria sanfordi*)

Habitat Requirements

Sanford's arrowhead is associated with freshwater wetland hydrology. This includes emergent wetlands as well as the margins of rivers, streams, ponds, reservoirs, irrigation and drainage canals and ditches, and stock-ponds. Sanford's arrowhead is occasionally reported to occur in Seasonal Wetland with sufficient ponding period to support emergent wetland species. All freshwater emergent wetlands, natural, modified, and built/created, regardless of landform association, should be considered potentially suitable habitat for Sanford's arrowhead.

Land Cover Types Relevant to Habitat Requirements

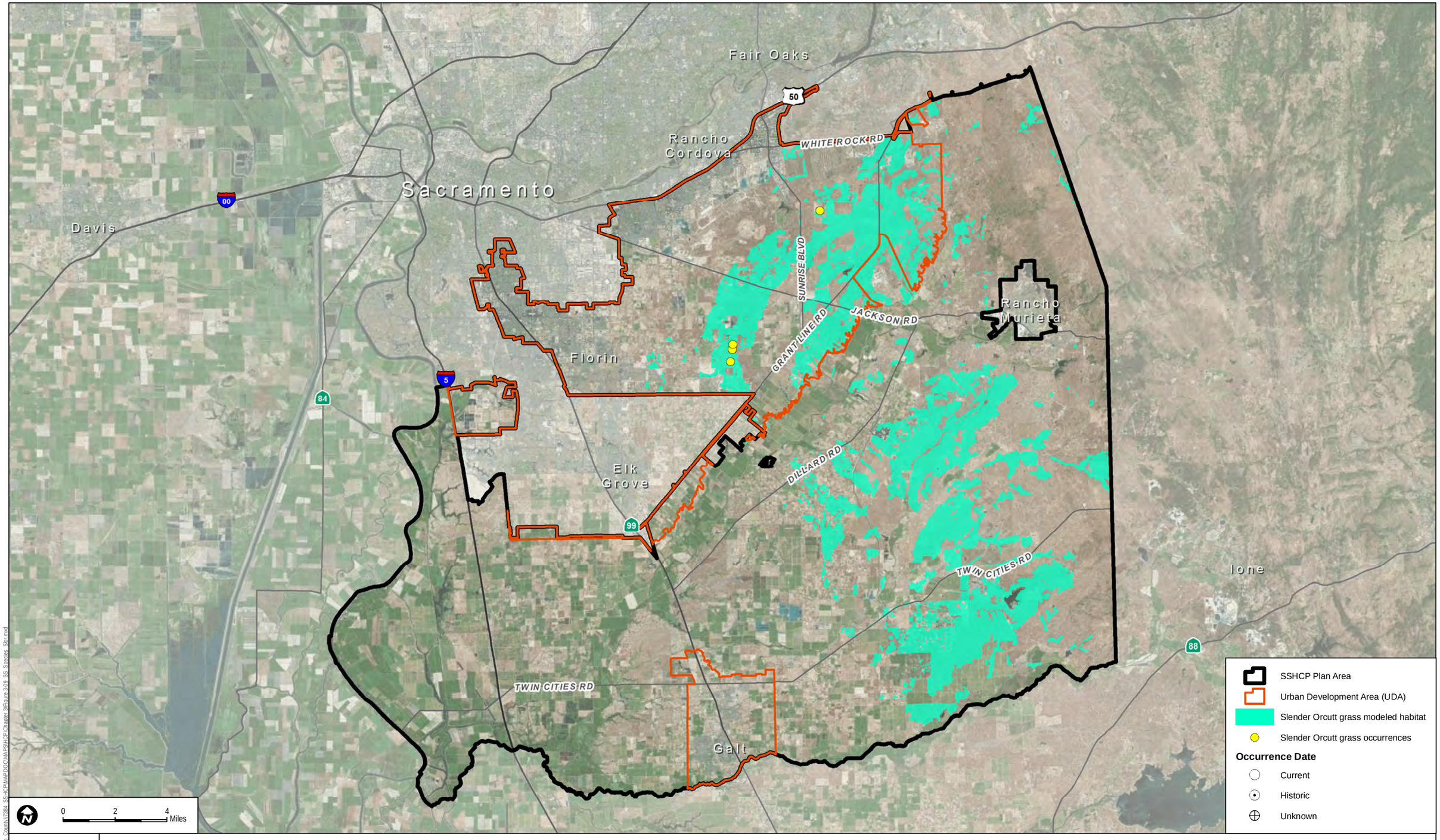
SSHCP land cover types that provide suitable habitat based on life history descriptions are Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek (Table 3-2). Because Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek land cover types are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are 64 documented occurrences of Sanford's arrowhead in the Plan Area. Fifteen occurrences are located in the UDA with three in PPU 2, two in PPU 3, one in PPU 4, and nine that are not within a PPU. Forty-nine occurrences are located outside of the UDA with three in PPU 5, 42 in PPU 6, three in PPU 7, and one that is not within a PPU.

Model Assumptions

- Soil types known to support Sanford's arrowhead in the Plan Area include Argonaut-Auburn complex, 3% to 8% slopes; Clear Lake clay, partially drained, 0 to 2% slopes frequently flooded; Columbia sandy loam, partially drained, 0 to 2% slopes; Columbia sandy loam, drained, 0 to 2% slopes, occasionally flooded; Cosumnes silt loam, drained, 0 to 2% slopes, occasionally flooded; Creviscreek sandy loam, 0 to 3% slopes; Dierssen sandy clay loam, drained, 0 to 2% slopes; Dierssen clay loam, deep, drained, 0 to 2% slopes; Durixeralfs, 0 to 1% slopes; Egbert clay, partially drained, 0 to 2% slopes; Egbert clay, partially drained, 0 to 2% slopes, frequently flooded; Fiddyment fine sandy loam, 1% to 8% slopes; Fluvaquents, 0 to 2% slopes, frequently flooded; Hedge loam, 0 to 2% slopes; Hicksville loam, 0 to 2% slopes, occasionally flooded; Hicksville gravelly loam, 0 to 2% slopes, occasionally flooded; Kimball-Urban land complex, 0 to 2% slopes; Liveoak sandy clay loam, 0 to 2% slopes, occasionally flooded; Madera loam, 2% to 8% slopes; Mokelumne-Pits mine complex, 15% to 50% slopes; Red Bluff-Redding complex, 0 to 5% slopes; Redding loam, 2% to 8% slopes; Redding gravelly loam, 0 to 8% slopes; San Joaquin silt loam, leveled, 0 to 1% slopes; San Joaquin silt loam, 0 to 3% slopes; San Joaquin silt loam, 3% to 8% slopes; San Joaquin-Galt complex, leveled, 0 to 1% slopes; San Joaquin-Urban land complex, 0 to 2% slopes; San Joaquin-Xerarents complex, leveled, 0 to 1% slopes; Reiff fine sandy loam, 0 to 2% slopes, occasionally flooded; Scribner clay loam, partially drained, 0 to 2% slopes; and Tinnin loamy sand, 0 to 2% slopes.
- Sanford's arrowhead is strictly associated with wetland systems supporting emergent marsh vegetation, both naturally occurring and built/created.
- Valley Grasslands are necessary to support the Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek that Sanford's arrowhead occupies.



SOURCE: Bing Maps, County of Sacramento 2012

FIGURE 3-9

Slender Orcutt Grass Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Sanford's Arrowhead Modeled Habitat

Modeled habitat for Sanford's arrowhead is all Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek associated with Argonaut-Auburn complex, 3% to 8% slopes; Clear Lake clay, partially drained, 0 to 2% slopes frequently flooded; Columbia sandy loam, partially drained, 0 to 2% slopes; Columbia sandy loam, drained, 0 to 2% slopes, occasionally flooded; Cosumnes silt loam, drained, 0 to 2% slopes, occasionally flooded; Creviscreek sandy loam, 0 to 3% slopes; Dierssen sandy clay loam, drained, 0 to 2% slopes; Dierssen clay loam, deep, drained, 0 to 2% slopes; Durixeralfs, 0 to 1% slopes; Egbert clay, partially drained, 0 to 2% slopes; Egbert clay, partially drained, 0 to 2% slopes, frequently flooded; Fiddyment fine sandy loam, 1% to 8% slopes; Fluvaquents, 0 to 2% slopes, frequently flooded; Hedge loam, 0 to 2% slopes; Hicksville loam, 0 to 2% slopes, occasionally flooded; Hicksville gravelly loam, 0 to 2% slopes, occasionally flooded; Kimball-Urban land complex, 0 to 2% slopes; Liveoak sandy clay loam, 0 to 2% slopes, occasionally flooded; Madera loam, 2% to 8% slopes; Mokelumne-Pits mine complex, 15% to 50% slopes; Red Bluff-Redding complex, 0 to 5% slopes; Redding loam, 2% to 8% slopes; Redding gravelly loam, 0 to 8% slopes; San Joaquin silt loam, leveled, 0 to 1% slopes; San Joaquin silt loam, 0 to 3% slopes; San Joaquin silt loam, 3% to 8% slopes; San Joaquin-Galt complex, leveled, 0 to 1% slopes; San Joaquin-Urban land complex, 0 to 2% slopes; San Joaquin-Xerarents complex, leveled, 0 to 1% slopes; Reiff fine sandy loam, 0 to 2% slopes, occasionally flooded; Scribner clay loam, partially drained, 0 to 2% slopes; and Tinnin loamy sand, 0 to 2% slopes.

Figure 3-10 illustrates the location of modeled habitat as well as documented occurrences of Sanford's arrowhead within the Plan Area.

3.4.2 Invertebrate Covered Species Modeled Habitat

Mid-Valley Fairy Shrimp (*Branchinecta mesovallensis*)

Habitat Requirements

This small vernal pool crustacean is entirely dependent upon the aquatic environment provided by vernal pool ecosystems. Mid-valley fairy shrimp depends upon the presence of water in the winter and early spring and the absence of water during the summer. These specific vernal pool wetland characteristics are dependent upon the surrounding uplands (Rogers, as cited in SSHCP Appendix B).

Mid-valley fairy shrimp are typically in Central Valley California floristic provinces below 300 meters in elevation. Typical habitat for mid-valley fairy shrimp in California includes vernal pools and seasonally ponded areas within vernal swales (Eng et al. 1990).

Optimal mid-valley fairy shrimp habitat tends to be small vernal pools, with an abbreviated hydroperiod, neutral to slightly alkaline, clear vernal pools, low in dissolved salts, dominated

with vernal pool plants, and sustains a complex vernal pool crustacean community (Eriksen and Belk 1999; Rogers 1998).

Land Cover Types Relevant to Habitat Requirements

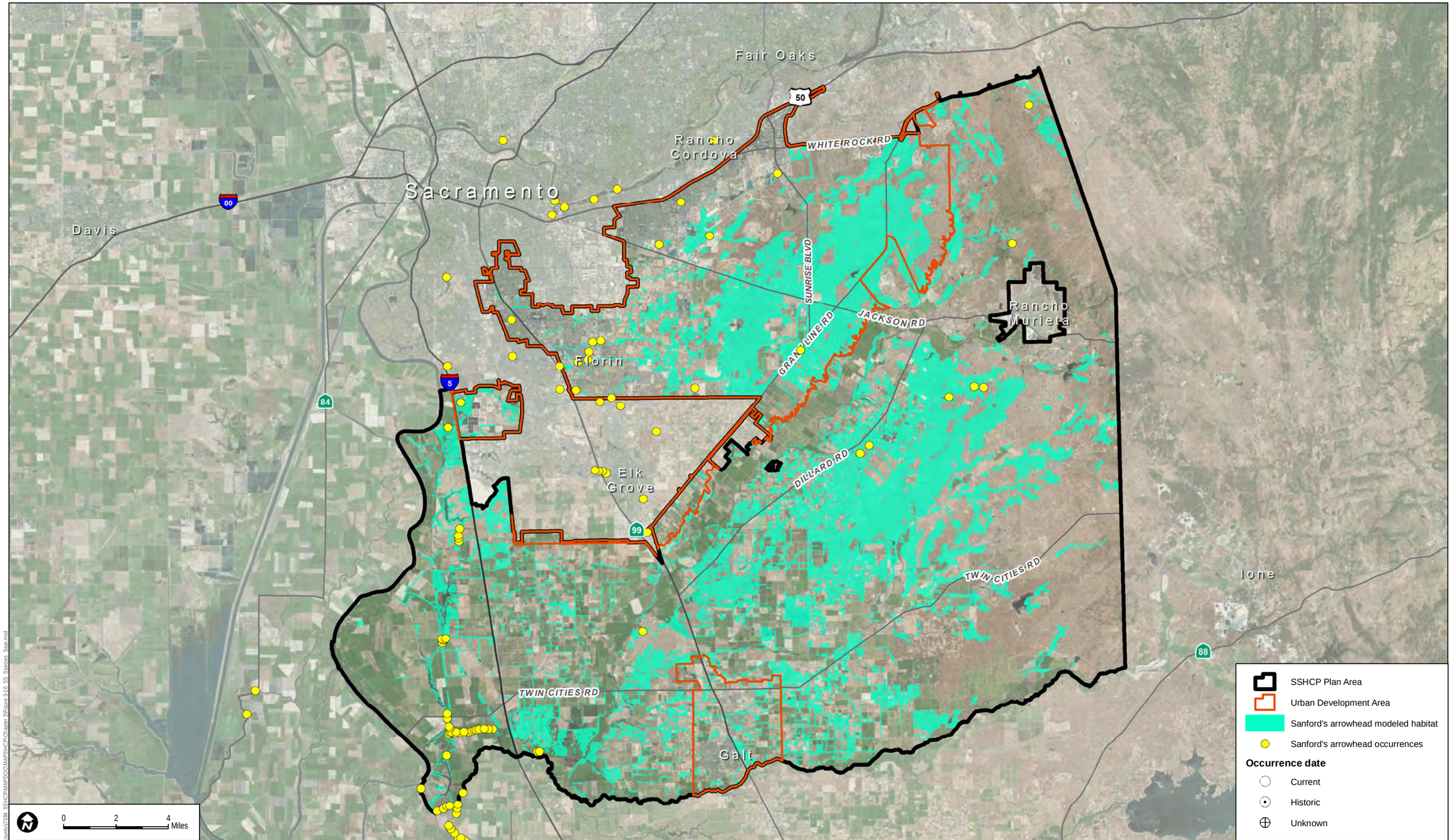
SSHCP land cover types that provide suitable habitat based on life history descriptions include Vernal Pool and Swale. Vernal pools are considered primary habitat in the Plan Area. Swales are considered suitable habitat as they provide connectivity between vernal pool cover types and facilitate the transport of genetic material from one location to another (Table 3-2).). Because Vernal Pools and Swales are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are 37 documented occurrences of mid-valley fairy shrimp located within the Plan Area. Twenty-two are located within the UDA including 10 in PPU 2, 9 in PPU 3, 2 in PPU 8, and 1 that is not within a PPU. Fifteen are located outside of the UDA, including nine in PPU 6 and six within PPU 7.

Model Assumptions

- Soil types known to support mid-valley fairy shrimp in the Plan Area include Bruella sandy loam, 0 to 2% slopes; Capay clay loam, 0 to 2% slopes, occasionally flooded; Clear Lake clay, hardpan substratum, drained, 0 to 1% slopes; Clear Lake clay, partially drained, 0 to 2% slopes; frequently flooded; Creviscreek sandy loam, 0 to 3% slopes; Durixeralfs-Gat complex, 0 to 2% slopes; Durixeralfs, 0 to 1% slopes; Fiddyment fine sandy loam, 1% to 8% slopes; Galt clay, 0 to 2% slopes; Hedge loam, 0 to 2% slopes; Hicksville loam, 0 to 2% slopes occasionally flooded; Kimball-silt loam, 0 to 2% slopes; Madera loam, 0% to 2% slopes; Natomas loam, 0 to 2 percent slopes; Red Bluff-Redding complex, 0 to 5% slopes; Red Bluff-Xerarents complex, 0 to 2% slopes; Red Bluff loam, 0 to 2% slopes; Red Bluff loam, 2 to 5% slopes; Redding gravelly loam, 0 to 8% slopes; Sailboat silt loam, drained, 0 to 2% slopes, occasionally flooded; San Joaquin-Durixeralfs complex, 0 to 1 percent slopes; San Joaquin-Galt complex, 0 to 3% slopes; San Joaquin-Galt complex, leveled, 0 to 1% slopes; San Joaquin-Xerarents complex, leveled, 0 to 1% slopes; San Joaquin silt loam, 0 to 3% slopes; San Joaquin silt loam, 3 to 8% slopes; San Joaquin silt loam, leveled, 0 to 1% slopes; Vleck gravelly loam, 2 to 15% slopes; Xerarents-Redding complex, 0 to 2% slopes; Xerarents-San Joaquin complex, 0 to 1% slopes.
- SSHCP land cover types that provide suitable habitat based on life history descriptions are all Vernal Pool and all Swale land cover.
- Valley Grasslands are necessary to support the Vernal Pool and Swale land cover types that mid-valley fairy shrimp occupies.



SOURCE: Bing Maps, County of Sacramento 2012

FIGURE 3-10

Sanford's Arrowhead Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Mid-Valley Fairy Shrimp Modeled Habitat

Modeled habitat for mid-valley fairy shrimp is all Vernal Pool, Swale, and Valley Grassland land cover types associated with Bruella sandy loam, 0 to 2% slopes; Capay clay loam, 0 to 2% slopes, occasionally flooded; Clear Lake clay, hardpan substratum, drained, 0 to 1% slopes; Clear Lake clay, partially drained, 0 to 2% slopes; frequently flooded; Creviscreek sandy loam, 0 to 3% slopes; Durixeralfs-Gat complex, 0 to 2% slopes; Durixeralfs, 0 to 1% slopes; Fiddyment fine sandy loam, 1% to 8% slopes; Galt clay, 0 to 2% slopes; Hedge loam, 0 to 2% slopes; Hicksville loam, 0 to 2% slopes occasionally flooded; Kimball-silt loam, 0 to 2% slopes; Madera loam, 0% to 2% slopes; Natomas loam, 0 to 2 percent slopes; Red Bluff-Redding complex, 0 to 5% slopes; Red Bluff-Xerarents complex, 0 to 2% slopes; Red Bluff loam, 0 to 2% slopes; Red Bluff loam, 2 to 5% slopes; Redding gravelly loam, 0 to 8% slopes; Sailboat silt loam, drained, 0 to 2% slopes, occasionally flooded; San Joaquin-Durixeralfs complex, 0 to 1% slopes; San Joaquin-Galt complex, 0 to 3% slopes; San Joaquin-Galt complex, leveled, 0 to 1% slopes; San Joaquin-Xerarents complex, leveled, 0 to 1% slopes; San Joaquin silt loam, 0 to 3% slopes; San Joaquin silt loam, 3% to 8% slopes; San Joaquin silt loam, leveled, 0 to 1% slopes; Vleck gravelly loam, 2% to 15% slopes; Xerarents-Redding complex, 0 to 2% slopes; Xerarents-San Joaquin complex, 0 to 1% slopes throughout the Plan Area.

Figure 3-11 illustrates the location of modeled habitat as well as the documented occurrences of mid-valley fairy shrimp within the Plan Area.

Ricksecker's Water Scavenger Beetle (*Hydrochara rickseckeri*)

Habitat Requirements

This vernal pool insect is entirely dependent upon the aquatic environment provided by vernal pool. The Ricksecker's water scavenger beetle depends upon the presence of water in the winter and early spring and the absence of water during the summer. These specific vernal pool wetland characteristics are dependent upon the surrounding uplands (Rogers, as cited in SSHCP Appendix B).

Vernal pools supporting Ricksecker's water scavenger beetle are typically in Central Valley California floristic provinces below 300 meters in elevation. Collection records suggest that the Ricksecker's water scavenger beetle is not sensitive to the size of vernal pools, and uses both vernal pools and swales, as well as constructed vernal pools (Rogers pers. obs., as cited in SSHCP Appendix B)

Optimal Ricksecker's water scavenger beetle habitat tends to be neutral to slightly alkaline, clear vernal pools, low in dissolved salts, dominated with vernal pool plants, sustaining a complex vernal pool crustacean community (Rogers 1998).

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat, based on life history descriptions are Vernal Pool and Swale land cover types (Table 3-2). Because Vernal Pools and Swales are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are eight documented occurrences of Ricksecker's water scavenger beetle in the Plan Area. Four occurrences are located inside the all in PPU 2 and four occurrences are located outside of the UDA including one in PPU 6 and three in PPU 7.

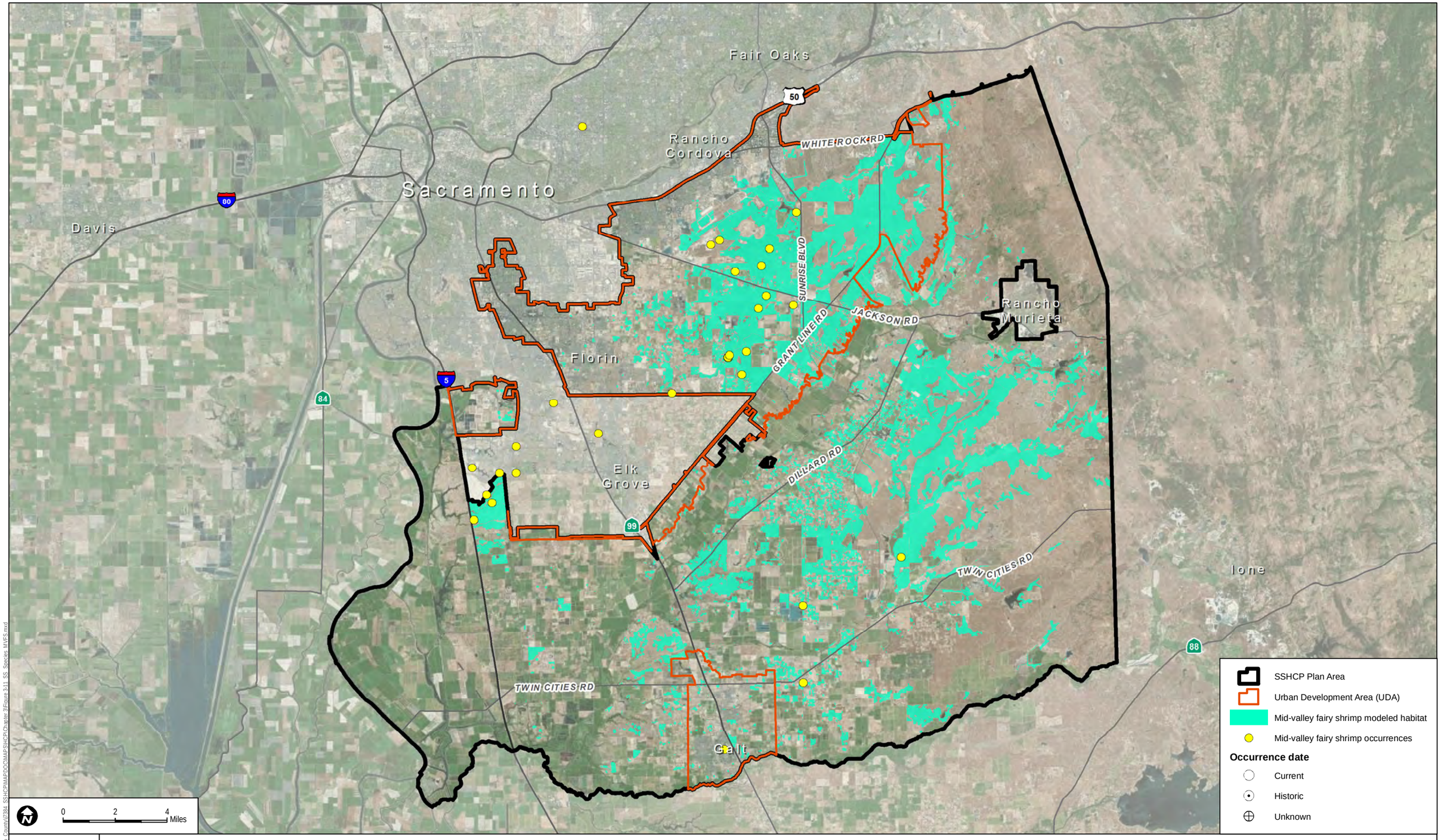
Model Assumptions

- Ricksecker's water scavenger beetle is not sensitive to the size of vernal pools or other aquatic habitats (Rogers pers. obs., as cited in SSHCP Appendix B).
- All Vernal Pool and Swale cover types are suitable habitat.
- Valley Grasslands are necessary to support the Vernal Pool and Swale land cover types that Ricksecker's water scavenger beetle occupies.

Ricksecker's Water Scavenger Beetle Modeled Habitat

Modeled habitat for Ricksecker's water scavenger beetle is all Vernal Pool, Swale, and Valley Grassland land cover types within the Plan Area.

Figure 3-12 illustrates the location of modeled habitat as well as the documented occurrences of Ricksecker's water scavenger beetle within the Plan Area.



SOURCE: Bing Maps 2015, County of Sacramento 2014, CDFG 2012, C. Witham 2011, Foothill Associates 2010, Kassis-Sylva 2011, Vollmar 2012

FIGURE 3-11

Midvalley Fairy Shrimp Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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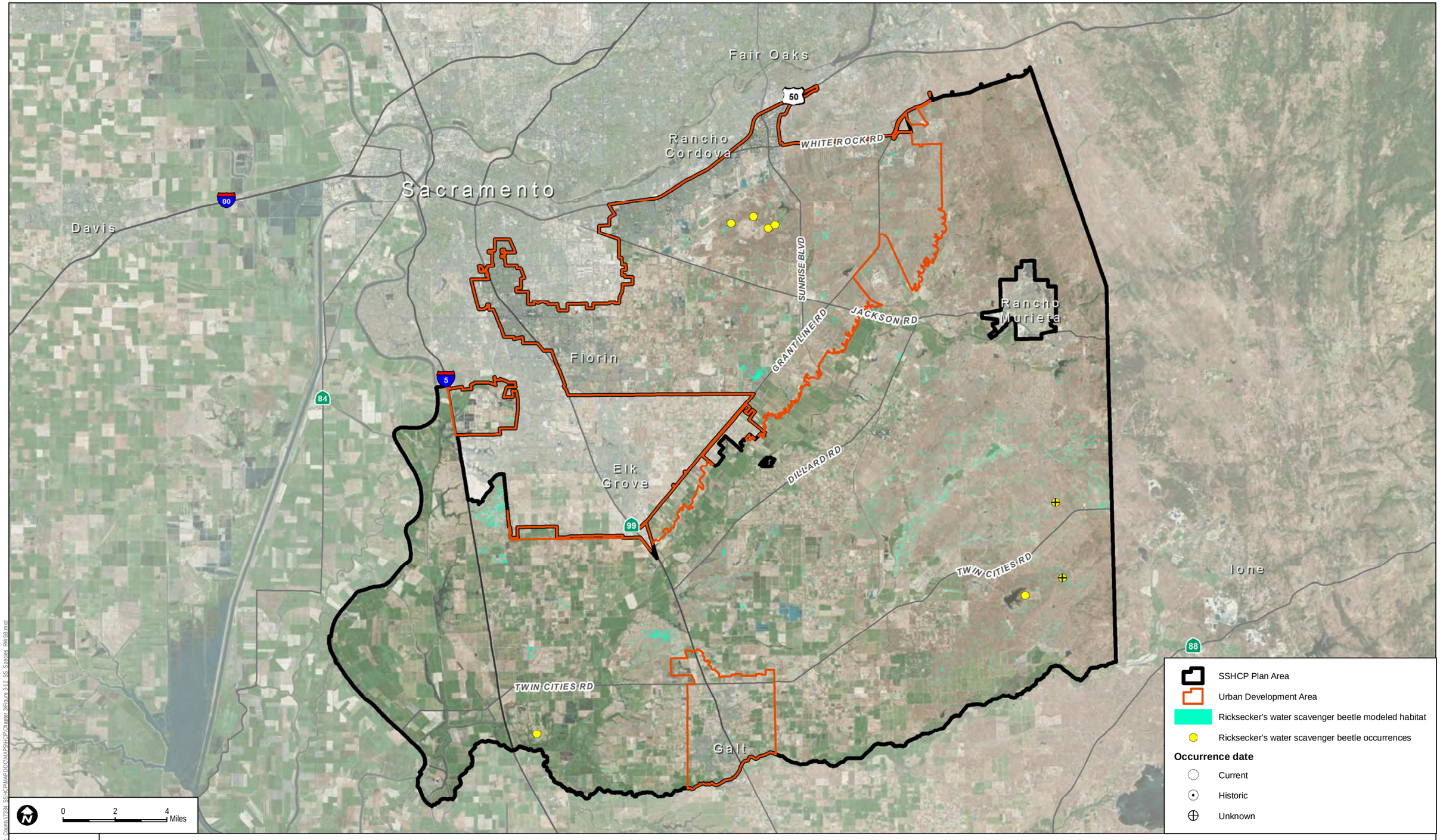

SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, Chris Rogers 2000, TNC

FIGURE 3-12

Ricksecker's Water Scavenger Beetle Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Habitat Requirements

The valley elderberry longhorn beetle is completely dependent upon its host plant, the elderberry shrub, the only recorded larval host plant (*Sambucus glauca, S. mexicana, S. caerulea*) (Barr 1991; Collinge et al. 2001; Eng 1984; Linsley and Chemsak 1972, 1997). Valley elderberry longhorn beetle spends most of its life in the larval stage, living within the stems of the elderberry plant. Adults eat the elderberry foliage until about June when they mate. The females lay eggs in crevices in the bark. Upon hatching, the larvae then begin to tunnel into the elderberry shrub, where they will spend 1 to 2 years eating the interior wood, which is their sole food source. The U.S. Fish and Wildlife Service (USFWS) considers all elderberry shrubs 2.5 centimeters (1 inch) or greater diameter at ground level within the species' range to be potential habitat (USFWS 1999a). The elderberry shrub is a component of riparian forests throughout the Central Valley. Although this shrub occasionally occurs outside of riparian areas, shrubs supporting the greatest beetle densities are where the shrubs are abundant and interspersed among dense riparian forest (Barr 1991; Collinge et al. 2001; USFWS 1999a). Within the Plan Area elderberry shrubs are commonly found interspersed in Mine Tailing Riparian Woodland cover type, an important cover type for the species.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat based on life history descriptions are Mine Tailing Riparian Woodland, Mixed Riparian Woodland and Mixed Riparian Scrub (Table 3-2).

Occurrences within the Plan Area

There are 156 documented occurrences of valley elderberry longhorn beetle within the Plan Area. There is one occurrence within the UDA in PPU 1 and 155 occurrences outside the UDA including 154 within PPU 5 and one within PPU 6.

Model Assumptions

- The valley elderberry longhorn beetle is completely dependent upon the elderberry plant.
- The elderberry and the valley elderberry longhorn beetle are largely found within riparian ecosystems.
- Isolated elderberry shrubs separated from contiguous habitat provide limited habitat value.

Valley Elderberry Longhorn Beetle Modeled Habitat

Modeled habitat for valley elderberry longhorn beetle is Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub throughout the Plan Area.

Figure 3-13 illustrates the location of modeled habitat as well as the documented occurrences for valley elderberry longhorn beetle within the Plan Area.

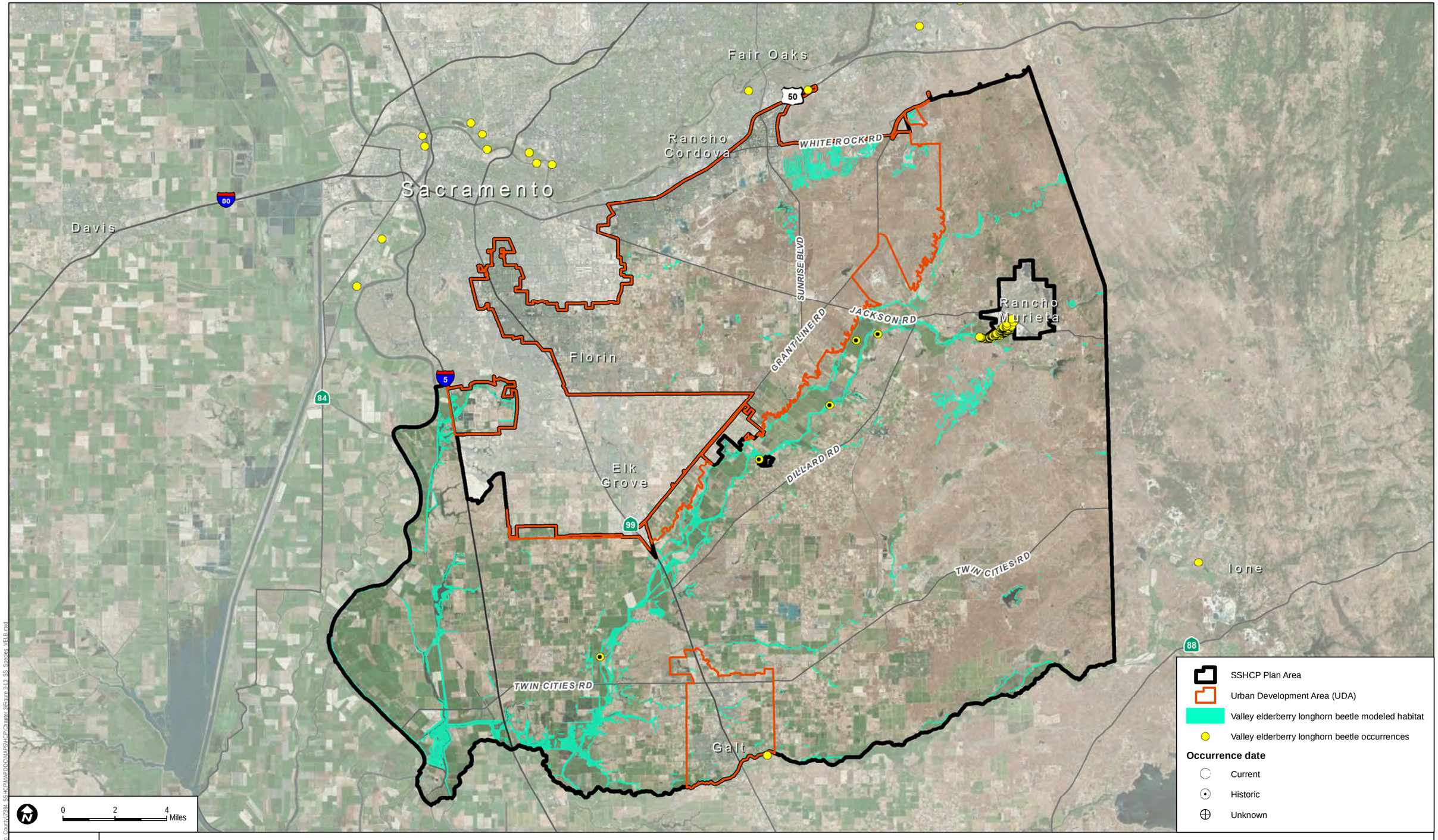
Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

Habitat Requirements

This small vernal pool crustacean is entirely dependent upon the aquatic environment provided by vernal pool wetland ecosystems. Vernal pool fairy shrimp depends upon the presence of water in the winter and early spring and the absence of water during the summer (Rogers, as cited in SSHCP Appendix B).

Habitats supporting the vernal pool fairy shrimp are typically in Central Valley California floristic provinces below 300 meters elevation. Typical habitat for vernal pool fairy shrimp in California include vernal pools, seasonally ponded areas within vernal swales, rock outcrop ephemeral pools, playas, and alkali flats (Eng et al. 1990). Vernal pool fairy shrimp have also been found in water pooled in sandstone outcrops and in alkaline vernal pools.

Optimal habitat for vernal pool fairy shrimp tends to be neutral to slightly alkaline, clear vernal pools, low in dissolved salts, dominated with vernal pool plants, and sustains a complex vernal pool crustacean community (Eriksen and Belk 1999; Rogers 1998). Fairy shrimp occurs only in cool-water pools. Individuals hatch from cysts during cold-weather winter storms; they require water temperatures of 50^{o}F or lower to hatch (Eriksen and Belk 1999; Helm 1998). The time to maturity and reproduction is temperature-dependent, varying between 18 days and 147 days, with a mean of 40 days (Helm 1998). Pool volume is also important in determining potential shrimp habitat because deeper pools with a large surface area can more easily maintain their dissolved oxygen levels. Similarly, deeper pools will pond long enough to allow the shrimp to complete their life cycle (Rogers, as cited in SSHCP Appendix B).



SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, T. Talley 2003

FIGURE 3-13

Valley Elderberry Longhorn Beetle Modeled Habitat and Documented Occurrences

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat based on life history descriptions include Vernal Pool, Swale, and Stream/Creek (VPIH). Vernal pools are the species primary habitat in the Plan Area. Swales and Stream/Creek (VPIH) are considered suitable habitat as they provide connectivity between Vernal Pool cover types and facilitate the transport of genetic material from one location to another (Table 3-2). These specific vernal pool wetland characteristics are dependent on the surrounding uplands. Because Vernal Pools, Swales, and Stream/Creek (VPIH) are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.

Occurrences within the Plan Area

There are 581 documented occurrences of vernal pool fairy shrimp within the Plan Area. There are 193 located within the UDA including 30 in PPU 1, 48 in PPU 2, 95 in PPU 3, four in PPU 4, one in PPU 8, and 15 that are not within a PPU. There are 388 occurrences outside of the UDA including 26 in PPU 1, 11 in PPU 5, 26 in PPU 6, 324 in PPU 7, and one that is not within a PPU.

Model Assumptions

- Vernal pool fairy shrimp are widely distributed throughout the Plan Area, although they appear to be more abundant outside of the Urban Development Area (UDA) than inside the UDA.
- All Vernal Pool and Swale cover types are suitable habitat.
- A select group of ephemeral steams or portions of those streams in this Plan Area are considered suitable habitat.
- Valley Grasslands are necessary to support the Vernal Pool, Swale, and Stream/Creek (VPIH) land cover types that vernal pool fairy shrimp occupies.

Vernal Pool Fairy Shrimp Modeled Habitat

Modeled habitat for vernal pool fairy shrimp is all vernal Pool, Swale, Stream/Creek (VPIH), and Valley Grassland throughout the Plan Area.

Figure 3-14 illustrates the location of modeled habitat as well as the documented occurrences of vernal pool fairy shrimp within the Plan Area.

Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)

Habitat Requirements

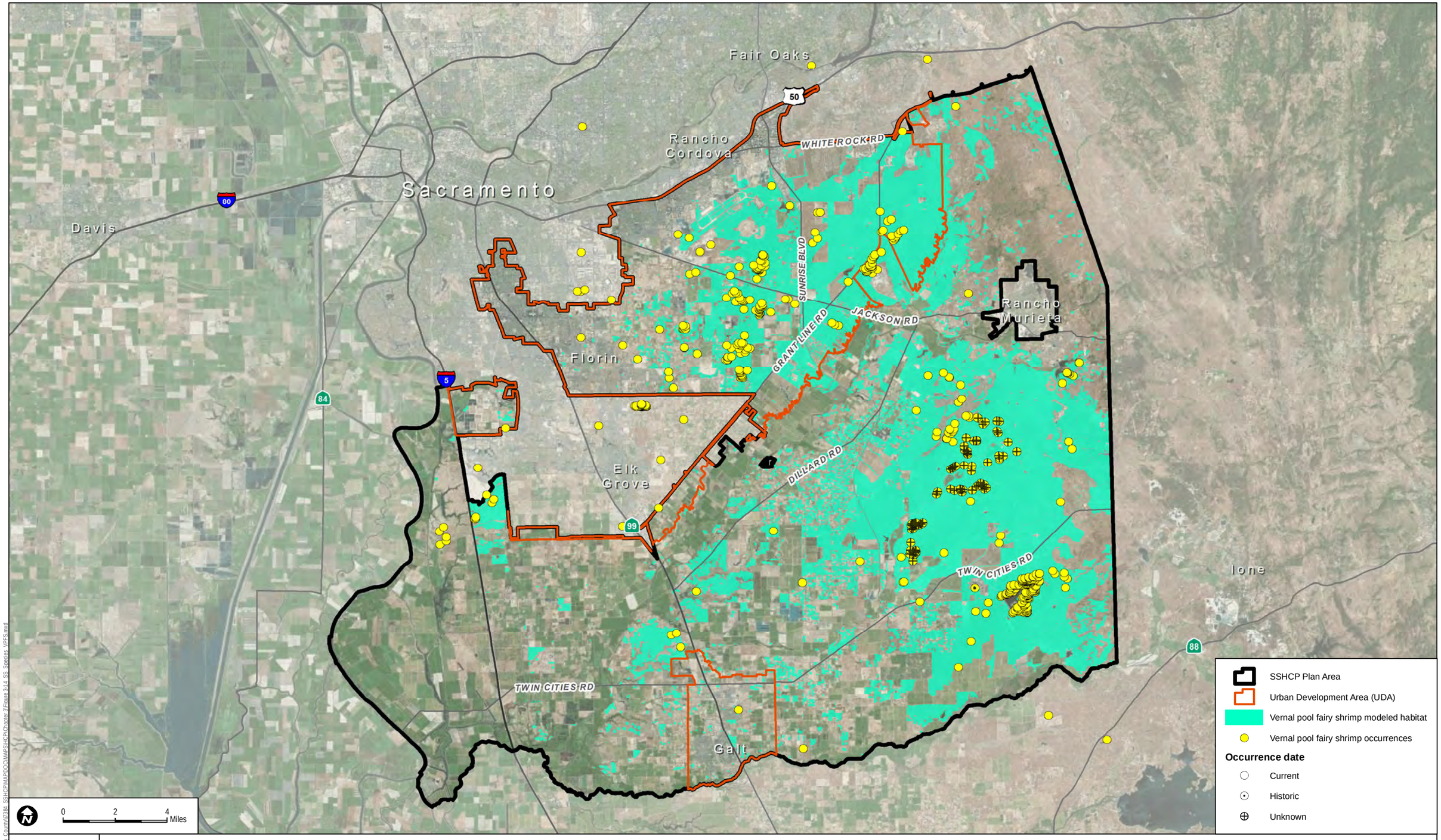
This small vernal pool crustacean is entirely dependent upon the aquatic environment provided by vernal pool wetland ecosystems. Vernal pool tadpole shrimp depends upon the presence of water in the winter and early spring and the absence of water during the summer. These specific vernal pool wetland characteristics are dependent upon the surrounding uplands.

Habitats supporting the Vernal pool tadpole shrimp are typically in Central Valley California floristic provinces below 300 meters in elevation. Typical habitat for vernal pool tadpole shrimp in California includes vernal pools, seasonally ponded areas within vernal swales, rock outcrop ephemeral pools, playas, and alkali flats (Eriksen and Belk 1999; Rogers 2001). Vernal pool tadpole shrimp have also been found in alkaline vernal pools.

Optimal habitat for vernal pool tadpole shrimp tends to be neutral to slightly alkaline, clear vernal pools, low in dissolved salts, dominated with vernal pool plants, and sustains a complex vernal pool crustacean community (Eriksen and Belk 1999). Pool volume is also important in determining potential shrimp habitat because deeper pools with a large surface area can more easily maintain their dissolved oxygen levels. Similarly, deeper pools will pond long enough to allow the shrimp to complete their life cycle. Occupied pools may have aquatic vegetation that may provide shelter from predators and range in size from 54 square feet to 84 acres (59 Federal Register 48136–48153). Although the tadpole shrimp is found on a variety of geologic formations and soil types, Helm (1998) found that, throughout the range, more than 50% of tadpole shrimp occurrences were on High Terrace, also known as old terrace landforms and Laguna Formation Redding and Corning soils. In the Plan Area, vernal pool tadpole shrimp has been observed in many of the vernal streams in the UDA (Adelsbach, pers. comm. 2013).These are mapped by the Permittees as the “Creek/Stream VPIH” land cover.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat based on life history descriptions include Vernal Pool, Swale, and Stream/Creek (VPIH). Vernal pools are considered the species primary habitat in the Plan Area. Swale and Stream/Creek (VPIH) land cover types are considered suitable habitat as they provide connectivity between the Vernal Pool land cover type and facilitate the transport of genetic material from one location to another (Table 3-2). These specific Vernal Pool Wetland characteristics are dependent on the surrounding uplands. Because Vernal Pools, Swales, and Stream/Creek (VPIH) are dependent on surrounding uplands, the Valley Grassland land cover type is also considered suitable habitat for this species.



SOURCE: Bing Maps 2015, County of Sacramento 2014, CDFG 2012, C. Witham 2011, ECORP 2009, EcoAnalysts 2008, Foothill Associates 2011, Helm 2007, Kassis-Sylva 2011, Gibson & Skordal 1994, Sugnet 1996, Richard Hill 1999 Kiefer 2011, LSA 2011, Vollmar 2011, USFWS 2014, Wildlands 2010

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

FIGURE 3-14

Vernal Pool Fairy Shrimp Modeled Habitat and Documented Occurrences

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Occurrences within the Plan Area

There are 851 documented occurrences of vernal pool tadpole shrimp within the Plan Area. Of the 851 documented occurrences, 587 are within the UDA including 266 in PPU 1, 145 in PPU 2, 147 in PPU 3, six in PPU 4, four in PPU 8, and 19 that are not within a PPU. There are 264 occurrences outside of the UDA including 42 in PPU 1, 26 in PPU 6, 194 in PPU 7, and two that are not within a PPU.

Model Assumptions

- Vernal pool tadpole shrimp are widely distributed throughout the Plan Area, although they appear to be more abundant within the Urban Development Area (UDA) than outside the UDA.
- All Vernal Pool, Vernal Stream, and Swale cover types are suitable habitat.
- A select group of ephemeral steams or portions of those streams in the Plan Area are considered suitable habitat (classified as Stream/Creek (VPIH)).
- Valley Grasslands are necessary to support the Vernal Pool, Swale, and Stream/Creek (VPIH) land cover types that vernal pool tadpole shrimp occupies.

Vernal Pool Tadpole Shrimp Modeled Habitat

Modeled habitat for vernal pool tadpole shrimp is all Vernal Pool, Swale, Stream/Creek (VPIH), and Valley Grassland land cover types throughout the Plan Area.

Figure 3-15 illustrates the location of modeled habitat as well as the documented occurrences of vernal pool tadpole shrimp within the Plan Area.

3.4.3 Amphibians

California Tiger Salamander (*Ambystoma californiense*)

Habitat Requirements

The upland component of California tiger salamander habitat typically consists of Grassland or Blue Oak Savanna (Shaffer et al. 1993; USFWS 2004a). California tiger salamander spends most of its life cycle underground in grassland habitat, primarily in rodent burrows. Breeding adults comprise approximately 30% of a California tiger salamander population, while approximately 70% consists of juveniles who have not yet reached sexual maturity. These juveniles remain underground in burrows year-round and typically do not return to breeding habitat during the winter. (Searcy, pers. comm. 2012). California tiger salamanders typically use underground

burrows constructed by ground squirrels or other fossorial animals in open grassland or under isolated oaks, and less commonly in woodlands (Shaffer et al. 1993). Adults are terrestrial outside of the breeding season, and have been known to inhabit rodent burrows located up to 1.3 miles from breeding ponds.

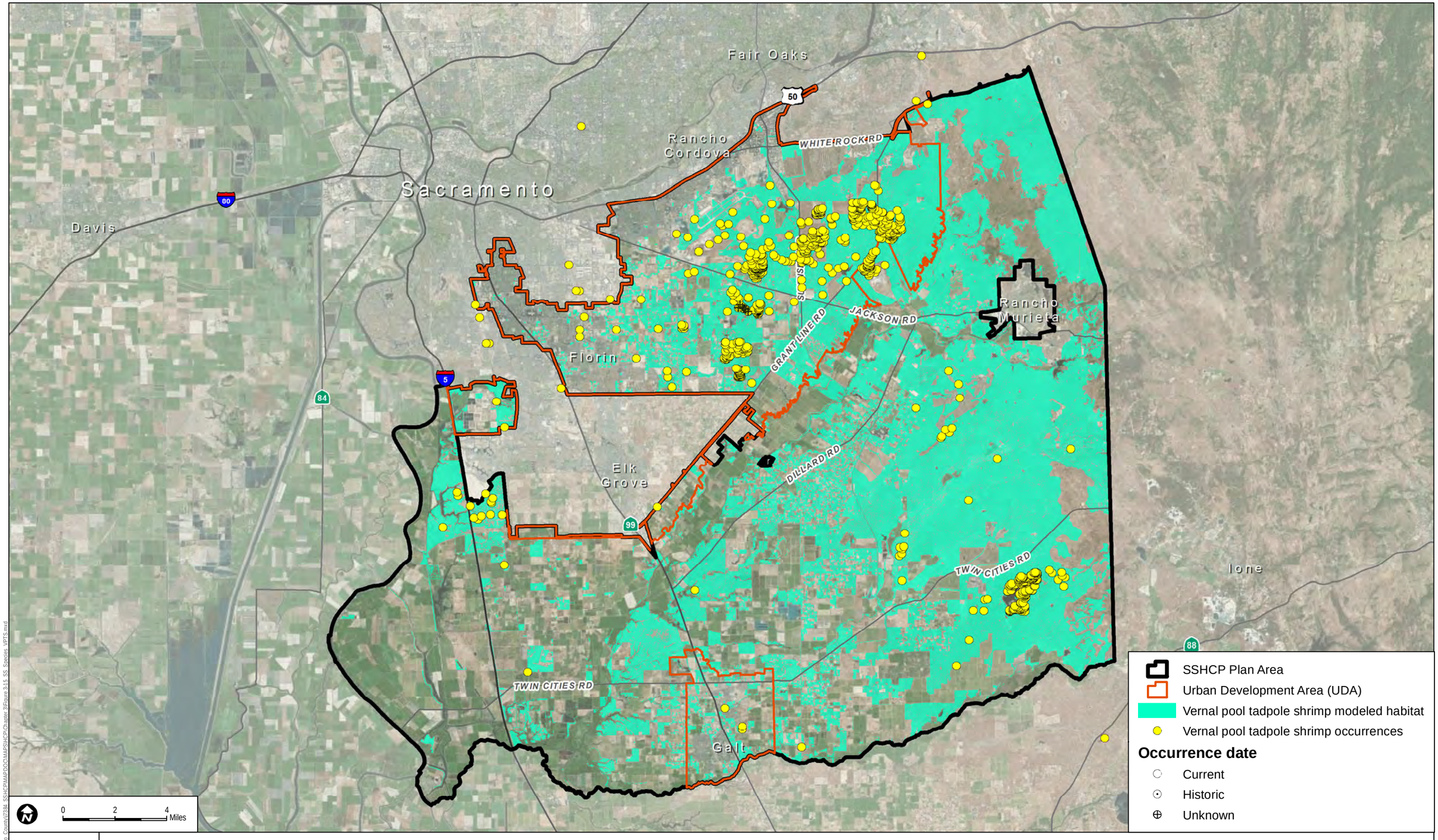
Once fall or winter rains begin, adult California tiger salamanders emerge from their upland refugia at night to migrate to breeding ponds (Stebbins 1985, 1989; Shaffer et al. 1993). Males remain at the breeding pools on average for 44.7 days and females averaged 11.8 days (Trenham et al. 2000). Historically, vernal pools and other natural seasonal ponds constituted primary breeding sites used by California tiger salamanders (Feaver 1971; Storer 1925; Trenham et al. 2000; Zeiner et al. 1988). In the absence of historical breeding ponds, stock ponds have become important aquatic habitats for the California tiger salamander throughout its range (USFWS 2004a). During this species' lifetime, individuals from sub-populations could migrate between aquatic and upland habitats, colonizing newly created and geographically isolated ponds provided the intervening habitat could be successfully traversed by dispersing individuals (USFWS 2004a).

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable aquatic habitat based on life history descriptions include Vernal Pool and Seasonal Wetland. Suitable habitat for upland refugia includes Valley Grassland, Blue Oak Woodland, and Blue Oak Savanna (Table 3-2).

Occurrences within the Plan Area

There are 31 documented occurrences of California tiger salamanders in the Plan Area. Two occurrences are located within the UDA in PPU 8 and 29 occurrences are outside of the UDA in PPU 7.



SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, C. Witham 2011, C. Little 2011,ECORP 2012, EcoAnalysts 2008, Foothill Associates 2011, Gibson & Skordal 2011, Helm 2011, Richard Hill 1999, Sugnet & Associated 1997, Kassiss-Sylva 2011, Kiefer 2011, LSA 2009, USFWS 2014, Vollmar 2011, Wildlands 2010

FIGURE 3-15

Vernal Pool Tadpole Shrimp Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

Path: Z:\Projects\Sacramento County\72304 SSHCP\MAPDOC\MAPS\HCP\Chapter 3\Figure 3-15 SS_Species_VPTS.mxd

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Model Assumptions

- California tiger salamanders have not been recorded within the Sacramento County Urban Services Boundary or north of the Cosumnes River despite extensive surveys in very large areas with presumably suitable habitat including Mather Field, Sacramento Valley Conservancy's Vernal Pool Prairie Preserve, the Sunrise Douglas Area, Kiefer landfill, Rancho Murieta, and areas East of Grant Line Road.
- In a 5-year study, Orloff (2011) found the majority of California tiger salamanders migrated at least 0.5 mile (0.8 kilometer) from the breeding site. A smaller number of salamanders appeared to migrate even farther, traveling 0.75 mile (1.2 kilometer) to almost 1.3 miles (2.2 kilometers) to and from the breeding ponds and upland habitat on adjacent property.
- A study by Searcy and Shaffer (2011) found that California tiger salamanders are physiologically capable of migrating up to 2,484 meters (1.5 miles) each breeding season and that 95% of the population occurs in upland habitat within 1,867 meters of the breeding pond.
- Trenham et al. (2001) recommended that plans to maintain local populations of California tiger salamanders should include pond(s) surrounded by at least 173-meter (567-foot) wide buffers of terrestrial habitat occupied by burrowing mammals.

California Tiger Salamander Modeled Habitat

Modeled aquatic habitat for California tiger salamander is Vernal Pool and Seasonal Wetland land cover located south of the Cosumnes River. Modeled upland refugia habitat is all Blue Oak Woodland, Blue Oak Savanna, and Valley Grassland land cover located within 1.5 miles of modeled aquatic habitat (i.e., within 1.5 miles of any Vernal Pool or Seasonal Wetland that is south of the Cosumnes River).

Figure 3-16 illustrates the location of modeled habitat as well as the documented occurrences of California tiger salamander within the Plan Area.

Western Spadefoot (*Spea hammondii*)

Habitat Requirements

Western spadefoot primarily occurs in lowland habitats generally below 900 meters (3,000 feet) within or adjacent to washes, floodplains of rivers, alluvial fans, playas, and alkali flats. They also occur in the foothills and mountains (Stebbins 1985) up to 1,363 meters (4,500 feet) (Morey 1988). Associated vegetative communities include valley-foothill grassland, open chaparral, pine-oak woodland and lower montane conifer and mixed conifer forest within open areas comprised of short grasses and sandy or gravelly soil. Western spadefoots have two distinct habitat requirements including quiet streams (Stebbins 2003) or seasonal pools for breeding and uplands for foraging and dry-season aestivation. Western spadefoot eggs and larvae have been

observed in a variety of permanent and temporary wetlands including rivers, creeks, pools in intermittent streams, vernal pools, and temporary rain pools (CDFG 2010). They have also been found in altered wetlands including vernal pools that have been disturbed by activities such as earthmoving, disking, intensive livestock use, and off-road vehicle use, and created wetlands such as artificial ponds, livestock ponds, sedimentation and flood control ponds, irrigation and roadside ditches, roadside puddles, tire ruts, and borrow pits (Fisher and Shaffer 1996; CDFG 2010). Often undervalued in conservation planning, terrestrial habitats surrounding aquatic breeding sites are critical to the survival of many semiaquatic species that depend on mesic ecotones to complete their life cycles (Semlitsch and Bodie 2003).

Land Cover Types Relevant to Habitat Requirements

Suitable aquatic habitat based on life history descriptions includes Vernal Pool, Seasonal Wetland, Swale, Open Water, and Stream/Creek. Suitable habitat for upland foraging includes Blue Oak Woodland, Blue Oak Savanna, and Valley Grassland (Table 3-2).

Occurrences within the Plan Area

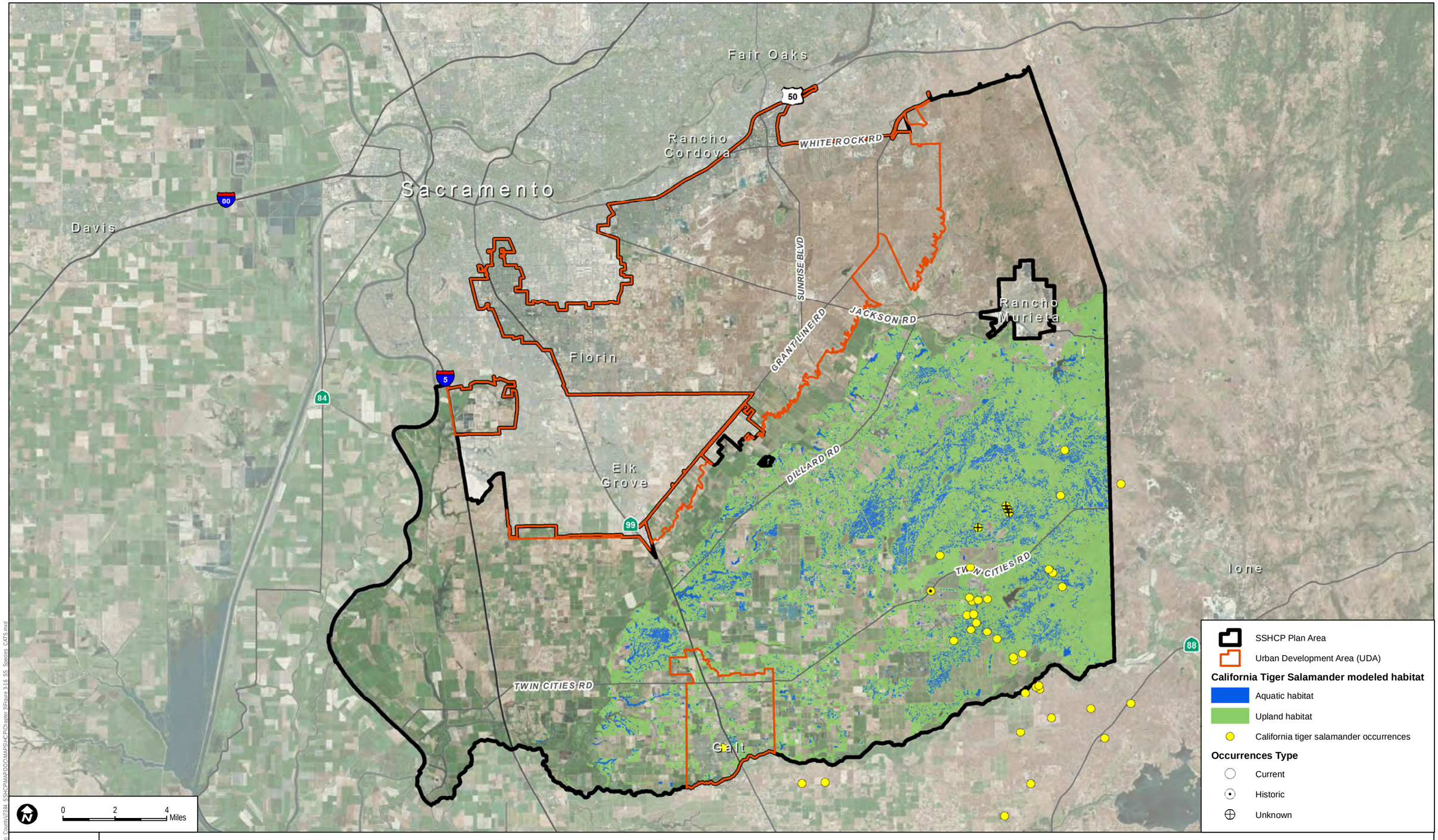
There are 41 documented occurrences of western spadefoot in the Plan Area. Twenty occurrences are inside the UDA with seven in PPU 1, 12 in PPU 2, and one in PPU 3. There are 21 occurrences outside of the UDA with two in PPU 5 and 19 in PPU 7.

Model Assumption

- Very little information is available regarding dispersal distances or minimum habitat size.
- Semlitsch and Brodie (2003) summarized data from the literature on the use of terrestrial habitats by 19 frog and 13 salamander species representing 1,363 individuals that are otherwise typically associated with wetlands. In general, plethodontid stream salamanders (e.g., *Desmognathus fuscus, Eurycea bislineata, Eurycea longicauda*), although migratory at some stage of their life cycle, remain close to the edges of ponds and streams and seldom move more than 20 to 30 meters from aquatic habitats. Alternatively, some species of frogs, toads and newts are highly mobile and move 1,000 to 1,600 meters (5,249 feet or about 1 mile) (e.g., *Bufo bufo, Rana catesbbeiana*, *Notophthalmus viridescens*). The majority of the remaining species occur at intermediate distances, where they emigrate to find suitable terrestrial habitat. The overall core terrestrial habitat ranged from 159 to 290 meters (522 to 951 feet) from the edge of aquatic breeding sites.

Western Spadefoot Modeled Habitat

Modeled aquatic habitat for western spadefoot is Vernal Pool, Seasonal Wetland, Swale, Open Water, and Stream/Creek land cover types in the Plan Area. Modeled upland habitat is Blue Oak Woodland, Blue Oak Savanna, and Valley Grassland within 1,600 meters (5,249 feet or approximately 1 mile) from modeled aquatic habitat.



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

FIGURE 3-16

California Tiger Salamander Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Figure 3-17 illustrates the location of modeled habitat and the documented occurrences of western spadefoot within the Plan Area.

3.4.4 Reptiles

Giant Gartersnake (*Thamnophis gigas*)

Habitat Requirements

Endemic to valley floor wetlands in California's Central Valley, the giant gartersnake inhabits marshes, sloughs, low gradient streams, and other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields. Suitable habitat consists of (1) adequate water during the snake's active season (early spring through mid-fall) to provide food and cover, (2) emergent, herbaceous wetland vegetation, such as Scirpus and Typha spp. for escape cover and foraging habitat during the active season, (3) grassy banks and openings in waterside vegetation for basking, and (4) higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter (Hansen 1988). Wylie et al. (2010) found that giant garter snakes will persist in areas dominated by rice, by foraging in flooded rice fields after the rice plants have grown sufficiently to provide cover from predators. It appears that giant garter snakes do not tolerate seasonal wetlands managed for waterfowl if there is no aquatic habitat available during the active summer season. A study of Body Condition Index (BCI) and population estimates strongly indicates that perennial marshes provide the highest quality giant garter snake habitat, rice agriculture is acceptable habitat, and seasonal winter wetlands provides the least suitable habitat of the three types (Wylie et al. 2010). Although rice fields are a key habitat for giant garter snakes throughout most of its range, there is no active rice cultivation within the Plan Area. The nearest region of rice production is the Natomas Basin located in northwest Sacramento County. Giant garter snakes are absent from larger rivers and other water bodies that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Brode 1988; Hansen 1980; Hansen 1988; Rossman and Stewart 1987). Riparian woodlands do not typically provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1980).

In addition to grassy banks, giant garter snakes will bask in bulrush, cattails, shrubs overhanging the water, patches of waterweed (*Ludwigia peploides*) and other floating vegetation. In the San Joaquin Valley, giant garter snakes also bask in openings within saltbush (*Atriplex* spp.) (Brode 1988; Van Denburgh and Slevin 1918). Riparian vegetation such as saltbush and willows (Salix spp.) provide cover from predation. Giant gartersnakes also bask in openings in vegetation created by rip-rap placed around water control structures. Giant garter snakes use small mammal burrows and other soil crevices above prevailing flood elevations during the winter (i.e., November to mid-March), typically with sunny exposures along south- and west-facing slopes (USFWS 1999b). During the active season, small mammal burrows, crayfish burrows, and soil crevices provide retreats from extreme heat (Hansen and Brode 1993).

Land Cover Types Relevant to Habitat Requirements

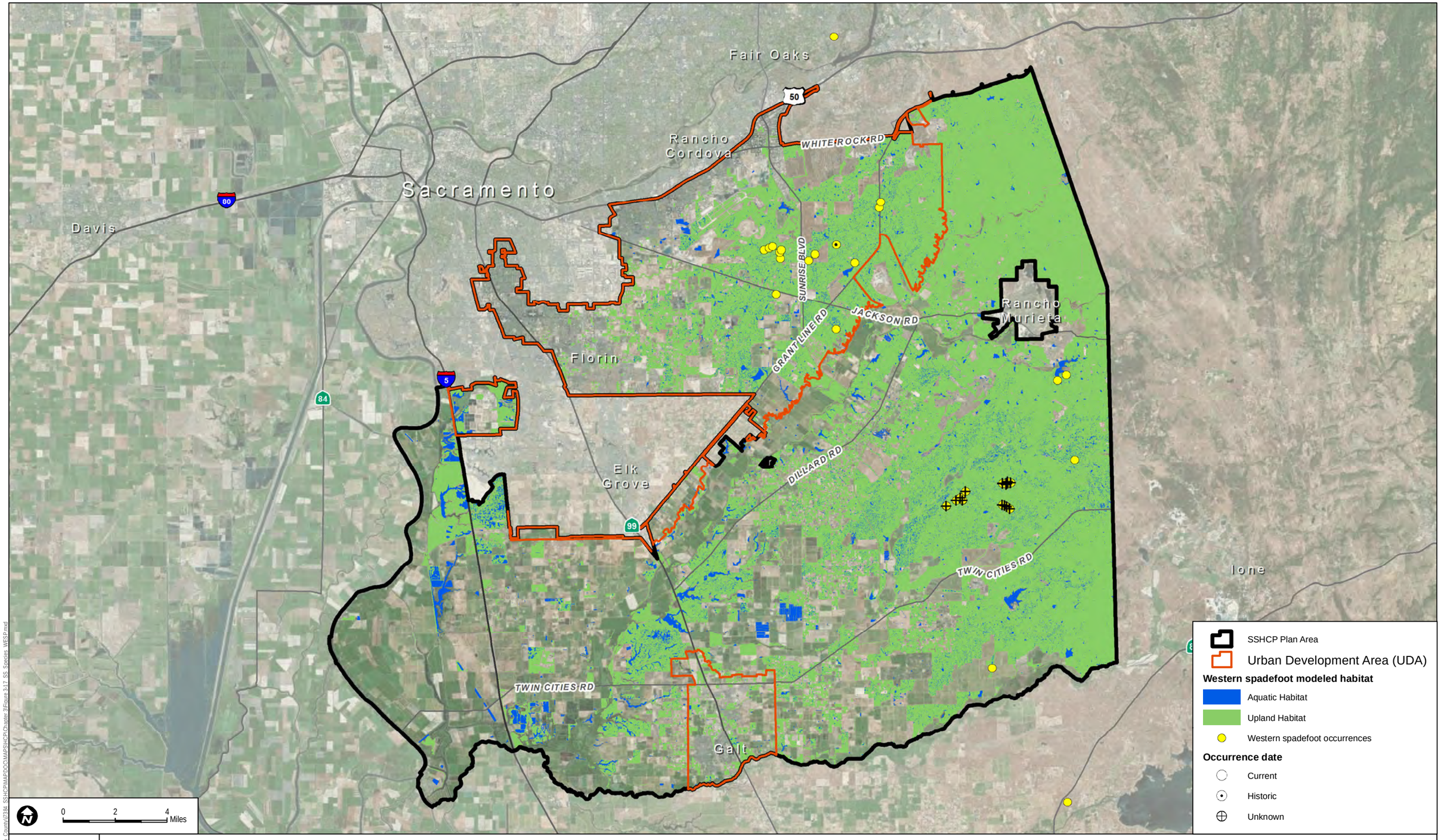
Suitable aquatic habitat for giant gartersnake based on life history descriptions include Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek. Suitable upland habitat includes Mixed Riparian Scrub and Valley Grassland (Table 3-2).

Occurrences within the Plan Area

There are 14 documented occurrences of giant gartersnake within the Plan Area. Two occurrences are within the UDA in PPU 2. Twelve occurrences are outside the UDA, including 11 in PPU 6 and one in PPU 7.

Model Assumptions

- Giant gartersnake occurrences have been documented along Plan Area stream reaches, primary in the southwestern portion of the Plan Area.
- The range of giant gartersnake within the Plan Area included the Central Valley great "tule" marsh (below 70 feet above sea level), and likely included emergent marsh areas along floodplains of streams and creeks up to an elevation of 230 feet above sea level.
- Stream reaches considered important suitable habitat owing to known use within the Plan Area include the following:
    - Elliot Mitigation site contains a prominent drainage that links to Stone Lakes and is wet year round.
    - Drainage canals south of Elk Grove have a past occurrence and link to Stone Lakes. The perennial segments of these canals are suitable habitat.
    - Badger Creek and all other creeks that drain into the marsh at the Cosumnes River Preserve is likely high-quality habitat due to its proximity and connectivity to a significant population of giant gartersnakes. The perennial segments of these creeks are suitable habitat.
    - The perennial segments of Laguna Creek (south) and tributaries are suitable habitat due to presence of Freshwater Marsh habitat and proximity to documented occurrences.
    - The perennial segments drainages and canals leading from the Cosumnes River Preserve including Deadman's Gulch.
- Giant gartersnakes use rice lands extensively and depend on them for habitat (Fuller, pers. comm. 2005)
- The average distance between upland, over wintering sites and aquatic breeding sites is thought to be approximately 150 meters, ranging from 50 to 400 meters (Wylie, pers. comm. 2005).
- Hansen and Brode (1993) also documented giant gartersnakes moving at least 400 meters (0.25 mile) between small lateral ditches and larger canals within the Natomas Basin.



Path: Z:\Projects\Sacramento_County\2784_SSHCP\MAPDOC\MAPS\HCP\Chapter 3\Figure 3-17_SS_Species_WESP.mxd

SOURCE: Bing Maps, County of Sacramento 2014, CNDDB 2012, CNPS 1999

FIGURE 3-17

Western Spadefoot Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Giant Garter Snake Modeled Habitat

The following streams, creeks or drainages are locations that are known to support giant gartersnakes within the Plan Area.

- A prominent drainageway on the Elliot mitigation site, which links to Stone Lakes National Wildlife Refuge (NWR) and is wet year-round.
- Drainage canals south of Elk Grove, which have a past occurrence and link to Stone Lakes NWR; the perennial segments of these canals are suitable habitat.
- Badger Creek and all other creeks that drain into the marsh at the Cosumnes River Preserve, which are likely high-quality habitat due to proximity and connectivity to a significant population of giant gartersnakes; the perennial segments of these creeks are suitable habitat.
- The perennial segments of Laguna Creek (south) and tributaries, which are suitable habitat due to presence of Freshwater Marsh habitat and proximity to documented occurrences.
- The perennial segments of drainages and canals leading from the Cosumnes River Preserve including Deadman's Gulch, which provides suitable habitat.

Giant gartersnake is known to occur at elevations of up to 230 feet above sea level and to travel up to 400 meters (0.25 mile) between aquatic and upland habitat. Therefore, the waterways described above plus Stream/Creek, Freshwater Marsh, Open Water, and Seasonal Wetland that are entirely or partially within 0.25 mile of the aforementioned waterways and are at or below 230 feet in elevation are modeled as high-value aquatic habitat. In addition to high-value aquatic habitat, non-high value aquatic habitat was defined as Stream/Creek, Freshwater Marsh, Open Water, and Seasonal Wetland that is up to 0.25 mile away from high-value habitat and is at or below 230 feet in elevation.

Upland habitat for giant gartersnake is Mixed Riparian Scrub and Valley Grassland within a distance of 0.25 mile from modeled aquatic habitat and is at or below an elevation of 230 feet. High-value upland habitat for giant gartersnake is defined as upland habitat within 200 feet of high-value aquatic giant gartersnake habitat (i.e., Stream/Creek, Freshwater Marsh, Open Water, and Seasonal Wetland) that is at or below 230 feet in elevation.

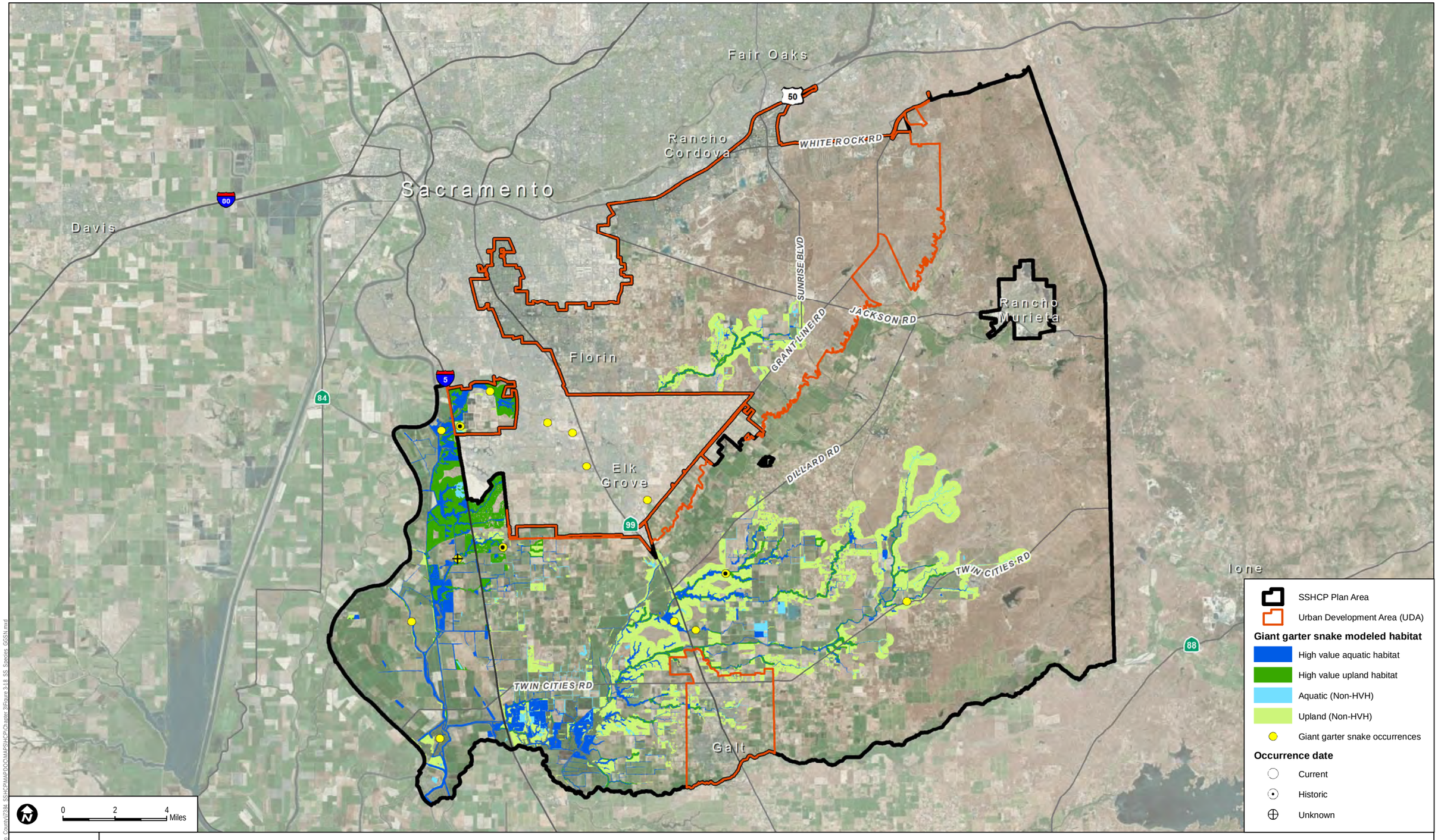
Figure 3-18 illustrates the location of modeled habitat as well as the documented occurrences of giant gartersnake within the Plan Area.

Western Pond Turtle (*Actinemys marmorata*)

Habitat Requirements

Western pond turtles inhabit a variety of aquatic habitats from sea level to elevations of 1,980 meters (6,500 feet). They are found in fresh to brackish aquatic habitats including marshes, rivers, ponds, and streams. Western pond turtles also may occur in created habitats such as irrigation ditches, reservoirs, and sewage and millponds. Preferred aquatic habitat is characterized by slow moving or quiet water, emergent aquatic vegetation, deep pools with undercut banks for refugia, partially submerged rocks and logs, open mud banks and matted floating vegetation for thermoregulatory basking. Western pond turtles use aquatic habitats primarily for foraging, thermoregulation, breeding, and avoidance of predators (Boyer 1965; Holland 1994; Reese and Welsh 1998a). Hatchling and young turtles (1 year) require shallow water areas (less than 30 centimeters [12 inches] deep) dominated primarily by emergent aquatic reeds (*Juncus* spp.) and sedges (Holland 1991), and have been observed to avoid areas of open water lacking these emergent plant species (Boyer 1965; Holland 1994; Hays et al. 1999; Reese and Welsh 1998a). Highly fluctuating flow rates associated with aquatic habitats may diminish habitat quality for western pond turtle (Reese and Welsh 1998b).

Western pond turtles "hibernate" in both aquatic and upland habitats. Aquatic hibernacula consist of rocks, logs, mud, and undercut areas along banks while upland hibernacula consist of burrows in leaf litter, heavy brush, or soil (Holland 1994). Western pond turtles are believed to hibernate between November 1 and March 1 (McDermott, pers. comm. 2015). In woodland and sage scrub habitats along coastal streams in central California, most western pond turtles leave the drying creeks in late summer and return after winter floods. Upland nesting sites must be dry and often have a high clay or silt component. Typically, western pond turtles dig nests in open sunny areas that are on slopes no steeper than 25 degrees, and typically within 300 feet of the aquatic habitat (McDermott, pers. comm. 2015).



SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, CNPS 1999

FIGURE 3-18

Giant Gartersnake Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

Path: Z:\Projects\Sacramento County\2784 SSHCP\MAPDOC\MAPS\HCP\Chapter 3\Figure 3-18_SS_Species_GSSN.mxd

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Land Cover Types Relevant to Habitat Requirements

Based on life history descriptions aquatic land cover types that provide suitable habitat for western pond turtles include Freshwater Marsh, Open Water, and Stream/Creek. Land cover types that provide suitable upland habitat include Blue Oak Woodland, Blue Oak Savanna, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, Mixed Riparian Scrub, and Valley Grassland when these land covers are near suitable aquatic habitat (Table 3-2).

Occurrences within the Plan Area

There are 19 documented occurrences of western pond turtle within the Plan Area. Three occurrences are within the UDA including two in PPU 2 and one in PPU 4. Sixteen occurrences are outside of the UDA including one in PPU 5, seven in PPU 6, and eight in PPU 7.

Model Assumptions

- Western pound turtle has been recorded along creek and stream reaches throughout the Plan Area.
- Holland (1994) reported that in the fall and spring, hatchling turtles may move as far as 400 meters (0.25 mile) from their upland nest locations to aquatic sites nearby.

Western Pond Turtle Habitat Model

Western pond turtle modeled aquatic habitat include all Stream/Creek land cover that occurs throughout the Plan Area and Freshwater Marsh and Open Water land covers within 400 meters (0.25 mile) of all Stream/Creek land cover. Western pond turtle modeled upland habitat is Blue Oak Woodland, Blue Oak Savanna, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, Mixed Riparian Scrub, and Valley Grassland within 0.25 mile of modeled aquatic habitat.

Figure 3-19 illustrates the location of modeled habitat as well as the documented occurrences of western pond turtle within the Plan Area.

3.4.5 Birds

Cooper's Hawk (*Accipiter cooperii*)

Habitat Requirements

Throughout its range, the Cooper's hawk nests in a wide variety of woodland and forest habitats, including oak woodland, riparian woodland, coniferous, deciduous, and mixed forest, woodlots,

and suburban and urban areas. In much of California's lowland valley and foothill landscapes, including those within the Plan Area, this species appears strongly associated with live oak woodland (Asay 1987). Dense canopy closure is a consistent feature of most nest sites, and the tallest tree in the stand is often selected for nesting (Kennedy 1988). In a study of 77 Cooper's hawk nests in California, Asay (1987) found that nearly all nests (i.e., 75) were in live oak trees. The other two nests were in a blue oak and California sycamore; and these trees were in stands of live oak. Riparian woodlands also provide important habitat for Cooper's hawks in Sacramento County (Trochet, pers. comm. 2004).

Cooper's hawks also breed in urban and suburban areas. Several urban populations of Cooper's hawks have been well documented (Beebe 1974; Mannan et al. 2004; Murphy et al. 1988; Rosenfield et al. 1991; Stahlecker and Beach 1979). Cooper's hawks appear tolerant of habitat fragmentation and human disturbance near the nest (Beebe 1974; Murphy et al. 1988; Palmer 1988; Rosenfield et al. 1992). Urban nest sites have included isolated trees within 492 feet (150 meters) of commercial and recreational activities, and 66 to 98 feet (20 to 30 meters) of residential houses (Rosenfield and Bielefeldt 1993; Stahlecker and Beach 1979).

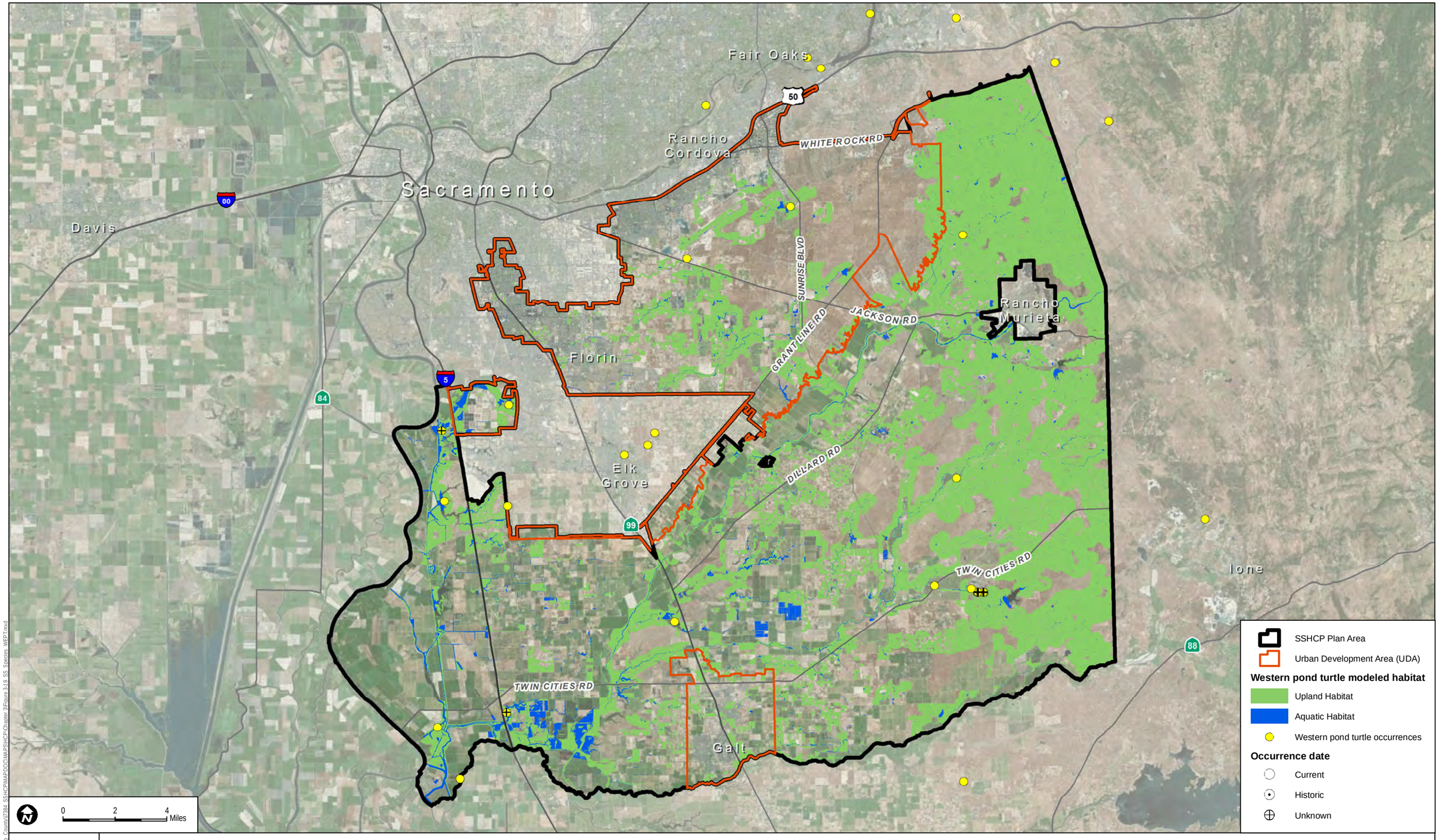
Cooper's hawks are considered aggressive ambush predators, using concealment to catch prey. Surprise attacks are often initiated at close range from behind an obstruction (Roth and Lima 2003). They often use a series of brief perch and scan episodes to locate and capture prey. In open habitats, Cooper's hawks occasionally hunt from the air, scanning the ground and stooping on prey (Rosenfield and Bielefeldt 1993). Cooper's hawks forage in structurally diverse woodland habitats that provide suitable prey abundance and diversity (i.e., medium-sized birds) and large numbers of sites within which to perch, scan, and launch attacks on potential prey.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Blue Oak Woodland, Blue Oak Savanna, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub. Suitable habitat for nesting includes Blue Oak Woodland, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub (Table 3-2).

Occurrences within the Plan Area

There are 20 documented occurrences of Cooper's hawk within the Plan Area. Seven are within the UDA including one in PPU 1, two in PPU 2, one in PPU 3, two in PPU 4, and one that is not within a PPU. Thirteen occurrences are outside of the UDA including two in PPU 5, eight in PPU 6, two in PPU 7, and one that is not within a PPU.



SOURCE: Bing Maps 2015, County of Sacramento 2014, CDFG 2012, CH2MHILL/Garcia & Associates, EIP Associates

FIGURE 3-19

Western Pond Turtle Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Model Assumptions

- Overall distribution, abundance, and population structure for Cooper's hawk are not well known within the Plan area.
- In urban Tucson, Arizona, home range size for nine subadult Cooper's hawks during their first fall/winter averaged 1,905 acres (771 hectares) (Mannan et al. 2004).
- In Tucson, Mannan and Boal (2000) studied the movements of adult male Cooper's hawks in adjacent home ranges during the breeding season. Home range sizes for nine individuals ranged between 33 and 323 acres (13 and 131 hectares) and averaged 162 acres (66 hectares).
- In a study of nesting Cooper's hawks in the Sacramento area, the average distance between adjacent nests was 0.99 mile (1.6 kilometers) (Asay 1987).
- Most Cooper's hawks breeding in California are permanent, non-migratory residents; however, Cooper's hawks breeding in montane habitats may exhibit seasonal movements, moving to snow-free lower elevations during winter (Zeiner et al. 1990).

Cooper's Hawk Habitat Model

Modeled foraging habitat is Blue Oak Woodland, Blue Oak Savanna, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub throughout the Plan Area. Modeled nesting habitat is Blue Oak Woodland, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub throughout the Plan Area.

Figure 3-20 illustrates the location of modeled habitat as well as the documented occurrences of Cooper's hawk within the Plan Area.

Ferruginous Hawk (*Buteo regalis*)

Habitat Requirements

The ferruginous hawk is considered an "open country" species that inhabits the grasslands, shrub steppes, and deserts of western North America. During the winter, ferruginous hawks use grasslands and arid areas, particularly where pocket gophers, ground squirrels, rabbits, or prairie dogs are abundant. Ferruginous hawks also winter near cultivated fields that support populations of pocket gophers (Bechard and Schmutz 1995), and are known to use urban open space grasslands as long as prey is available (Berry et al. 1998). Ferruginous hawks have been observed in open grassland habitats and non-vineyard agricultural areas in the Plan Area (Manolis, pers. comm. 2004). Characteristics of these grasslands and agricultural lands are that

they support abundant prey and include friable soils (for digging and burrowing), moderate to dense vegetative cover (particularly grasses), and some topographic variation.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Valley Grassland, Irrigated Pasture-Grassland, Vernal Pool, Seasonal Wetland, and Swale (Table 3-2).

Occurrences within the Plan Area

There are 26 documented occurrences of Ferruginous hawk within the Plan Area. Eight occurrences are within the UDA including seven in PPU 2 and one in PPU 4. Eighteen occurrences are outside of the UDA including six in PPU 5, four in PPU 6, seven in PPU 7, and one that in not within a PPU.

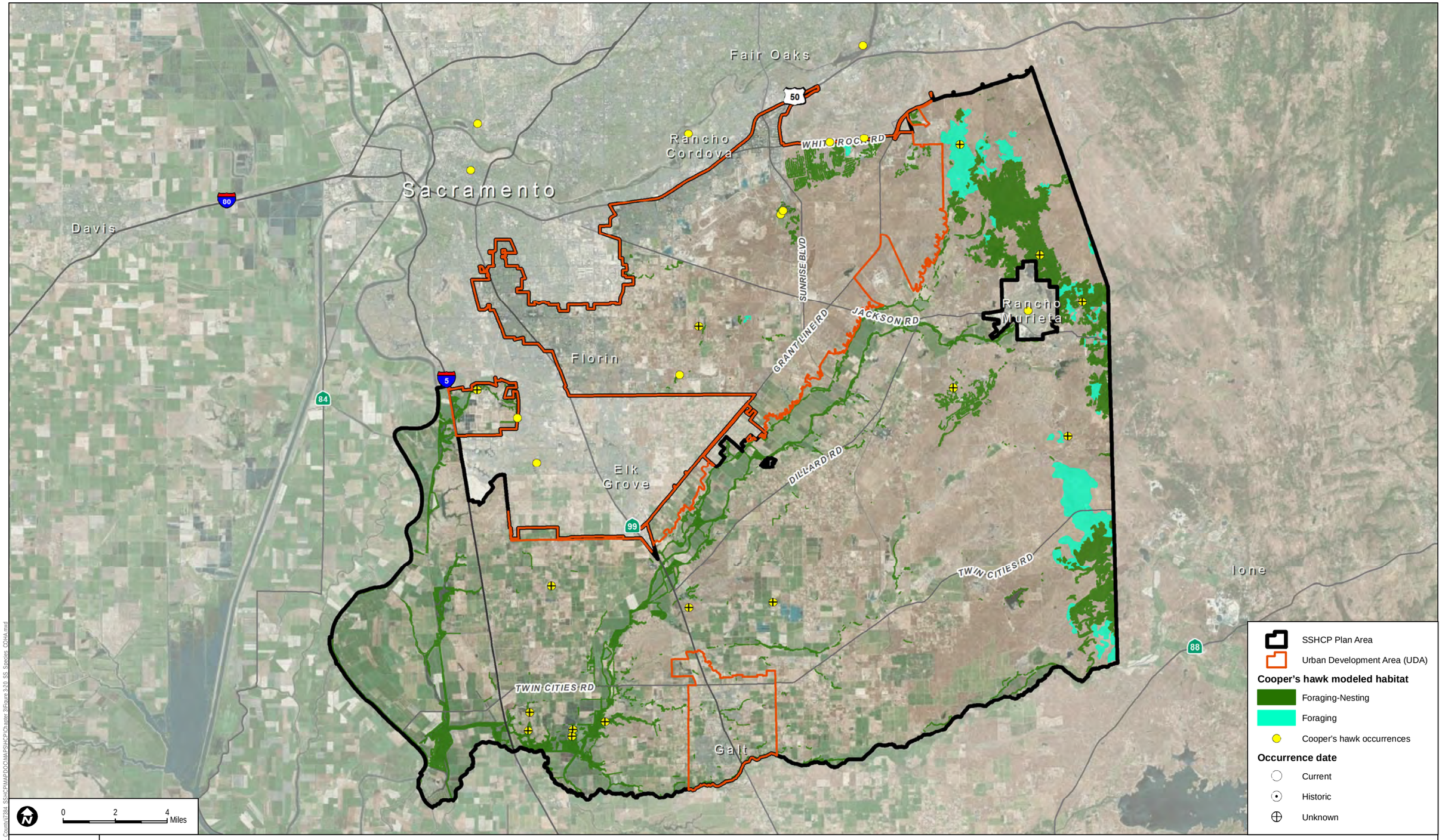
Model Assumptions

- Ferruginous hawks do not regularly breed in California, with the most recent breeding being recorded in 1989 in northeastern California (Harlow and Bloom 1989).
- Occurrence information is not well documented from within the Plan Area.
- The spatial requirements of ferruginous hawks during winter have not been widely reported (Bechard and Schmutz 1995) and what constitutes the minimum size of suitable winter foraging habitat is unknown for most areas.
- Bechard and Schmutz (1995) suggest the Ferruginous hawk may defend winter territories. Winter densities in Utah have been reported at one individual per 3.60 square miles (Smith and Murphy 1978), and Plumpton and Andersen (1997) found a mean daily Minimum Convex Polygon home range size of 1.36 square miles.

Ferruginous Hawk Habitat Model

Modeled foraging habitat is Valley Grassland, Irrigated Pasture-Grassland, Vernal Pool, Seasonal Wetland, and Swale land cover located anywhere in the Plan Area.

Figure 3-21 illustrates the location of modeled habitat as well as the documented occurrences of Ferruginous hawk within the Plan Area.



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SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, ebird.org

FIGURE 3-20

Cooper's Hawk Modeled Habitat and Documented Occurrences

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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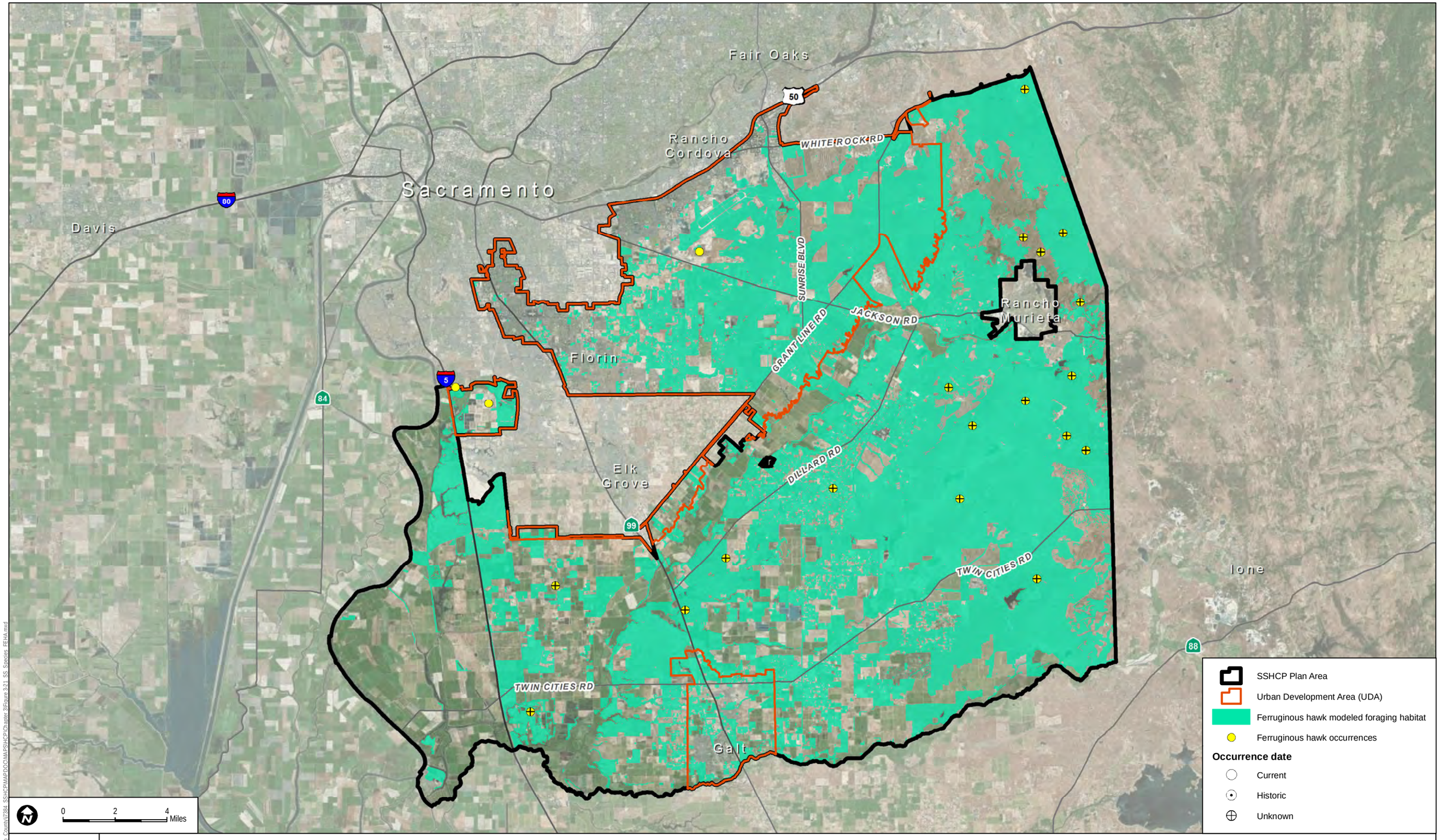

SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, ebird.org

FIGURE 3-21

Ferruginous Hawk Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

Path: Z:\Projects\Sacramento County\2784 SSHCP\MAPDOC\MAPS\HCP\Chapter 3\Figure 3-21 SS Species FEHA.mxd

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Greater Sandhill Crane (*Grus canadensis tabida*)

Habitat Requirements

Greater sandhill cranes wintering in and adjacent to the Plan Area use open agricultural habitats, natural vegetation communities, and seasonally managed wetlands. After the onset of winter rains, Sandhill Cranes begin foraging for invertebrates by probing soils in grassland habitats and overturning cattle dung. They also hunt for mice in taller grassland vegetation (Littlefield and Ivey 2000). They appear to avoid grassland habitats when vegetation exceeds 10 inches (25 centimeters). Invertebrates are also consumed in natural and managed seasonal wetlands.

Grain is also an important component to the sandhill crane's diet and as such agricultural habitat types are frequently utilized as foraging habitat. Common habitat types used for foraging include pastures, alfalfa, corn (chopped, disked, flooded, and stubble), tomatoes (flooded, ripped), and wheat (disked, ripped, flooded, stubble) (Ivey and Herziger 2003). Ivey (pers. comm. 2004) rated agriculture crops in the Plan Area in order of importance. Rice and corn were rated the highest, followed by winter wheat and irrigated pasture. Alfalfa was the next highest rated crop, followed by hay, dryland pasture, and row crops. Sandhill Crane use in the above crop types occurs even though the crops are harvested for farming income.

Habitats also important for greater sandhill cranes include flooded fields for roosting and rocky uplands (e.g., dirt and gravel roads) for collecting "grit." Roosting areas are located in shallowly flooded areas where cranes loaf during the day and seek protection from terrestrial predators at night. Although they will select sites with emergent vegetation along the periphery of the wetland, they rarely use roosts with heavy emergent vegetation (Littlefield and Ivey 2000).

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Cropland, Irrigated Pasture-Grassland, Valley Grassland, Seasonal Wetland, and Freshwater Marsh. Suitable habitat for night roosting include Vernal Pool, Seasonal Wetland, and Freshwater Marsh (Table 3-2).

Occurrences within the Plan Area

There are 210 documented occurrences of greater sandhill crane within the Plan Area. Eight are within the UDA including one in PPU 1, one in PPU 4, and six in PPU 8. Two hundred and two are outside the UDA, including 191 in PPU 6 and 11 in PPU 7.

Model Assumptions

- Greater sandhill cranes travel limited distances to foraging sites from night roost areas. The average distance traveled was 0.88 mile (range 0.17 to 1.89 miles) (Ivey and Herziger 2003) and 1.74 miles (Pogson 1990) between roost sites and foraging areas.
- The size of roost sites is variable. Sandhill cranes roosting in Oregon used sites between 1 and 300 acres (0.5 and 120 hectares).
- Littlefield (1993) recommended roost sites should be at least 20 acres (8 hectares).
- Greater sandhill crane use in the Plan Area principally occurs in the Cosumnes Floodplain (Sloat, as cited in SSHCP Appendix B).

Greater Sandhill Crane Habitat Model

Modeled night roosting habitat is Vernal Pool, Seasonal Wetland, and Freshwater Marsh within 2 miles of greater sandhill crane occurrences per discussion with USFWS staff and CDFW staff (Gardner, pers. comm. 2010; Adelsbach, pers. comm. 2010). This element of the species' model is consistent with the *Conservation Assessment for Greater Sandhill Cranes Wintering on the Cosumnes River Floodplain and Delta Regions of California* (Littlefield and Ivey 2000), although extends beyond the Cosumnes River Floodplain within the Plan Area. Modeled foraging habitat is Cropland, Irrigated Pasture-Grassland, Valley Grassland, Seasonal Wetland, and Freshwater Marsh within 1.75 miles of modeled roosting habitat.

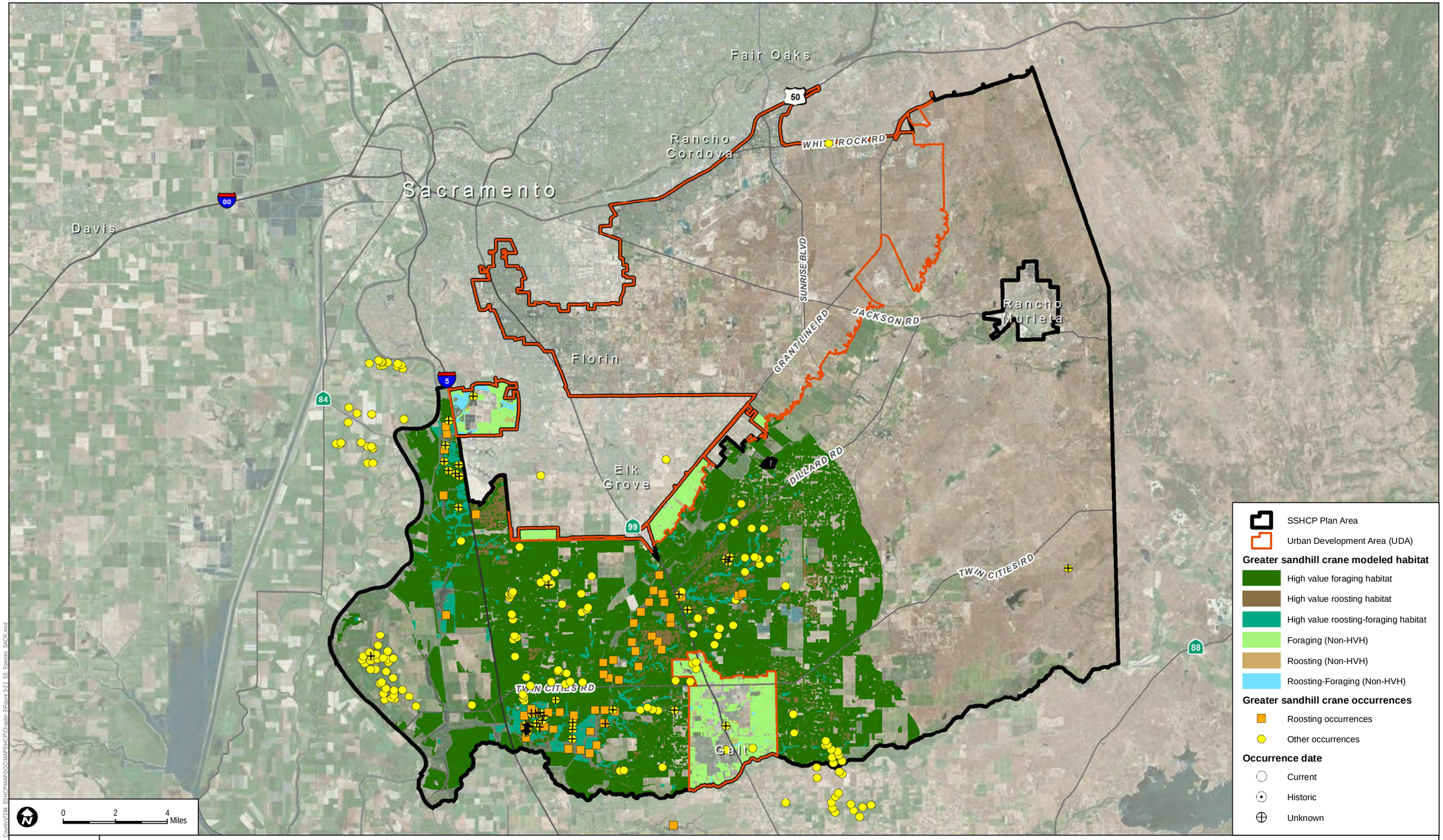
High-value habitat for greater sandhill crane is defined as modeled habitats above sea level and outside the UDA (i.e., modeled habitats within the UDA are excluded).

Figure 3-22 illustrates the location of modeled habitat as well as the documented occurrences of greater sandhill crane within the Plan Area.

Loggerhead Shrike (*Lanius ludovicianus*)

Habitat Requirements

Loggerhead shrikes occur in dry, open habitats including grasslands, pastures with fence rows, agricultural fields, open woodlands (savannas), scrub, and riparian areas. They inhabit open areas with clear visibility for hunting, perches for scanning, and scattered small trees and large shrubs for nesting. Loggerhead shrikes typically avoid completely treeless and shrubless areas (Cade and Woods 1997), as well as urbanized and densely wooded areas (Grinnell and Miller 1944). Winter foraging habitat is similar to summer breeding and foraging habitat, however, shrikes also use idle pastures and hayfields during the winter (Bartgis 1992).



SOURCE: Bing Maps, County of Sacramento 2014, TNC 2000, Ivey 2003, Pogson & Lindstedt 2005, ebird.org, ICF 2013

FIGURE 3-22

Greater Sandhill Crane Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale; suitable habitat for nesting include Mine Tailing Riparian Woodland, Mixed Riparian Scrub, and Valley Grassland (Table 3-2).

Occurrences within the Plan Area

There are 34 documented occurrences of loggerhead shrike within the Plan Area. Seven are within the UDA including two in PPU 1, one in PPU 2, two in PPU 3, one in PPU 4, and one in PPU 8. Twenty-seven occurrences are outside of the UDA, including three in PPU 5, 15 in PPU 6, seven in PPU 7, and two that are not within a PPU.

Model Assumptions

- In mainland California, the average size of territories averaged 21 acres (9 hectares) and ranged between 11 acres (4 hectares) and 40 acres (16 hectares) (Yosef 1996).
- Loggerhead shrikes occur year-round in suitable habitat throughout the Plan Area. They are probably regular breeders in the Plan Area in low densities (Trochet, pers. comm. 2004); however, their overall distribution, abundance, and population structure are not well known.

Loggerhead Shrike Habitat Model

Modeled foraging habitat is Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale throughout the Plan Area. Modeled nesting habitat is Mine Tailing Riparian Woodland, Mixed Riparian Scrub, and Valley Grassland throughout the Plan Area.

Figure 3-23 illustrates the location of modeled habitat as well as the documented occurrences of loggerhead shrike within the Plan Area.

Northern Harrier (*Circus cyaneus*)

Habitat Requirements

Northern harrier breeds in a variety of open grassland, wetland, and agricultural habitats. Open wetland habitats used for breeding include marshy meadows, wet and lightly grazed pastures, and freshwater and brackish marshes. Northern Harrier breeding habitat also includes dry upland habitats, including grasslands, croplands, drained marshlands, and shrub-steppe in cold deserts.

Although Midwestern populations use wetland habitats more frequently, western populations tend to use upland habitats (e.g., grasslands) disproportionately. Northern harriers winter throughout California where suitable habitat occurs. Wintering habitat includes open areas dominated by herbaceous vegetation, including grasslands, pastures, croplands, coastal sand dunes, brackish and freshwater marsh, and estuaries. Northern harriers rarely occur in forested areas (Grinnel and Miller 1944; MacWhirter and Bildstein 1996; Martin 1987).

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, Swale, and Freshwater Marsh. Suitable habitat for nesting includes Cropland, Irrigated Pasture-Grassland, and Valley Grassland (Table 3-2).

Occurrences within the Plan Area

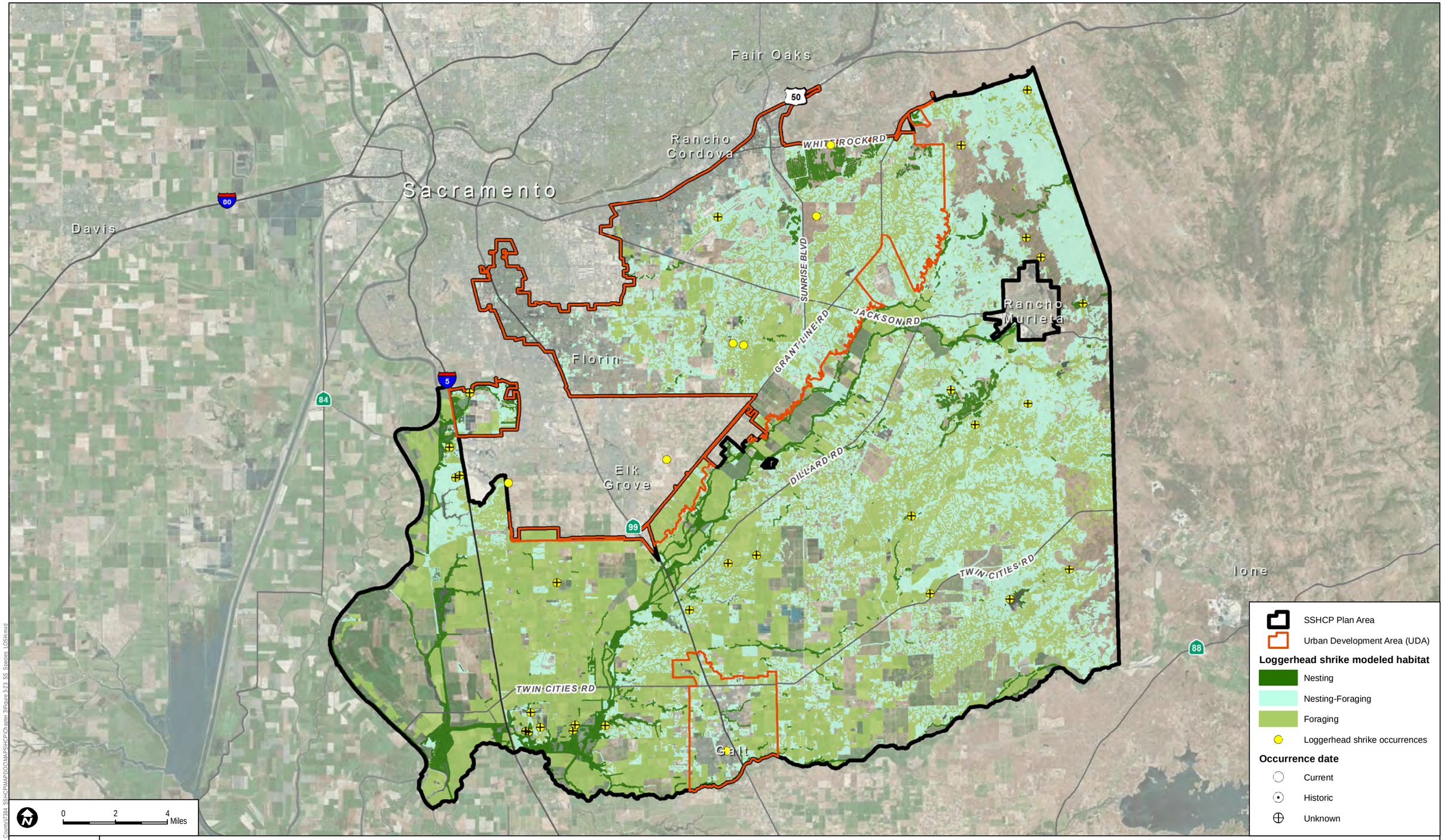
There are 70 documented occurrences of northern harrier within the Plan Area. Twelve are within the UDA including, four in PPU 1, two in PPU 2, two in PPU 3, two in PPU 4, and two in PPU 8. Fifty-eight occurrences are outside of the UDA, including five in PPU 5, 42 in PPU 6, seven in PPU 7, and four that are not within a PPU.

Model Assumptions

- Reported territory sizes for males range from 2 to 272 acres (0.8 to 110 hectares); females typically defend a smaller territory (Martin 1987; Simmons 1983).
- During the breeding season, reported average home range sizes from eight studies were 420 to 37,067 acres (170 to 15,000 hectares) (MacWhirter and Bildstein 1996).
- Males reportedly will hunt ≥10 kilometers (≥6 miles) from the nest (Barnard 1983; Thompson-Hanson 1984).
- Northern harriers occur in suitable habitat within the Plan Area and are probably regular breeders (Trochet, pers. comm. 2004); however, their overall range, abundance, and population structure are not well known.

Northern Harrier Habitat Model

Modeled foraging habitat is Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, Swale, and Freshwater Marsh throughout the Plan Area. Modeled nesting habitat is Cropland, Irrigated Pasture-Grassland, and Valley Grassland throughout the Plan Area.



SOURCE: Bing Maps, County of Sacramento 2012

FIGURE 3-23

Loggerhead Shrike Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Figure 3-24 illustrates the location of modeled habitat as well as the documented occurrences of northern harrier within the Plan Area.

Swainson's Hawk (*Buteo swainsoni*)

Habitat Requirements

In the Central Valley of California, there are about 25 different tree species that have been utilized for nesting (CDFG 2010). The most common nest trees are Fremont's cottonwood (*Populus fremontii*), oaks (*Quercus* spp.), willows (*Salix* spp.), walnuts (*Juglans* spp.), eucalyptus (*Eucalyptus* spp.), pines (*Pinus* spp.), and Deodar cedar (*Cedrus deodara*). Most nest trees are associated with riparian systems. Schlorff and Bloom (1984) found 87% of all Swainson's hawk's nests in the Central Valley to be associated with riparian systems. Within his study area in parts of Yolo, Sacramento and San Joaquin Counties, Estep (1989) found 78% of nest trees to be in riparian systems. Swainson's hawk's nests are also found well away from waterways in lone trees in fields and pastures, in trees along roadside edges, in small groves, around farm buildings, and in some urban areas. Nest trees can also be found in proximity to farm buildings (Bloom 1980; Swolgaard 2004), often in large, well-established, exotic tree species or relict natives.

Nesting in completely urbanized areas is an unusual phenomenon that has recently been discovered in some particular urban settings: 1979 in Davis and 1983 in Stockton (D. Yee, pers. comm. 2004). Urban-nesting always occurs in association with suitable foraging habitat being relatively close to the nest (e.g., Stockton and Davis are surrounded in all directions by high-quality foraging habitat in suitable agricultural crops) (Holt pers. obs., as cited in SSHCP Appendix B).

Swainson's hawks forage successfully in a variety of farming habitats. Alfalfa is the crop that provides the highest foraging value due to high prey densities and regular harvesting and irrigation that make prey available for capture. However, a variety of suitable farming habitats also provide valuable foraging habitats at differing times and for different prey species during the period of time when Swainson's hawks are in the Plan Area. This mosaic of suitable foraging habitats provides the best opportunity for regular and successful hunting during the nesting season (Holt pers. obs., as cited in SSHCP Appendix B).

Dry pasture is largely comprised of annual grassland land covers and is grazed primarily by cattle during some part of the year. A large portion of the Swainson's hawk's historical habitat is believed to be similar to dry pasture, although the prey species, their abundance, and availability are likely quite different today as introduced grasses and forbs and introduced grazers now dominate this habitat (Holt pers. obs., as cited in SSHCP Appendix

B). Therefore, direct comparisons with historical conditions should be considered with caution. Swolgaard (2004) observed Swainson's hawks foraging in grassland habitats, but noted that its frequency of use was lower than expected based on its availability.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale. Suitable habitat for nesting includes mixed Riparian Woodland and Mixed Riparian Scrub (Table 3-2).

Occurrences within the Plan Area

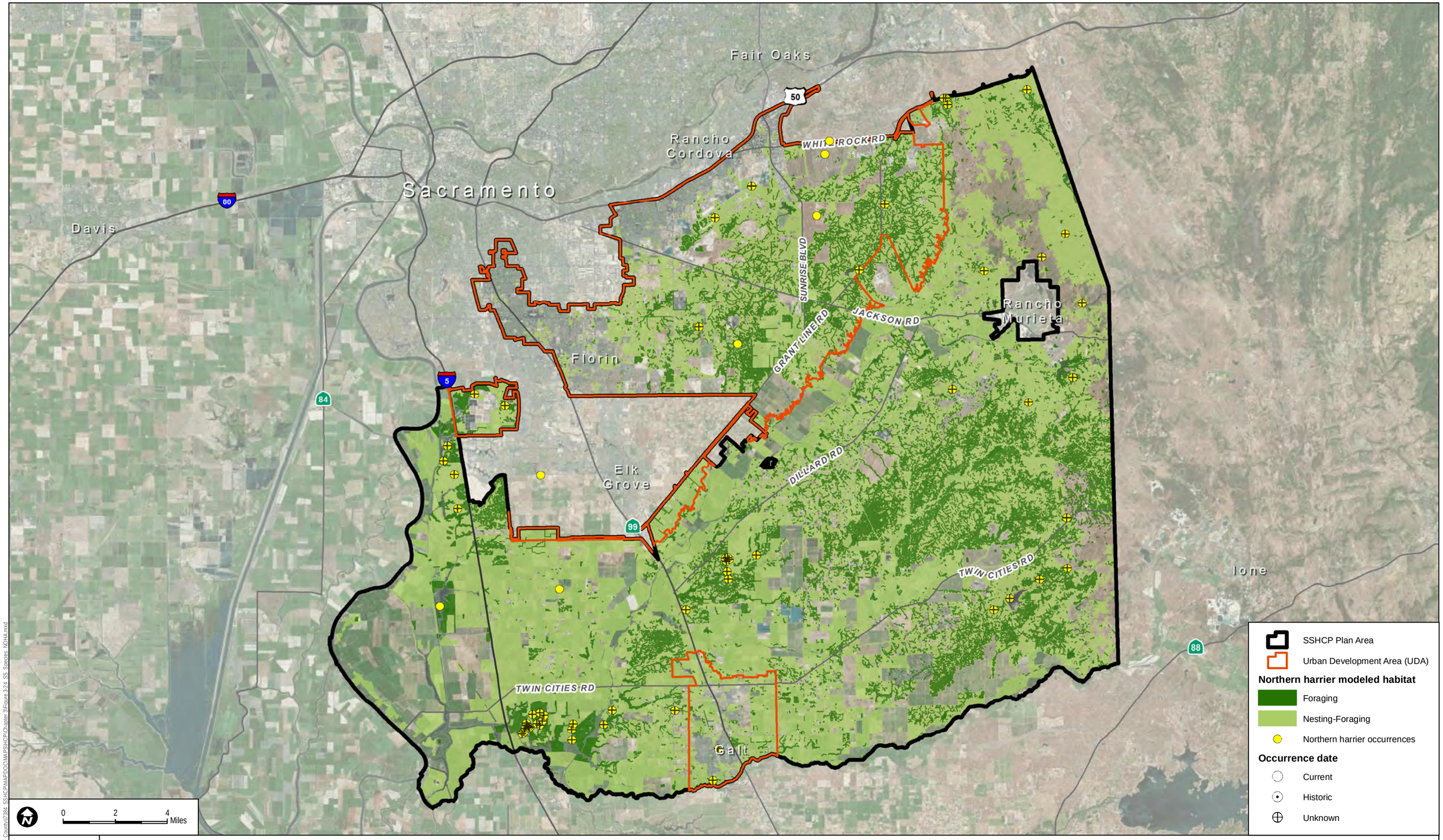
There are 410 documented occurrences of Swainson's hawk within the Plan Area. Sixty-two are within the UDA, including 10 within PPU 1, five in PPU 2, eight in PPU 3, 17 in PPU 4, 20 in PPU 8, and two that are not within a PPU. Three hundred and forty either are outside of the UDA, including 35 in PPU 5, 284 in PPU 6, 28 in PPU 28, and one that in not within a PPU.

Model Assumptions

- Radio-tagged male Swainson's hawks were recorded to travel as far as 17 miles (Estep 1989) and 18 miles (Babcock 1995) from a nest to exploit more favorable agricultural foraging opportunities.
- Estep (1989) found mean home ranges to be 6,818 acres. While Babcock (1995) plotted out 9,978 acres as the mean home range in his study area in eastern Yolo County.
- Swainson's hawks are typically not found at elevations above 500 feet in Sacramento County (Gifford et al. 2012).
- Swainson's hawk occurrences are recorded throughout the Plan Area (CDFG 2010; ebird.org 2005–2010; Estep 2006 and 2007; Gill Ranch Survey 2003).

Swainson's Hawk Habitat Model

Modeled foraging habitat is Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale throughout the Plan Area at elevations below 500 feet. Modeled nesting habitat is mixed Riparian Woodland and Mixed Riparian Scrub throughout the Plan Area at elevations below 500 feet.



SOURCE: Bing Maps, County of Sacramento 2014, ebird.org

FIGURE 3-24

Northern Harrier Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

Path: Z:\Projects\Sacramento County\2304 SSHCP\MAPDOC\MAPS\HCP\Chapter 3\Figure 3-24_SS_Species_NOHA.mxd

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High-value habitat for Swainson's hawk is defined by the SSHCP as modeled foraging habitat occurring in the western portion of the Plan Area (within PPUs 4, 6, and 8).

Figure 3-25 illustrates the location of modeled habitat as well as the documented occurrences of Swainson's hawk within the Plan Area.

Tricolored Blackbird (*Agelaius tricolor*)

Habitat Requirements

During the breeding season, tricolored blackbirds typically nest in dense colonies (some estimated as having 200,000+ nests), with males defending small territories and mating with one to four females (Beedy and Hamilton 1999). They are also considered itinerant breeders, sometimes nesting more than once at different locations during the breeding season. Studies by Neff (1937) reported that nesting colonies are often located in seasonal wetlands with tules and cattails present. More recent studies indicate that nesting colonies are also regularly found in Himalayan blackberries (*Rubus discolor*) (Cook 1999) and grain fields (DeHaven 2000). Other substrates where they have been observed nesting include giant European reed (*Arundo donax*), safflower (*Carthamus tinctorius*) (DeHaven et al. 1975), tamarisk (*Tamarix* spp.), elderberry (*Sambucus* spp.), poison-oak (*Toxicodendron diversilobum*), and riparian scrublands and forests (e.g., *Salix, Populus*, and *Fraxinus* spp.) (American Birds file data).

Tricolored blackbird foraging habitats in all seasons include annual grasslands, wet and dry vernal pools and other seasonal wetlands, agricultural fields (such as large tracts of alfalfa and pastures with continuous haying schedules, and recently tilled fields), cattle feedlots, and dairies. They also forage occasionally in Mixed Riparian Scrub habitats along marsh borders. Weed-free row crops, intensively managed vineyards, and orchards do not serve as regular foraging sites (Beedy and Hamilton 1997, 1999; DeHaven 2000).

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, Swale, Freshwater Marsh, and Open Water. Suitable habitat for nesting includes Cropland, Valley Grassland, Seasonal Wetland, and Freshwater Marsh (Table 3-2).

Occurrences within the Plan Area

There are 36 documented occurrences of tricolored blackbird within the Plan Area. Twenty-two occurrences are within the UDA, including three in PPU 2, 15 in PPU 3, one in PPU 4, and three

that are not within a PPU. Fourteen occurrences are outside of the UDA, including three in PPU 5, four in PPU 6, five in PPU 7, and two that are not within a PPU.

Model Assumptions

- Over the past couple of decades tricolored blackbird colony sites have been documented throughout the Plan Area.
- DeHaven et al. (1975) banded 33,058 nestlings and only 39% of band recoveries were re-located within 16 kilometers (10 miles) of natal colonies.
- Most tricolored blackbirds forage within five kilometers (three miles) of their colony sites (Orians 1961), but commute distances of up to 13 kilometers (8 miles) have been reported (Hamilton, pers. comm. 2004).

Tricolored Blackbird Habitat Model

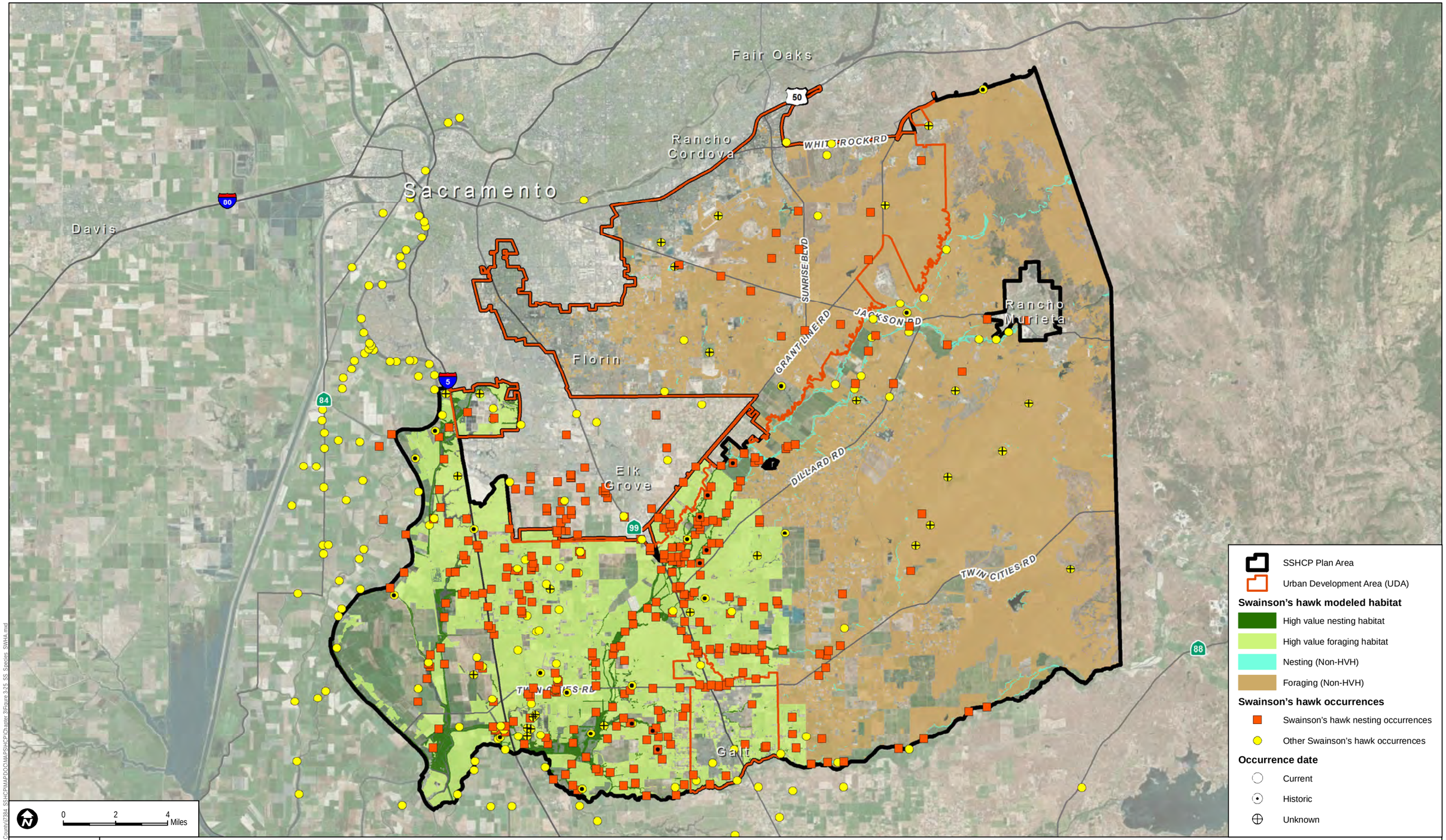
Modeled foraging habitat is Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, Swale, Freshwater Marsh, and Open Water throughout the Plan Area. Modeled nesting habitat is Cropland, Valley Grassland, Seasonal Wetland, and Freshwater Marsh throughout the Plan Area.

Figure 3-26 illustrates the location of modeled habitat as well as the documented occurrences of tricolored blackbird within the Plan Area.

Western Burrowing Owl (*Athene cunicularia hypugaea*)

Habitat Requirements

The most important habitat consideration for burrowing owls is the availability of underground burrows throughout their life cycle. Throughout their range, they use burrows excavated by fossorial mammals or reptiles (Karalus and Eckert 1987). Where the number and availability of natural burrows are limited, owls may occupy other natural and unnatural sites such as rock outcrops (Gleason and Johnson 1985; Rich 1986), concrete and asphalt (Trulio 1994), cavities under piles of rubble, drainage culverts, discarded pipe and other tunnel-like structures, and human-made artificial burrows (Collins and Landry 1977).



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SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, BIOS 2012, ESTEP Environmental 2006, ebird.org

FIGURE 3-25

Swainson's Hawk Modeled Habitat and Documented Occurrences

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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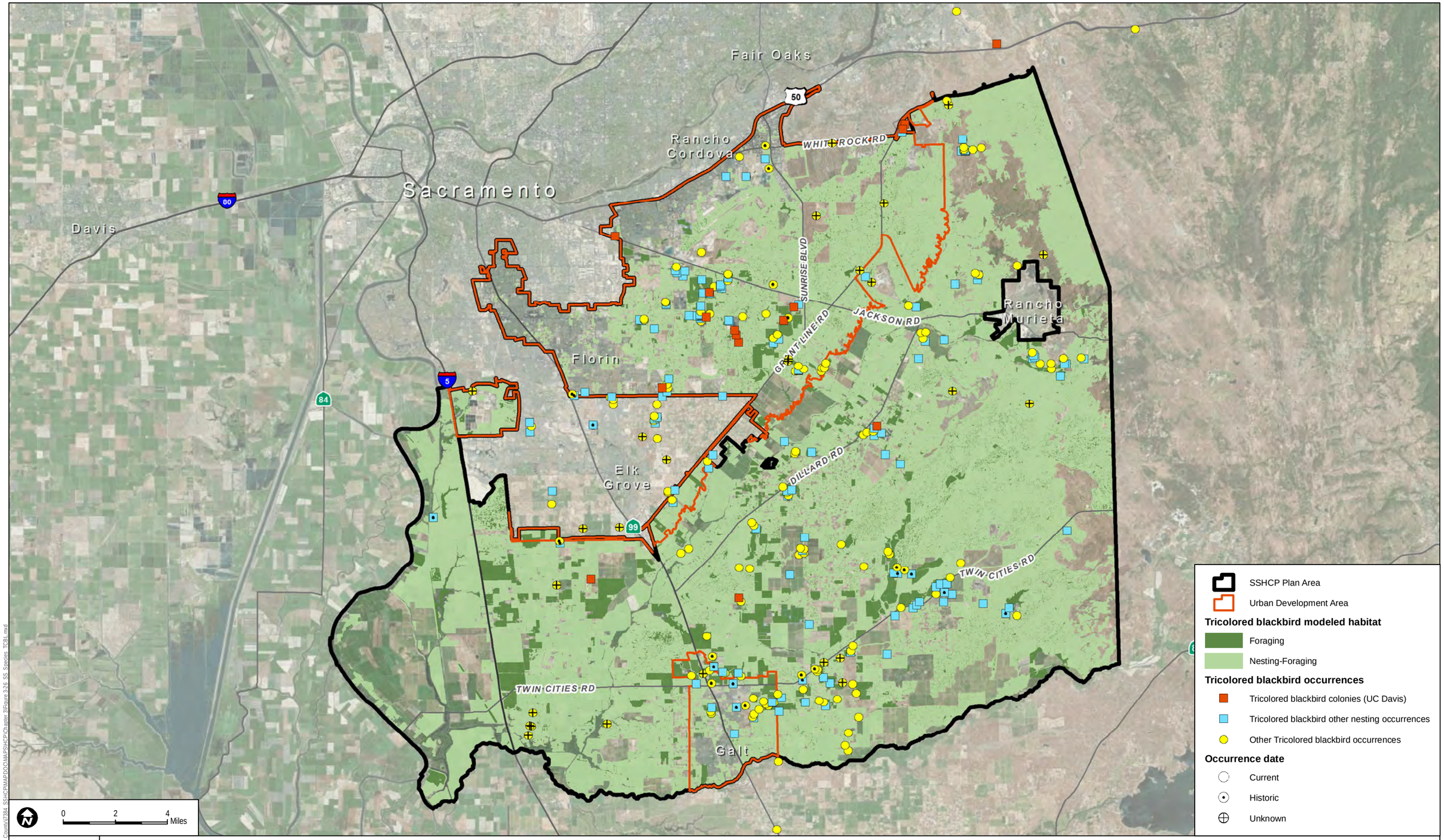

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SOURCE: Bing Maps, County of Sacramento 2014, UC Davis 2014, CDFG 2012, BIOS 2012, Lizette Cook 1997, ebird.org

FIGURE 3-26

Tricolored Blackbird Modeled Habitat and Documented Occurrences

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Over their range, burrowing owls inhabit grasslands, deserts, sagebrush scrub, agricultural areas (including pastures and untilled margins of Cropland), earthen levees and berms, coastal uplands, and urban vacant lots, as well as the undeveloped margins of airports, golf courses, roads, and railroad beds. In California, the four cover types most frequently occupied by burrowing owls are: grasslands adjacent to intensive agriculture; intensive agriculture where owls nest along irrigation banks; large, unfragmented grasslands; and small grassland and ruderal patches surrounded by and adjacent to urban development (Rosenberg and DeSante 1997; Rosenberg and Haley 2004).

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable foraging habitat based on life history descriptions include Blue Oak Savanna, Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, Swale, and Stream/Creek (VPIH); suitable habitat for nesting include Valley Grassland, Blue Oak Savanna, Cropland, and Irrigated Pasture-Grassland (Table 3-2).

Occurrences within the Plan Area

There are 97 documented occurrences of western burrowing owl within the Plan Area. Thirty-six are within the UDA, including two in PPU 1, 16 in PPU 2, two in PPU 3, 12 in PPU 4, and four that are not within a PPU. Sixty-one are outside of the UDA, including three in PPU 1, one in PPU 5, 30 in PPU 6, 23 in PPU 7, and four that are not within a PPU.

Model Assumptions

- During the breeding season, adult male Burrowing Owls have been documented foraging over a range of 0.8 to 1.2 square miles (2 to 3 square kilometers) (Haug and Oliphant 1987), and primarily within 0.4 mile (600 meters) of the nest burrow (Gervais et al. 2003; Rosenberg and Haley 2004).
- In two burrowing owl demography studies conducted in the San Francisco Bay Area, owls moved an average distance of 0.5 to 0.9 mile (0.8 to 1 kilometers) between breeding seasons. Of this sample population, 27% remained at the same nest site; 14% dispersed less than 265 feet (81 meters) away; 34% dispersed 0.05 to 0.5 mile (80 to 805 meters); 8% dispersed 0.5 to 1.0 mile (805 meters to 2 kilometers); 14% dispersed 1 to 5 mile (2 to 8 kilometers); and 2% moved 5 to 10 miles (8 to 16 kilometers) (Chromczak unpublished data, cited in CBD et al. 2003).
- Western burrowing owls occur in suitable habitat throughout the Plan Area; however, their overall distribution, abundance, and population structure are not well known.

- Although burrowing owl populations have declined or disappeared from much of their historical habitat, outlying areas of Sacramento County still provide suitable habitat for the species. Burrowing owls are known to occupy patches of habitat in the western part of the Plan Area that extend from the Sacramento Regional County Sanitation District Bufferlands (Jones, pers. comm. 2004) to The Nature Conservancy's Cosumnes River Preserve (Reiner, pers. comm. 2004), as well as patches of habitat in the rolling grasslands in eastern Sacramento County. The Meadowview and Pocket areas within the City of Sacramento (outside the Plan Area) support disjunct, isolated populations north to Florin Road.

Western Burrowing Owl Habitat Model

Modeled wintering habitat is Blue Oak Savanna, Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, Swale, and Stream/Creek (VPIH) throughout the Plan Area. Modeled nesting habitat is Valley Grassland, Blue Oak Savanna, Cropland, and Irrigated Pasture-Grassland throughout the Plan Area.

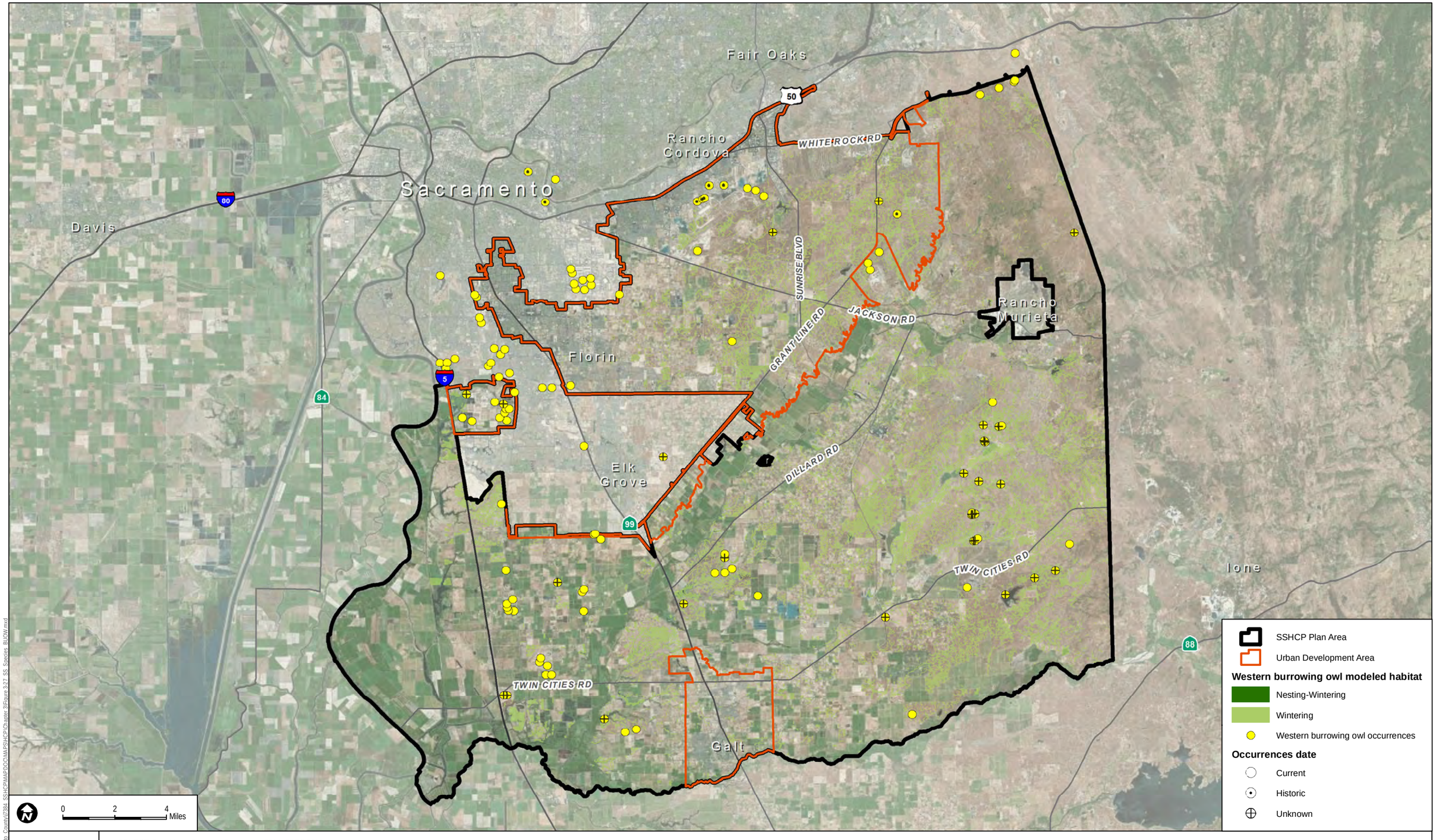
Figure 3-27 illustrates the location of modeled habitat as well as the documented occurrences of western burrowing owl within the Plan Area.

White-Tailed Kite (*Elanus leucurus*)

Habitat Requirements

White-tailed kites generally inhabit low-elevation grasslands, wetlands dominated by grasses, oak woodlands, and agricultural and riparian areas (Dunk 1995). Nest sites are rarely found in isolated trees. They are usually located on the edge of riparian habitats, or in hedgerows and groups of trees, and are commonly found adjacent to natural vegetation, pasture crops (alfalfa) and sugar beets (Sloat, as cited in SSHCP Appendix B).

White-tailed kites use a variety of habitat types for foraging and the importance of these habitats is dependent on vegetation structure and prey abundance. Lightly grazed or ungrazed grasslands/pastures support larger prey populations and are thus considered more suitable, although intensively cultivated areas are also used (Dunk 1995). In cultivated areas, perennial crops such as alfalfa and sugar beets tend to support higher prey numbers, and White-tailed kite nest densities have been highly correlated with these two crops (Erichsen et al. 1994). Warner and Rudd (1975) reported that foraging primarily occurred in two habitat types, riparian and irrigated cultivated land (e.g., alfalfa, tomatoes, sugar beets).



SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, Chris Conrad 2004, Ebird.org, TNC

FIGURE 3-27

Western Burrowing Owl Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Blue Oak Savanna, Cropland, Irrigated Pasture-Grassland, Valley Grassland, Mixed Riparian Scrub, Vernal Pool, Seasonal Wetland, and Swale. Suitable habitat for nesting include Blue Oak Woodland, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub (Table 3-2).

Occurrences within the Plan Area

There are 62 documented occurrences of white-tailed kite within the Plan Area. Twenty are within the UDA including two in PPU 1, seven in PPU 2, four in PPU 3, two in PPU 4, one in PPU 8, and four that are not within a PPU. Forty-two are outside the UDA, including five in PPU 5, 34 in PPU 6, and three that are not within a PPU.

Model Assumptions

- Territory sizes estimated along the south coast of California near Long Beach ranged from 22 to 128 acres (nine to 52 hectares) (Waian 1973) and near San Diego from 42 to 217 acres (17 to 88 hectares) (Henry 1983).
- During winter and the breeding season, Warner and Rudd (1975) found foraging from nest or perch sites extended up to 2 miles, but most were less than 0.6 mile.
- No regularly occurring surveys have been conducted throughout the SSHCP Study Area, however, White-tailed kites are known to nest or forage throughout the Study Area (Conard, pers. comm. 2004).

White-Tailed Kite Habitat Model

Modeled foraging habitat is Blue Oak Savanna, Cropland, Irrigated Pasture-Grassland, Valley Grassland, Mixed Riparian Scrub, Vernal Pool, Seasonal Wetland, and Swale throughout the Plan Area. Modeled nesting habitat is Blue Oak Woodland, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub throughout the Plan Area.

Figure 3-28 illustrates the location of modeled habitat as well as the documented occurrences of white-tailed kite within the Plan Area.

3.4.6 Mammals

American Badger (*Taxidea taxus*)

Habitat Requirements

American badger occurs in a variety of open habitats, including grasslands, shrublands, savannas, and meadows. The Plan Area is within American badger's range in California. American badgers have been documented in the northeastern portion of the Plan Area.

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat based on life history descriptions include Blue Oak Savanna, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale (Table 3-2).

Occurrences within the Plan Area

There are nine documented occurrences of American badger within the Plan Area. Eight are within the UDA, including one in PPU 1 and seven in PPU 2. One occurrence is outside of the UDA in PPU 1.

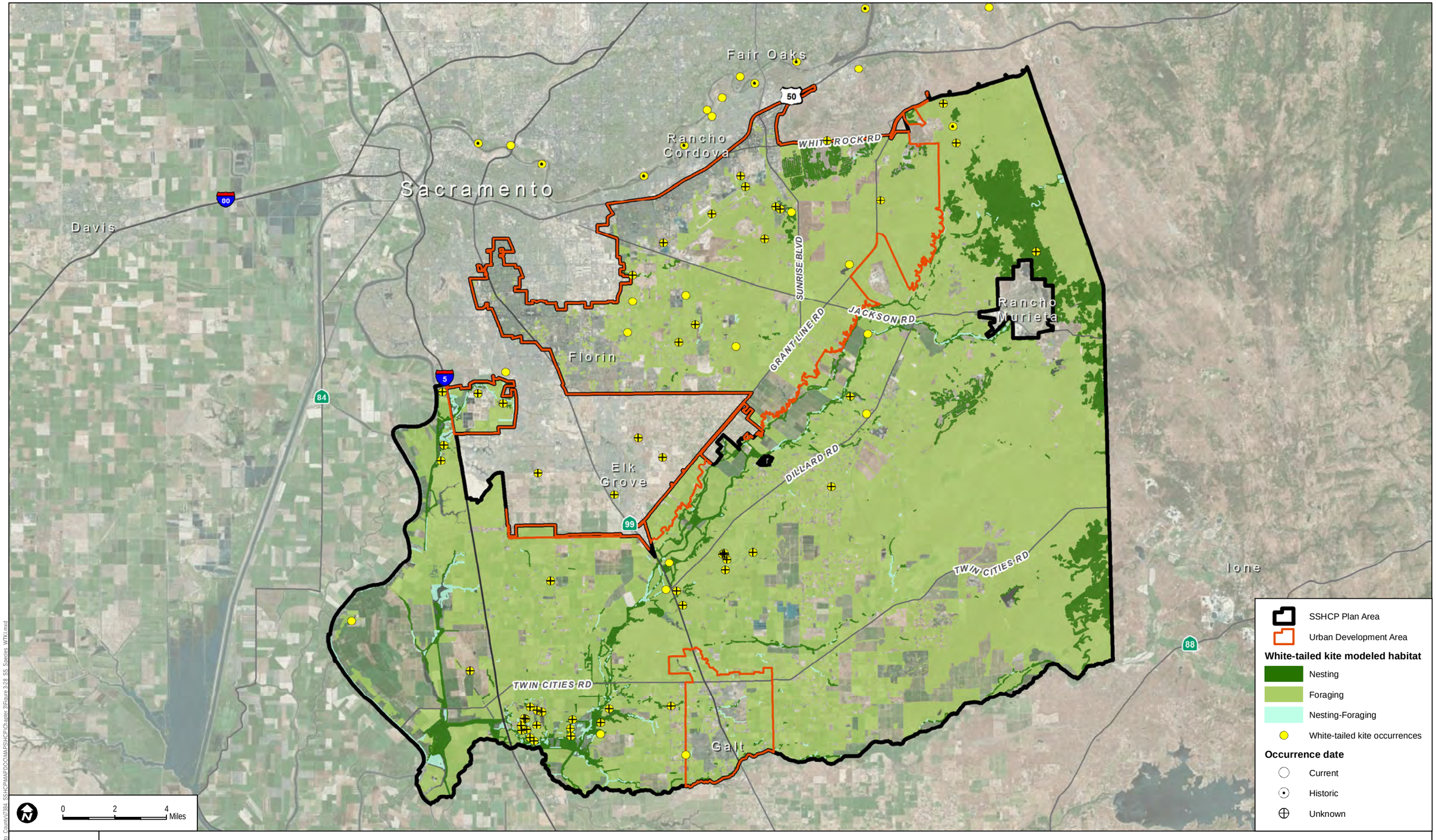
Model Assumptions

- Female and male home range sizes in Utah have been estimated at 338–751 acres and 1,327–1,549 acres, respectively (Lindzey 1978). In Idaho, female and male badger home ranges averaged 400 acres and 600 acres, respectively (Messick and Hornocker 1981).
- The SSHCP Study Area is positioned within American badger's California range; and Badgers have been documented in the northeastern portion of the Plan Area.
- Badgers require large relatively undisturbed areas; therefore, primary habitat occurs in the eastern grasslands and rangelands of the Plan Area.

American Badger Habitat Model

Modeled habitat is Blue Oak Savanna, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale within rural portions of the Plan Area.

Figure 3-29 illustrates the location of modeled habitat as well as the documented occurrences of American badger within the Plan Area.



SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012, ESTEP 2006, ebird.org

FIGURE 3-28

White-Tailed Kite Modeled Habitat and Documented Occurrences

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

NOTE: Historic occurrences are observations prior to 1990. CNDDB points are centroids of CNDDB polygons of variable certainty.

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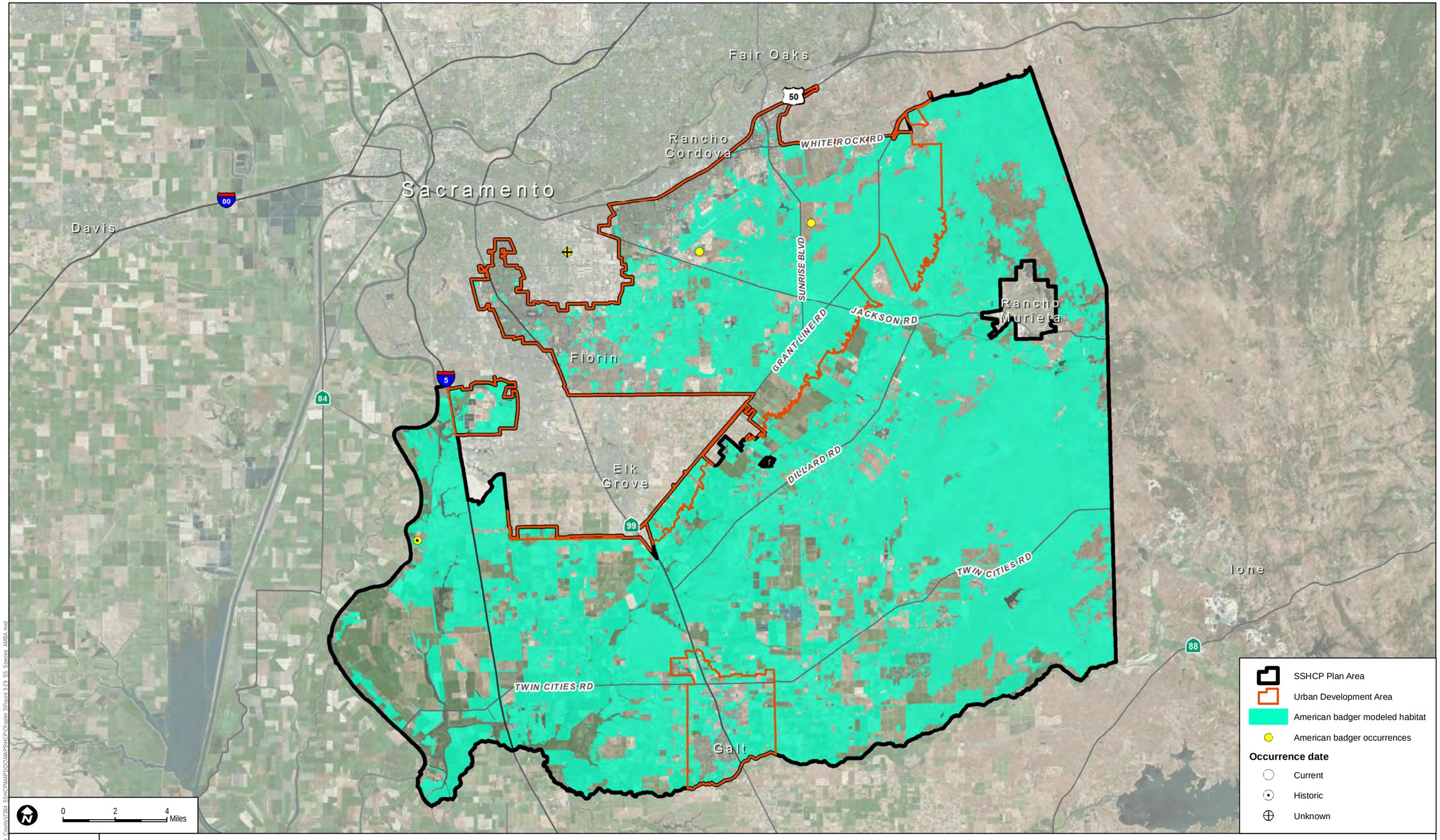

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SOURCE: Bing Maps, County of Sacramento 2014, CDFG 2012

FIGURE 3-29

American Badger Modeled Habitat and Documented Occurrences

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Western Red Bat (*Lasiurus blossevillii*)

Habitat Requirements

Western red bat roosts in the foliage of large shrubs and trees in habitats bordering forests, rivers, agricultural areas, and urban areas (Harvey et al. 1999). Roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas with mature trees (Western Bat Working Group 1998). Pierson et al. (1999) describe roosting habitat as large diameter riparian cottonwoods and sycamores, and older orchard trees (particularly walnuts).

Foraging has been noted in habitats such as mature orchards, oak woodland, low elevation conifer forest, and non-native trees in urban and rural residential areas. In addition, this species may forage in habitats adjacent to streams and rivers that do not provide roosting habitat. Water features are a vital habitat component because bats often drink immediately after emergence and water is an important source of concentrated insects (Johnson, as cited in SSHCP Appendix B).

Land Cover Types Relevant to Habitat Requirements

SSHCP land cover types that provide suitable habitat for foraging based on life history descriptions include Valley Grassland, Blue Oak Woodland, Blue Oak Savanna, Orchard, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, Mixed Riparian Scrub, Vernal Pool, Seasonal Wetland, Swale, Freshwater Marsh, Open Water, and Stream/Creek. Suitable habitat for roosting include Blue Oak Woodland, Blue Oak Savanna, Orchard, Mine Tailing Riparian Woodland, and Mixed Riparian Woodland (Table 3-2).

Occurrences within the Plan Area

There are seven documented occurrences of western red bat within the Plan Area. Five are within the UDA including one in PPU 2, one in PPU 8 and three that are not within a PPU. Two occurrences are outside of the UDA including one in PPU 5 and one in PPU 7.

Model Assumptions

- Data regarding reported territory sizes and distances traveled between roosting and foraging sites is not available.
- Fifty-six records for the western red bat (1977 to 2002) varied in location precision from "Sacramento County" to "Sacramento" to an actual address. Over 30 western red bats were from localities reported as the City of Sacramento, Folsom, Rancho Cordova, Wilton, Elk Grove, and Galt (Constantine, unpubl. data 2004).

Western Red Bat Habitat Model

Modeled foraging habitat is Valley Grassland, Blue Oak Woodland, Blue Oak Savanna, Orchard, Mine Tailing Riparian Woodland, Mixed Riparian Woodland, Mixed Riparian Scrub, Vernal Pool, Seasonal Wetland, Swale, Freshwater Marsh, Open Water, and Stream/Creek throughout the Plan Area. Modeled roosting habitat is Blue Oak Woodland, Blue Oak Savanna, Orchard, Mine Tailing Riparian Woodland, and Mixed Riparian Woodland throughout the Plan Area.

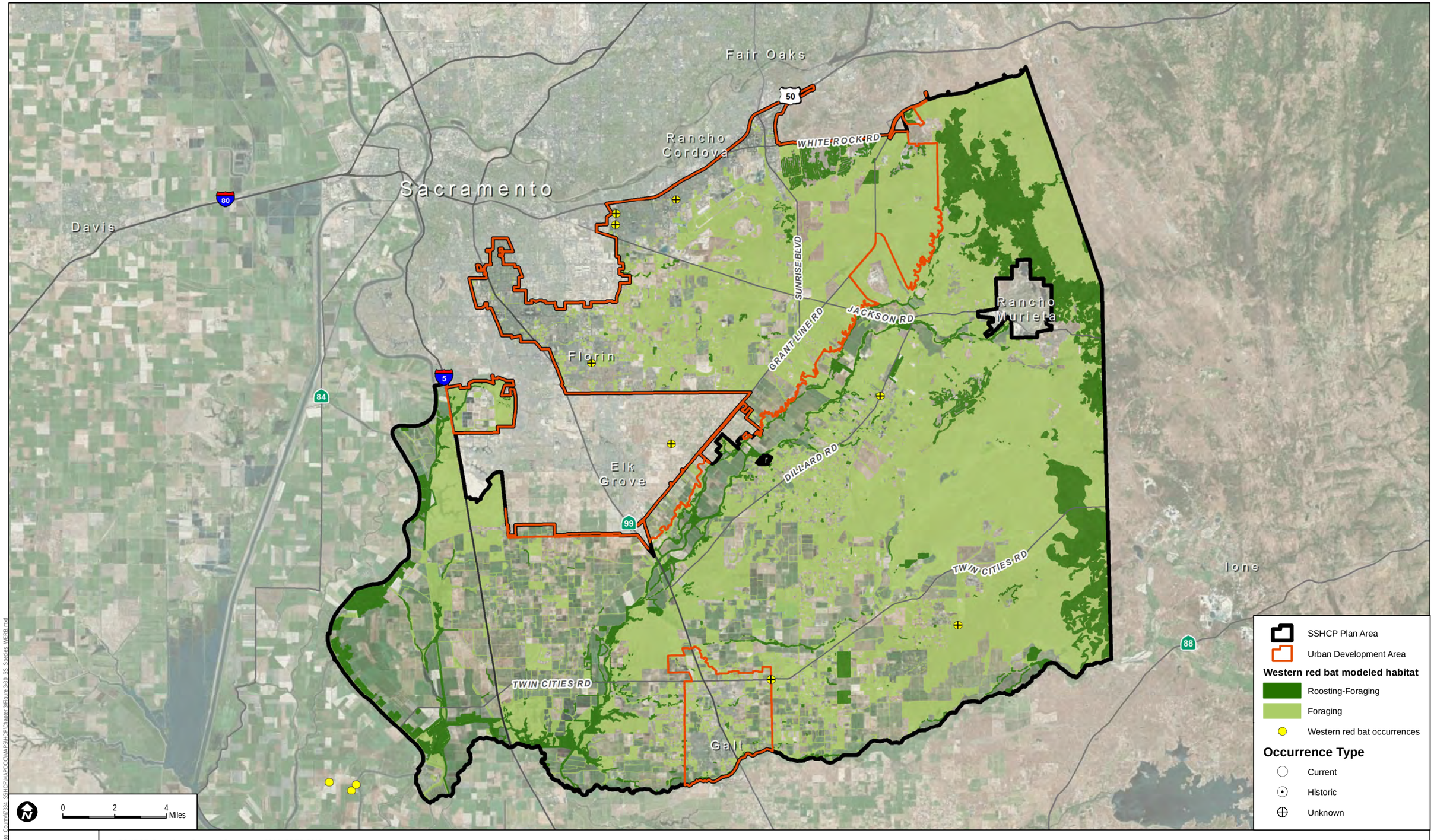
Figure 3-30 illustrates the location of modeled habitat as well as the documented occurrences of western red bat within the Plan Area.

3.5 Existing Preserves in the Plan Area

The Plan Area includes several established existing Preserves both inside and outside of the UDA. Existing Preserves within the Plan Area totals approximately 64,500 acres and includes wildlife refuges, nature preserves, lands under conservation easements, conservation/mitigation banks, and individual project mitigation sites. Of the approximately 64,500 acres of existing Preserve, approximately 3,170 acres are inside the UDA and about 61,330 acres are outside the UDA (Figure 3-40).

The largest grouping of existing Preserves inside the UDA occurs in the Sacramento Valley Vernal Pool Prairie Preserve area located south of Jackson Highway between Excelsior and Eagles Nest roads north of Grant Line Road in PPU 3. The Preserve area includes lands under conservation easement or owned by the Sacramento Valley Conservancy, two conservation or mitigation banks: Arroyo Seco, Bryte Ranch, and other mitigation sites. Other sites with permanent conservation easements are scattered throughout the UDA, with concentrations occurring along northern Laguna Creek, sites within the City of Rancho Cordova, at the Sacramento Regional County Sanitation District Bufferlands and at the Keifer Landfill Bufferlands. Preserved lands at the Sacramento Regional County Sanitation District Bufferlands are on termed easements.

Outside of the UDA, significant Preserves and conservation banks are established west of Interstate 5 (PPU 6), within the Cosumnes River floodplain (PPU 6), and in eastern Sacramento County (PPU 7). Major Preserves larger than 500 acres include the Stone Lakes National Wildlife Refuge, Deer Creek Hills, Chance Ranch, Borden Ranch, Snyder Preserve, Clay Station Conservation Bank, Laguna Terrace Conservation Bank, Gill Ranch Conservation Bank, Elliot mitigation site, Delta Meadows, Sacramento Municipal Utilities District (SMUD) mitigation site, and the Cosumnes River Preserve. Smaller conservation sites are distributed within the Cosumnes River and Deer Creek corridor, eastern Sacramento County grasslands, and agricultural lands west of State Route 99. In addition to established Preserves, the conservation network outside of the UDA includes conservation/mitigation banks with available conservation credits approved by USFWS and the U.S. Army Corps of Engineers.



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

FIGURE 3-30

Western Red Bat Modeled Habitat and Documented Occurrences

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Because existing Preserves generally are located in areas with high resource value, they will provide important existing "building blocks" that the SSHCP Plan Permittees considered during the development of the SSHCP Conservation Strategy, including the proposed SSHCP Preserve System. As discussed in Chapter 7, the SSHCP Conservation Strategy supplements, complements, and links together the existing Preserves by establishing new SSHCP Preserves adjacent to these existing Preserves. Although the Implementing Entity will use existing Preserves to build from, the SSHCP does not count acres of existing Preserves toward achieving the SSHCP Biological Goals and Objectives, and the SSHCP does not seek conservation "credits" for the existing Preserves. Nonetheless, the existing Preserves have conserved resources within the Plan Area, and help to inform the development of the SSHCP conservation strategy by providing building blocks from which the SSHCP Preserve System can grow.

3.6 SSHCP Covered Species Critical Habitat

Federal Critical Habitat has been designated for six of the SSHCP Covered Species: vernal pool species (slender Orcutt grass, Sacramento Orcutt grass, vernal pool fairy shrimp, and vernal pool tadpole shrimp), valley elderberry longhorn beetle, and California tiger salamander.

On August 11, 2005, the USFWS designated Critical Habitat units for four vernal pool crustaceans and 11 vernal pool species, including slender Orcutt grass, Sacramento Orcutt grass, vernal pool fairy shrimp, and vernal pool tadpole shrimp. On February 10, 2006, USFWS identified Critical Habitat units for each individual species identified in the 2005 final rule: 597,821 total acres of Critical Habitat for vernal pool fairy shrimp, 228,785 total acres of Critical Habitat for vernal pool tadpole shrimp, 33,273 total acres of Critical Habitat for Sacramento Orcutt grass, and 94,213 total acres of Critical Habitat for slender Orcutt grass (USFWS 2006).

3.6.1 Slender Orcutt Grass and Sacramento Orcutt Grass

USFWS has designated 33,273 acres of Critical Habitat for Sacramento Orcutt grass, and 94,213 acres of Critical Habitat for slender Orcutt grass (USFWS 2006).

Within the Plan Area, PPU 2 includes 527 acres of Critical Habitat for both slender Orcutt grass and Sacramento Orcutt grass. PPU 7 includes 9,587 acres of Critical Habitat for just Sacramento Orcutt grass. Of the 9,587 acres of Critical Habitat for Sacramento Orcutt grass within PPU 7, 4,444 acres occur within existing Preserves.

The primary constituent elements of Critical Habitat for Sacramento Orcutt grass (*Orcuttia viscida*) and slender Orcutt grass (*Orcuttia tenuis*) are as follows:

1. Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing

surface water in the depressional features including swales connecting the pools described in paragraph (c)(12)(ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

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

3.6.2 Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

As discussed above, USFWS designated 597,821 acres of Critical Habitat for vernal pool fairy shrimp and 228,785 acres of Critical Habitat for vernal pool tadpole shrimp (USFWS 2006).

Within the Plan Area, Critical Habitat for vernal pool fairy shrimp (13-Mather Unit, 14A and 14B-Cosumnes Unit) and vernal pool tadpole shrimp (8-Mather Unit, 9A and 9B-Cosumnes Unit) overlaps exactly and include 1,204 acres in PPU 2, 29,534 acres in PPU 7, and less than 0.1 acre in PPU 5. Of the 1,204 acres of Critical Habitat for within PPU 2, 7.3 acres of Critical Habitat occur within existing Preserves. Of the 29,534 acres of Critical Habitat within PPU 7, 13,223 acres of Critical Habitat occur within existing Preserves.

USFWS (2006) described the primary constituent elements for vernal pool fairy shrimp (*Branchinecta lynchi*) and vernal pool tadpole shrimp (*Lepidurus packardi*) as follows:

1. Topographic features characterized by mounds, swales, and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting vernal pools, providing for dispersal and promoting hydroperiods of adequate length in the pools.
2. Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 18 days, in all but the driest years; thereby providing adequate water for species incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.
3. Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within

the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding.

4. Structure within the pools described in paragraph (c)(3)(ii) of this section, consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

3.6.3 Valley Elderberry Longhorn Beetle

On August 8, 1980 (USFWS published the final rule listing the valley elderberry longhorn beetle as a threatened species, and designating Critical Habitat within two areas within Sacramento. The Critical Habitat was designated in two units: Sacramento Zone and American River Parkway Zone. These two units lie outside the Plan Area and are not considered further in the SSHCP.

3.6.4 California Tiger Salamander

On August 25, 2005, USFWS published the final rule designating Critical Habitat for the central population of the California tiger salamander, within 19 counties in California (USFWS 2005a). The USFWS Critical Habitat designation included 97,045 acres in the Central Valley, 20,293 acres in southern San Joaquin, 68,873 acres in the East Bay, and 12,898 acres in the Central Coast, totaling 199,109 acres.

The Plan Area includes 7,420 acres of California tiger salamander Critical Habitat within PPU 7 (designated as California tiger salamander Critical Habitat unit 3)., USFWS 2005a described the primary constituent elements for the central population of California tiger salamander as follows:

1. Standing bodies of fresh water (including natural and created (e.g., stock)) ponds, vernal pools, and other ephemeral or permanent water bodies, which typically support inundation during winter rains and hold water for a minimum of 12 weeks in a year of average rainfall.
2. Upland habitats adjacent and accessible to and from breeding ponds that contain small mammal burrows or other underground habitat that California tiger salamander depend on for food, shelter, and protection from the elements and predation.
3. Accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

Of the 7,420 acres of Critical Habitat for California tiger salamander within PPU 7, 3,436 acres of Critical Habitat occur within existing Preserves.

3.7 SSHCP Covered Species Recovery Plans

Federal recovery plans have been published for 12 SSHCP Covered Species including Ahart's dwarf rush, Boggs Lake hedge-hyssop, legenere, pincushion navarretia, slender Orcutt grass, Sacramento Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, western spadefoot, and valley elderberry longhorn beetle. In addition, a draft Recovery Plan has been published for giant gartersnake.

3.7.1 Vernal Pool Species

USFWS published the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon in 2005 for 33 species (20 listed species and 13 species of concern), including Ahart's dwarf rush, Boggs Lake hedge-hyssop, legenere, pincushion navarretia, Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, mid-valley fairy shrimp, vernal pool tadpole shrimp, and western spadefoot (USFWS 2005b). It delineates two large core recovery areas in the Plan Area: (1) the Mather Core Recovery Area located within the UDA; and (2) the Cosumnes/Rancho Seco Core Recovery Area, located outside of the UDA. According to USFWS (2005c), the "core areas are the specific sites that are necessary to recover these endangered or threatened species or to conserve sites that are necessary to recover these endangered or threatened species or to conserve the species of concern addressed in this recovery plan." USFWS (2005c) also states that "the core areas were developed in part using critical habitat boundaries, but the two areas differ in that core areas not included in critical habitat have no legal mandate for protection under the Endangered Species Act and solely rely upon voluntary implementation." The Recovery Plan focuses on five elements: (1) habitat protection, (2) adaptive habitat management and monitoring, (3) status surveys, (4) research, and (5) public participation and outreach. The Recovery Plan establishes recovery criteria for these five elements (USFWS 2005b):

1. Habitat protection criteria:
    a. Suitable vernal pool habitat within each prioritized core area for the species is protected.
    b. Species occurrences distributed across the species' geographic and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.
    c. Reintroductions and introductions must be carried out and meet success criteria established in action 2.5.3.7.
    d. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected.

Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in this plan.

e. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring (see Chapter 3).

Table 3-3 depicts the species-specific recovery criteria for the vernal pool species in the Mather Core Recovery Area. The Mather Core Recovery Area has been designated as Zone 1.[1]

Table 3-3
Recovery Criteria for the Mather Core Recovery Area and Cosumnes/Rancho Seco Recovery Area

Common Name	Percent Occurrences to Protect	Percent Suitable Habitat to Protect in Each Core Recovery Area	Reintroductions/ Introductions	Collection Sources
Boggs Lake hedge-hyssop	80% (to conserve)	**Mather Core** 95% (to conserve)	Reintroduce to vernal pool regions and soil types from which status surveys indicate species has been extirpated to conserve.	At least one population from each core area.
Ahart's dwarf rush	100% (to conserve)	**Mather Core** 95% (to conserve)	Reintroduce to vernal pool regions and soil types from which status surveys indicate species has been extirpated to conserve.	Each population.
Legenere	80% (to conserve)	**Mather Core** 95% (to conserve) **Cosumnes/Rancho Seco** 95% (to conserve)	Reintroduce to vernal pool regions and soil types from which status surveys indicate species has been extirpated to conserve.	At least one population from each core area.
Slender Orcutt grass	80% (to delist)	95% (to delist)	Reintroduce to vernal pool regions and soil types from which status surveys indicate species has been extirpated to delist.	Each vernal pool region. Mather Core Recovery Area contains small populations or few occurrences and should

[1] "Core areas were identified as Zone 1 in cases where they were occupied by very narrowly endemic species (with few populations and narrow or disjunct distributions that are known to be, or are likely to be, genetically or ecologically distinct) or where the core area supported a high diversity of the species covered by this recovery plan. Protection of Zone 1 core areas is necessary to prevent the extinction or irreversible decline of one or more species" (USFWS 2005b, p. III-118).

Table 3-3
Recovery Criteria for the Mather Core Recovery Area and Cosumnes/Rancho Seco Recovery Area

Common Name	Percent Occurrences to Protect	Percent Suitable Habitat to Protect in Each Core Recovery Area	Reintroductions/ Introductions	Collection Sources
				be a first source for seedbanking.
Sacramento Orcutt grass	100% (to delist/ downlist)	**Mather Core** 95% (to downlist) 100% (to delist) **Cosumnes/Rancho Seco** 95% (to downlist) 100% (to delist)	Reintroduce to appropriate soils in the Orangevale-Folsom area and Rancho Seco area to replace extirpated occurrences. Additional populations must be discovered or established in order to delist.	Each population.
Vernal pool fairy shrimp	80% (to delist)	**Mather Core** 85% (to delist) **Cosumnes/Rancho Seco** 85% (to delist)	Reintroduce to vernal pool regions and soil types from which status surveys indicate species has been extirpated to delist.	Not given.
Mid-valley fairy shrimp	80% (to delist)	**Mather Core** 95% (to conserve) **Cosumnes/Rancho Seco** 95% (to conserve)	Not given.	Not given.
Vernal tadpole shrimp	80% (to downlist) 100% of re-introduced populations (to delist)	**Mather Core** 95% (to downlist) **Cosumnes/Rancho Seco** 95% (to downlist)	Reintroduce to vernal pool regions and soil types from which status surveys indicate species has been extirpated to delist.	Not given.
Western spadefoot	80% (where it co-occurs with other vernal pool species) (to conserve)	**Mather Core** 85% (to conserve) **Cosumnes/Rancho Seco** 95% (to conserve)	Not given.	Not given.

2. Adaptive habitat management and monitoring criteria:

   a. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected in (1) A through E above. Plans must be developed and implemented within 5 years of protection of individual parcels/properties/areas to

ensure that populations are stable or increasing and progress toward reaching recovery goals is being made while additional habitat protections are being developed. Plans must include provisions for managing non-native and native competitors, appropriate grazing, fire or other management regimes, adaptive habitat management, incorporation of new information resulting from implementation of research actions, and addressing site-specific threats.

b. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of (1) A through E above (e.g., funding, personnel).

c. Monitoring indicates ecosystem function has been maintained in the areas protected under (1) A through D for at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

d. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria (see Table 3-3).

3. Status surveys criteria:

a. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring. (Determining when this criterion is met may rely partly on completion of research actions to model population viability or development of standardized monitoring and survey protocols to determine appropriate parameters to measure during status surveys).

b. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated (see Chapter 3).

4. Research criteria:

a. Research actions necessary for recovery and conservation of the Covered Species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed

and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

b. Research on genetic structure has been completed (for species where necessary for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully represented by populations protected in Habitat Protection (1) A through E above.

c. Research necessary to determine appropriate parameters to measure population viability for each species have been completed (see Chapter 3).

5. Public participation and outreach criteria:

   a. Recovery Implementation Team is established and functioning to oversee range-wide recovery efforts.

   b. Vernal Pool Region working groups are established and functioning to oversee regional recovery efforts.

   c. Participation plans for each Vernal Pool Region have been completed and implemented.

   d. Vernal Pool Region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4 (see Chapter 3).

6. The Recovery Plan indicates that an HCP that addresses the species in the Vernal Pool Recovery Plan may be considered equivalent to the Vernal Pool Recovery Plan if the HCP addresses the six elements described below.

   a. Permanently protected Vernal Pool Preserves within the area covered by the Habitat Conservation Plan in large contiguous blocks of suitable habitat.

   b. Protection of the entire genetic range of each listed species within the area covered by the Habitat Conservation Plan.

   c. Protection of all populations of species with 25 or fewer total occurrences addressed in this plan within the area covered by the Habitat Conservation Plan.

   d. Connectivity with other Preserves within the area covered by the Habitat Conservation Plan.

   e. Adaptive management of the Preserves within the area covered by the Habitat Conservation Plan to support the species addressed in this Recovery Plan.

   f. Sufficient funding for management, maintenance and monitoring of the Preserves in perpetuity.

The recovery criteria for seven of the species listed in Table 3-3 include conservation of 95% of suitable habitat within each the Mather Core Recovery Area. The Plan Permittees recognize that protecting 95% of suitable species habitat in the Mather Core Recovery Area is not feasible because past land use decisions, developments, and agreements, approved by the regulatory agencies since 2005 have already precluded the preservation of that much suitable habitat in the Mather Core Recovery Area. The Recovery Plan does, in item 6 above, however, provide for alternative conservation mechanisms to be used in lieu of the Recovery Plan. One such mechanism is an HCP that takes a comprehensive approach to protecting large interconnected blocks of habitat to protect species (see Chapter 7 for the SSHCP Conservation Strategy).

3.7.2 Giant Gartersnake

USFWS published the *Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*)* (USFWS 1999b). The Draft Recovery Plan sets forth recovery criteria for four recovery units in the Central Valley: Sacramento Valley, Mid-Valley, San Joaquin Valley, and South Valley (USFWS 1999b). The goal of the Draft Recovery Plan is to achieve recovery by 2028 and initiate delisting of the giant gartersnake. The SSHCP Plan Area is within the Mid-Valley recovery unit (see Figure 7 of the Draft Recovery Plan) and generally identifies giant gartersnake populations in the "Sacramento Area" (see Table 2 of the Draft Recovery Plan).

The Draft Recovery Plan recovery criteria for giant gartersnake are as follows (USFWS 1999b, p. v):

a. Monitoring shows that in 17 out of 20 years, 90% of the subpopulations in the four recovery units contain both adults and young
b. All extant populations within the recovery unit are protected from threats that limit populations
c. Supporting habitat within the recovery unit is adaptively managed and monitored
d. Subpopulations are well connected by corridors of suitable habitat
e. Repatriation (reintroduction) has been successful at a specified number of suitable sites

The recovery criteria for the Mid-Valley Recovery Unit are the same as listed above for the entire recovery area, except for "b," which states that "the six existing populations within the recovery unit are protected from threats that limit these populations" (USFWS 1999b, p. 47).

The Draft Recovery Plan identified six actions needed to achieve the recovery criteria (USFWS 1999b, p. v):

1. Protect existing populations and habitat
2. Restore populations to former habitat

3. Survey to determine species distributions
4. Monitor populations
5. Conduct necessary research, including studies on demographics, population genetics, and habitat use
6. Develop and implement incentive programs, and an outreach and education plan

The Draft Recovery Plan defines a "population" as "all the giant gartersnakes within a basin or area (e.g., Colusa Basin, American Basin, Mendota Area" and a subpopulation as "a cluster of locality records in a contiguous habitat area." The Sacramento Area, which includes the SSHCP Plan Area, therefore would support a population of giant gartersnake. The SSHCP Plan Area subpopulations would include clusters of occurrences in areas such as Cosumnes River, Morrison Creek, and Laguna Creek.

The Draft Recovery Plan provides more detailed step-down narratives of the six actions, including details for the Mid-Valley Recovery Unit that apply to the Plan Area.

1. Protect known populations of the giant gartersnake.

   1.1 Protect populations on private lands.

   This action focuses on protecting populations on private lands that are not already under protection by a public or conservation agency through acquisition, easement, or some other mechanism (USFWS 1999b). For the SSHCP Plan Area, the Draft Recovery Plan identifies Task 1.1.9 for the Stone/Beach Lakes area, including the Cosumnes River area (see Table 3 in Draft Recovery Plan). Task 1.1.9 refers to the SSHCP planning efforts, with mitigation on private lands to focus on areas east and west of Interstate 5, acquire lands and restore wetlands south of Lambert Road to connect the giant gartersnake population to the Badger Creek/Willow Creek population, and maintain compatible agricultural practices. These actions are Priority 1 actions in the Draft Recovery Plan, indicating that these actions are needed to prevent extinction or to present the species from declining irreversibly in the foreseeable future (USFWS 1999b).

   1.2 Develop or update management recommendations for giant gartersnake habitats.

   1.3 Develop, update, and implement management plans for populations on public and conservation lands.

   These actions focus on developing or periodically refining management recommendations for ricelands, ditch and canal maintenance, wetlands, and nonaquatic habitats based on new information and incorporating them into management plans for existing public and conservation lands. Where habitat

restoration is recommended as part of management, restoration guidelines should be include. Within the SSHCP Plan Area, management recommendations for these actions are included in Table 4 of the Draft Recovery Plan (USFWS 1999b). Task 1.3.5 states that the USFWS and County of Sacramento should incorporate giant gartersnake considerations into management guidelines, build refugia from flooding, and expand habitat at the Stone Lakes NWR.

Other protection actions that should generally be implemented and are applicable to the SSHCP include expediting permit approvals for levee repairs to protect adjacent giant gartersnake habitat (1.4), reviewing water efficiency measures (e.g., reduced agriculture runoff) that may conflict with management recommendations for giant gartersnake and its habitat (1.5), assurance of water delivery for giant gartersnake (1.6), and monitoring of existing populations (1.7).

2. Surveys for new populations of giant gartersnake.

   Action 2.3 includes surveys for giant gartersnake in the Mid-Valley Recovery Unit, especially because it is rapidly urbanizing. Such surveys will help establish appropriate mitigation.

3. Re-establish populations of giant gartersnakes to suitable habitat within former range.

   Action 3.1 is to identify suitable sites and conduct surveys for repatriation of giant gartersnakes. However, the Draft Recovery Plan does not identify any potential repatriation sites in the Mid-Valley Recovery Unit, so this action does not apply to the SSHCP.

4. Conduct necessary research on the giant gartersnake.

   This action includes: mark-recapture studies to understand demographics (mortality rates, fecundity, population size) (4.1), genetic studies to determine relatedness of different populations (4.2), radiotelemetry studies (4.3), population viability studies (4.4), developing guidelines for collecting giant gartersnake specimens for research (4.5), buffer/edge effects studies to determine appropriate buffer distances (4.6), studies of contaminant effects such as selenium (4.7), studies of health in selected populations (4.8), studies of effects of introduced predators and development and implementation of a management program (4.9), and studies of how quickly giant gartersnakes colonize new created marsh (4.10). Specific sites for these studies are not identified in the Draft Recovery Plan.

5. Develop and implement an outreach and education program.

   This action includes: developing guidelines for appropriate land use practices to distribute to landowners and agencies, including ditch and canal maintenance and rodenticide, herbicide and pesticide use (5.1) and developing and distributing

informational material to interested parties, including private and public landowners (5.2). Specific sites or areas for outreach and education are not identified in the Draft Recovery Plan.

6. Develop and implement economic and other incentives for conservation and recovery on private lands.

   This action focuses on creating incentives for landowners to maintain practices that benefit the giant gartersnake, including agricultural incentives (6.1), construction incentives for water districts and users (6.2), and promoting habitat conservation plans that are consistent with the Draft Recovery Plan (6.3).

3.7.3 Valley Elderberry Longhorn Beetle

USFWS published the *Valley Elderberry Longhorn Beetle Recovery Plan* in 1984. The Recovery Plan states that in order to recover the beetle, habitat must be protected along the several rivers, including the American, Sacramento, Feather, Stanislaus, Mokelumne, Calavera, Cosumnes, and San Joaquin. The Mokelumne and Cosumnes Rivers are located in the central and southern portions of the SSHCP Plan Area. The main components of the Valley Elderberry Longhorn Beetle Recovery Plan include: surveys for presence of the valley elderberry longhorn beetle; development of habitat protection plans, restoration of conserved sites (including exotics removal); and management and maintenance, including minimizing the use of herbicides and insecticides, preventing removal of riparian vegetation, and preventing riprapping of habitat sites. The Recovery Plan includes narratives for the following objectives (USFWS 1984).

1. Preserve and protect known habitat sites to provide adequate habitat conditions for valley elderberry longhorn beetle.

   The Recovery Plan identified occupied sites along three specific rivers for habitat preservation through long-term administrative actions: American River, Merced River, and Putah Creek (USFWS 1984, p. 22). The Mokelumne and Cosumnes Rivers within the SSHCP Plan Area are not specifically identified for protection in the Recovery Plan. The Recovery Plan has a specific objective (13) for developing management plans for protected sites.

2. Survey riparian forests of the Sacramento and San Joaquin Valleys for presence of valley elderberry longhorn beetle and incorporate findings into short-term and long-term management programs.

   This objective included surveys along the Mokelumne River from Comanche Reservoir Dam and along the Cosumnes River from Bridgehouse downstream to their confluences with the San Joaquin River.

3. Determine ecological requirements and management needs of valley elderberry longhorn beetle.

   This objective includes: field studies of the autecology of the species at known and newly discovered sites (31), laboratory studies on life history (32), field studies on potential management needs at certain sites (Goethe Park, Ancil Hoffman Park, American River Parkway, and Solano Lake Park) (33), studies of habitat rehabilitation methods for riparian areas and incorporate results into short- and long-term management programs (34), determination of population status and success of management (35), and determination of delisting criteria.

   With the exception of management needs at certain sites, these actions could be conducted throughout the Recovery Plan area.

4. Preserve and protect newly discovered valley elderberry longhorn beetle habitat to provide suitable habitat conditions for the species.

   This objective includes: minimizing further degradation, development, or modification of habitat (41); protecting newly discovered populations (42); minimizing use of insecticides, herbicides, and other toxic substances (43); and minimizing other activities that are incompatible with habitat maintenance (44).

5. Reestablish valley elderberry longhorn beetle at rehabilitated sites within the species' historical range.

   This objective includes: determining suitability of potential existing habitat and rehabilitation sites for reintroduction (51), protecting habitat sites (52), developing and implementing a management program for each site (53), and reintroducing valley elderberry longhorn beetle at selected sites (54).

6. Increase public awareness of valley elderberry longhorn beetle through education and information programs.

   This objective includes: signage at county parks (61); various audio-visual programs, publications, brochures, and press releases (62); and distribution of information to local parks, schools, newspapers, radio, and television (63). Specific site-specific actions for education are not identified in the Draft Recovery Plan. Also, because the Recovery Plan dates back to 1984, education actions will need to be update to take advantage of current information technologies (e.g., websites, social media).

7. Enforce law and regulation to protect valley elderberry longhorn beetle.

   This objective includes: informing local agencies about legal status of valley elderberry longhorn beetle, including applicable laws and regulations (71), eliminating illegal

collecting (72), and examining the effectiveness of existing laws and regulations and proposing changes as necessary (73).

3.8 SSHCP Preserve Planning Units

To assist with development of an adequate SSHCP Conservation Strategy, the Plan Area was divided into eight PPUs that encompass areas where important Covered Species resources are present, and where habitat preservation will be planned (see Section 1.2.1 and Figure 1-1). These eight SSHCP PPUs are geographic subdivisions of the Plan Area designed to ensure that adequate Biological Goals and Measurable Objectives (see Chapter 7) were developed for all biological resources located within the Plan Area.

PPUs were delineated to capture specific habitat or agricultural land cover types or areas identified as being important for a specific suite of species. For instance, PPU 7, which is located in the southeastern portion of the Plan Area, was delineated to encompass the vast majority of vernal pool grasslands remaining in the County. PPU 7 also contains the designated Cosumnes/Rancho-Seco Core Recovery Area (C/RS) (USFWS 2005b), which is considered an important area for protection of vernal pool species. This section describes the existing conditions within each PPU including natural land cover types and species occurrences within each PPU. Tables 3-4 and 3-5 provide a summary of the existing land cover types within each PPU and Table 3-6 provides a summary of the species occurrences within each PPU.

Table 3-4
Summary of Existing Land Cover Types within the PPUs Inside the UDA (acres)

Land Cover Type	PPU 1	PPU 2	PPU 3	PPU 4	PPU 8	Outside PPUs	Grand Total
Terrestrial							
Valley Grassland	13,377	3,589	7,072	1,168	1,488	3,650	30,344
Blue Oak Savanna	0	0	18	0	0	0	18
Blue Oak Woodland	0	0	0	0	0	0	0
Cropland	359	82	578	1,817	1,773	872	5,481
Orchard	164	0	13	0	13	22	212
Vineyard	15	0	1,341	1	19	0	1,376
Irrigated Pasture-Grassland	6	82	1,477	353	1,097	203	3,218
Aquatic							
Vernal Pool	389	70	341	21	36	77	934
Swale	193	40	167	12	7	42	461
Seasonal Wetland	17	29	8	78	27	3	162
Freshwater Marsh	19	14	62	266	10	21	392
Mixed Riparian Woodland	2	0	33	69	114	27	245
Mixed Riparian Scrub	3	0	18	185	35	1	242

Table 3-4
Summary of Existing Land Cover Types within the PPUs Inside the UDA (acres)

Land Cover Type	PPU 1	PPU 2	PPU 3	PPU 4	PPU 8	Outside PPUs	Grand Total
Mine Tailing Riparian Woodland	220	0	0	0	0	0	220
Stream/Creek (VPIH)	35	19	15	0	0	0	69
Stream/Creek	14	12	53	11	20	53	163
Open Water	83	10	116	10	2	16	237
Non-Habitat Land Cover Types							
Aqueducts	55	69	9	0	0	0	133
Disturbed	551	1,426	538	46	87	1,213	3,861
High Density Development	1,158	3,180	857	338	986	5,143	11,662
Low Density Development	401	239	1,312	784	991	1,505	5,232
Major Roads	157	181	130	90	241	428	1,227
Mine Tailings	345	0	0	0	0	0	345
Recreation/Landscaped	11	227	145	4	187	811	1,385
Not Mapped	0	0	0	0	0	0	0
Grand Total	**17,574**	**71**	**14,303**	**5,253**	**2**	**5**	**67,618**

Table 3-5
Summary of Existing Land Cover Types within the PPUs Outside the UDA (acres)

Land Cover Type	PPU 1	PPU 5	PPU 6	PPU 7	Outside PPUs	Grand Total
Terrestrial						
Valley Grassland	1,468	27,463	17,633	52,278	5,964	104,806
Blue Oak Savanna	-	692	-	3,080	1,847	5,619
Blue Oak Woodland	-	5,864	11	2,781	475	9,131
Cropland	53	2,549	39,102	4,644	-	46,348
Orchard	-	392	2,496	807	-	3,695
Vineyard	-	3,548	9,912	11,623	-	25,083
Irrigated Pasture-Grassland	2	2,203	6,948	3,621	-	12,774
Aquatic						
Vernal Pool	43	339	944	2,221	53	3,600
Swale	11	89	125	531	36	792
Seasonal Wetland	-	446	1,636	325	31	2,438
Freshwater Marsh	-	159	2230	170	4	2,563
Mixed Riparian Woodland	-	1,169	4,096	336	11	5,612
Mixed Riparian Scrub	-	173	984	53	4	1,214
Mine Tailing Riparian Woodland	-	59	17	345	-	421
Stream/Creek (VPIH)	4	-	-	-	-	4
Stream/Creek	1	481	1,639	432	63	2,616
Open Water	9	365	1,180	528	24	2,106

Table 3-5
Summary of Existing Land Cover Types within the PPUs Outside the UDA (acres)

Land Cover Type	PPU 1	PPU 5	PPU 6	PPU 7	Outside PPUs	Grand Total
Non-Habitat Land Cover Types						
Aqueducts	-	57	-	75	-	132
Disturbed	531	1,396	326	161	12	2,426
High Density Development	-	122	727	522	42	1,413
Low Density Development	22	4,553	3,436	5,306	60	13,377
Major Roads	12	277	863	358	28	1,538
Mine Tailings	-	76	-	664	13	753
Recreation/Landscaped	-	62	108	45	578	793
Not Mapped	-	-	784	-	-	784
Grand Total	**2,156**	**52,534**	**6**	**90,906**	**9,245**	**250,038**

Table 3-6
Summary of Covered Species Documented Occurrences in PPUs

Species	PPU 1	PPU 2	PPU 3	PPU 4	PPU 5	PPU 6	PPU 7	PPU 8	Outside PPUs	Grand Total
Plants										
Ahart's dwarf rush	1	1	—	—	—	—	—	—	—	2
Boggs Lake hedge-hyssop	27	1	1	—	—	—	—	—	2	31
Dwarf downingia	—	—	—	—	—	8	2	—	—	10
Legenere	20	7	7	1	1	16	9	—	1	62
Pincushion navarretia	—	—	—	—	—	—	48	—	—	48
Sacramento Orcutt grass	36	—	2	—	—	—	2	—	—	40
Sanford's arrowhead	—	3	2	1	3	42	3	—	10	64
Slender Orcutt grass	1	—	3	—	—	—	—	—	—	4
Invertebrates										
Mid-valley fairy shrimp	—	10	9	—	—	9	6	2	1	37
Ricksecker's water scavenger beetle	—	4	—	—	—	1	3	—	—	8
Valley elderberry longhorn beetle	1	—	—	—	154	1	—	—	—	156
Vernal pool fairy shrimp	56	48	95	4	11	26	324	1	16	581
vernal pool tadpole shrimp	308	145	147	6	—	26	194	4	21	851
Amphibians										
California tiger salamander	—	—	—	—	—	—	29	2	—	31
Western spadefoot	7	12	1	—	2	—	19	—	—	41
Reptiles										
Giant gartersnake	—	—	—	2	—	11	1	—	—	14
Western pond turtle	—	2	—	1	1	7	8	—	—	19

Table 3-6
Summary of Covered Species Documented Occurrences in PPUs

Species	PPU 1	PPU 2	PPU 3	PPU 4	PPU 5	PPU 6	PPU 7	PPU 8	Outside PPUs	Grand Total
Birds										
Burrowing owl	5	16	2	12	1	30	23	—	8	97
Cooper's hawk	1	2	1	2	2	8	2	—	2	20
Ferruginous hawk	—	7	—	1	6	4	7	—	1	26
Loggerhead shrike	2	1	2	1	3	15	7	1	2	34
Northern harrier	4	2	2	2	5	42	7	2	4	70
Greater sandhill crane	1	—	—	1	—	191	11	6	—	210
Swainson's hawk	10	5	8	17	35	284	28	20	3	410
Tricolored blackbird	—	3	15	1	3	4	5	—	5	36
White-tailed kite	2	7	4	2	5	34	—	1	7	62
Mammals										
American badger	1	7	—	—	—	1	—	—	—	9
Western red bat	—	1	—	—	1	—	1	1	3	7

Inside UDA Preserve Planning Units

PPU 1 encompasses approximately 19,729 acres located in the northern portion of the Plan Area of which about 17,573 acres are inside the UDA (see Figure 3-31). Although the large majority of PPU 1 is inside the UDA, about 2,156 acres of PPU 1 lie outside the UDA (see section describing Outside Preserve Planning Units below). PPU 1 is bordered by U.S. Highway 50 to the north, Prairie City Road to the northeast, the Deer Creek floodplain boundary to the southeast, Sloughhouse to the south, and Sunrise Boulevard to the west. The following describes that portion of the UDA that is within the UDA.

The dominant land cover in PPU 1 is Valley Grassland, which comprises approximately 13,378 acres of the unit. PPU 1 also contains the greatest amount of Vernal Pool (approximately 289 acres) and Swale (approximately 193 acres) acreage of any PPU within the UDA, making it an important PPU for preservation of vernal pool species. Some urbanization has already occurred in this PPU, south of U.S. Highway 50 and east of Sunrise Boulevard, with high-density development comprising approximately 1,158 acres of the unit. PPU 1 encompasses the City of Rancho Cordova in the Plan Area, as well as lands east of Rancho Cordova in unincorporated areas of the County. There are two Preserves within PPU 1 encompassing approximately 680 acres. They include the Sunrise-Douglas Conservation Bank and the Montolina Preserve. PPU 1 also contains 15,827 acres of the 24,245 acre Mather Core Recovery Area (USFWS 2005b).

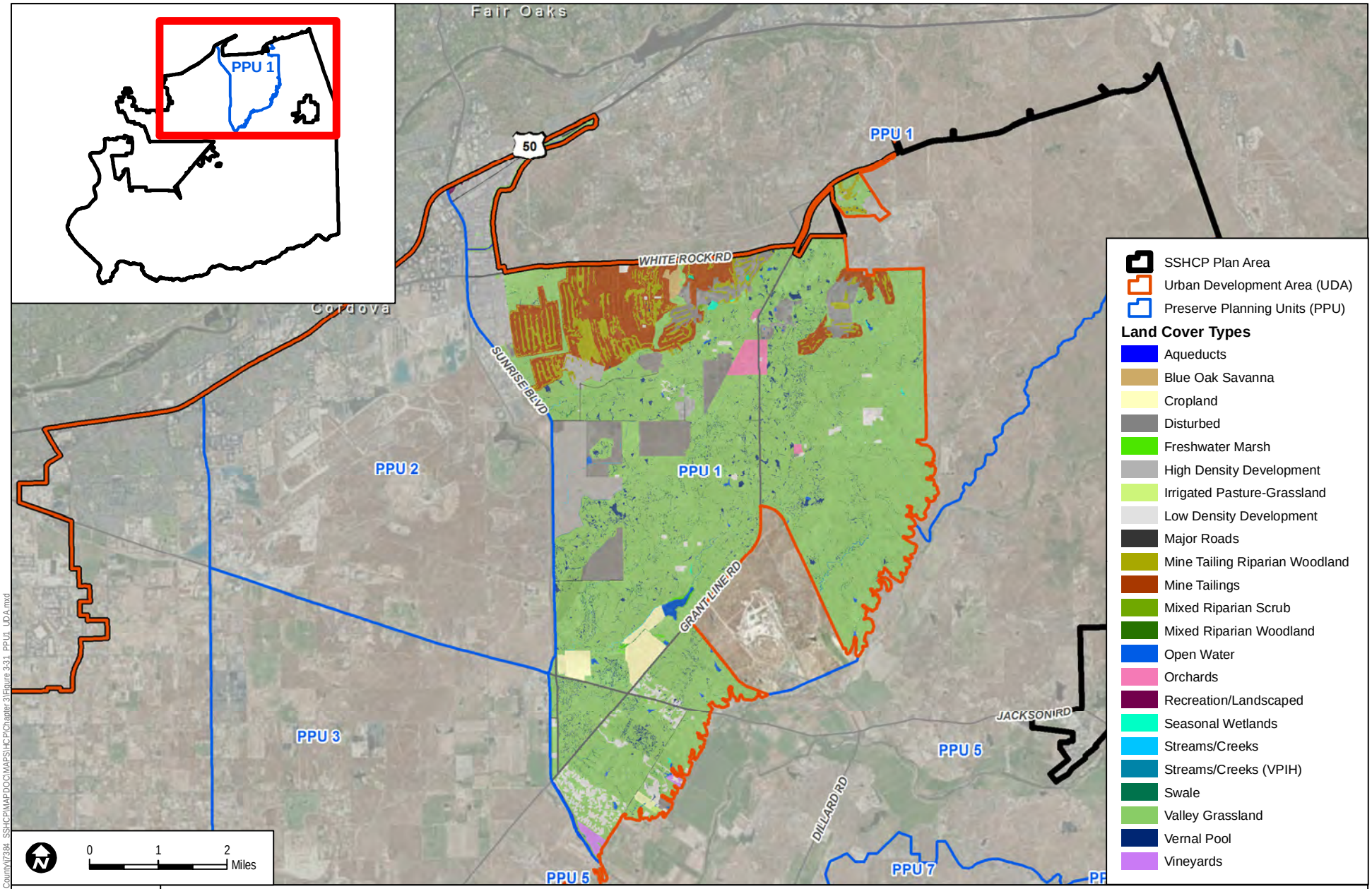
Species with documented occurrences within PPU 1 include Ahart's dwarf rush, Boggs Lake hedge-hyssop, legenere, Sacramento Orcutt grass, slender Orcutt grass, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, western spadefoot, American badger, and all of the bird Covered Species except ferruginous hawk and loggerhead shrike.

PPU 2 encompasses approximately 9,271 acres and is located in the northern portion of the Plan Area (Figure 3-32). PPU 2 is bordered on the north by U.S. Highway 50, on the east by Sunrise Boulevard, on the south by Jackson Highway, and on the west by Bradshaw Road.

A substantial portion of PPU 2 is developed, including Mather Field and urban development directly north and southeast of the airport. PPU 2 includes 3,180 acres of high-density development, 239 acres of low density development, and 1,426 acres of disturbed land covers. PPU 2 also includes 3,589 acres of Valley Grassland with 70 acres of Vernal Pool and 40 acres of Swale. There is approximately 30 acres of existing Preserve within PPU 2. PPU 2 also contains 3,081 acres of the 24,245 acre Mather Core Recovery Area (USFWS 2005b); all of Slender Orcutt Grass Critical Habitat Unit 6 (1,160 acres); all of Sacramento Orcutt Grass Critical Habitat Unit 2 (1,160 acres); all of Vernal Pool Fairy Shrimp Critical Habitat Unit 13 (2,450 acres); and all of Vernal Pool Tadpole Shrimp Critical Habitat Unit 8 (2,450 acres).

PPU 2 contains documented occurrences for many of the Covered Species, including occurrences of Ahart's dwarf rush, Boggs Lake hedge-hyssop, legenere, Sanford's arrowhead, mid-valley fairy shrimp, Ricksecker's water scavenger beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, western spadefoot, western pond turtle, American badger, western red bat and all of the bird Covered Species except greater sandhill crane.

PPU 3 encompasses approximately 14,303 acres located in the northwestern portion of the Plan Area (Figure 3-33). PPU 3 is bordered by Jackson Highway on the north, by Sunrise Boulevard on the east, by the Deer Creek and the Cosumnes River floodplain boundary on the south, the Central California Traction railroad line on the southeast, and by Bradshaw Road on the west.



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SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-31

Preserve Planning Unit 1 - Inside UDA

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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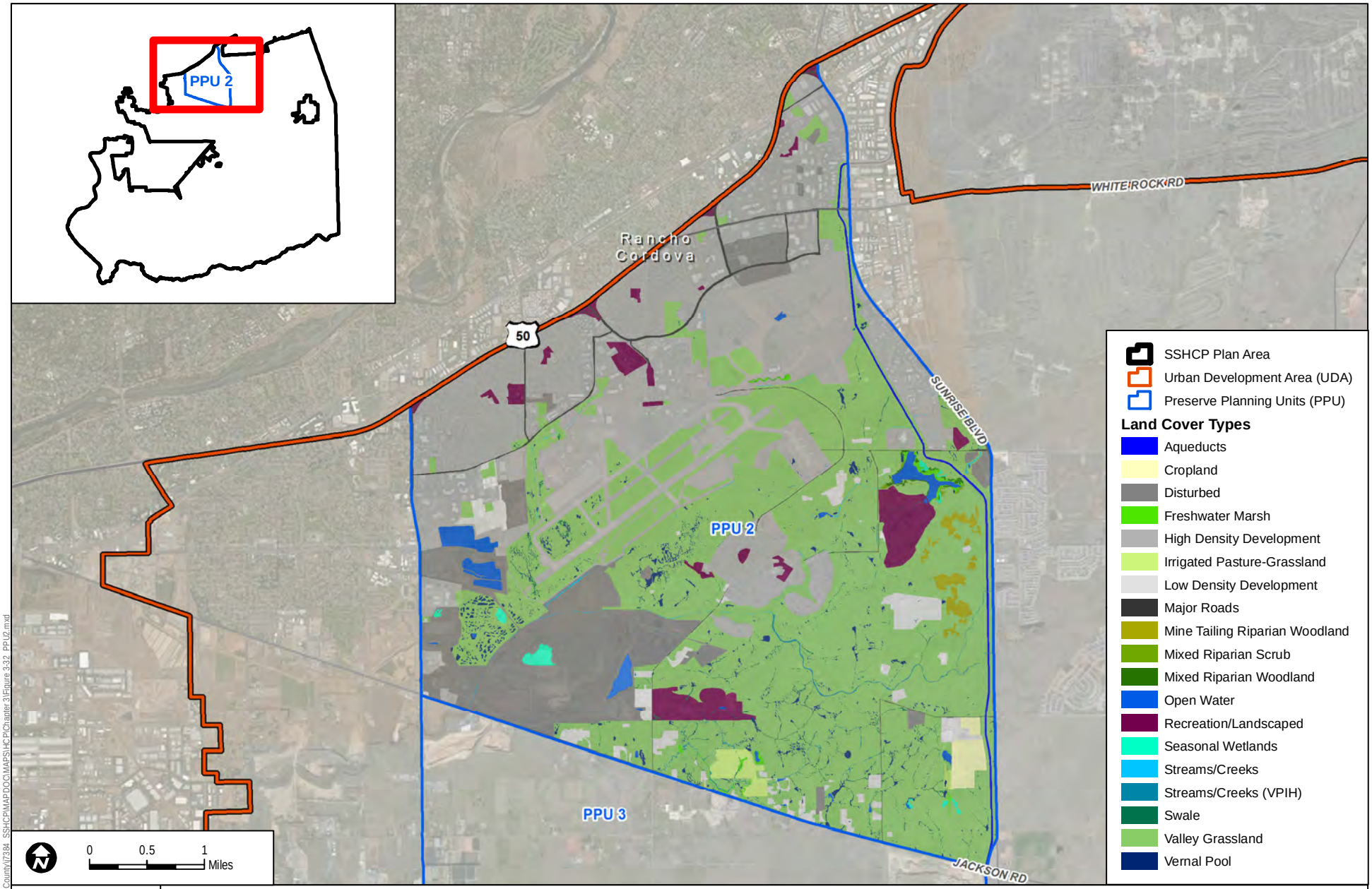

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-32

Preserve Planning Unit 2

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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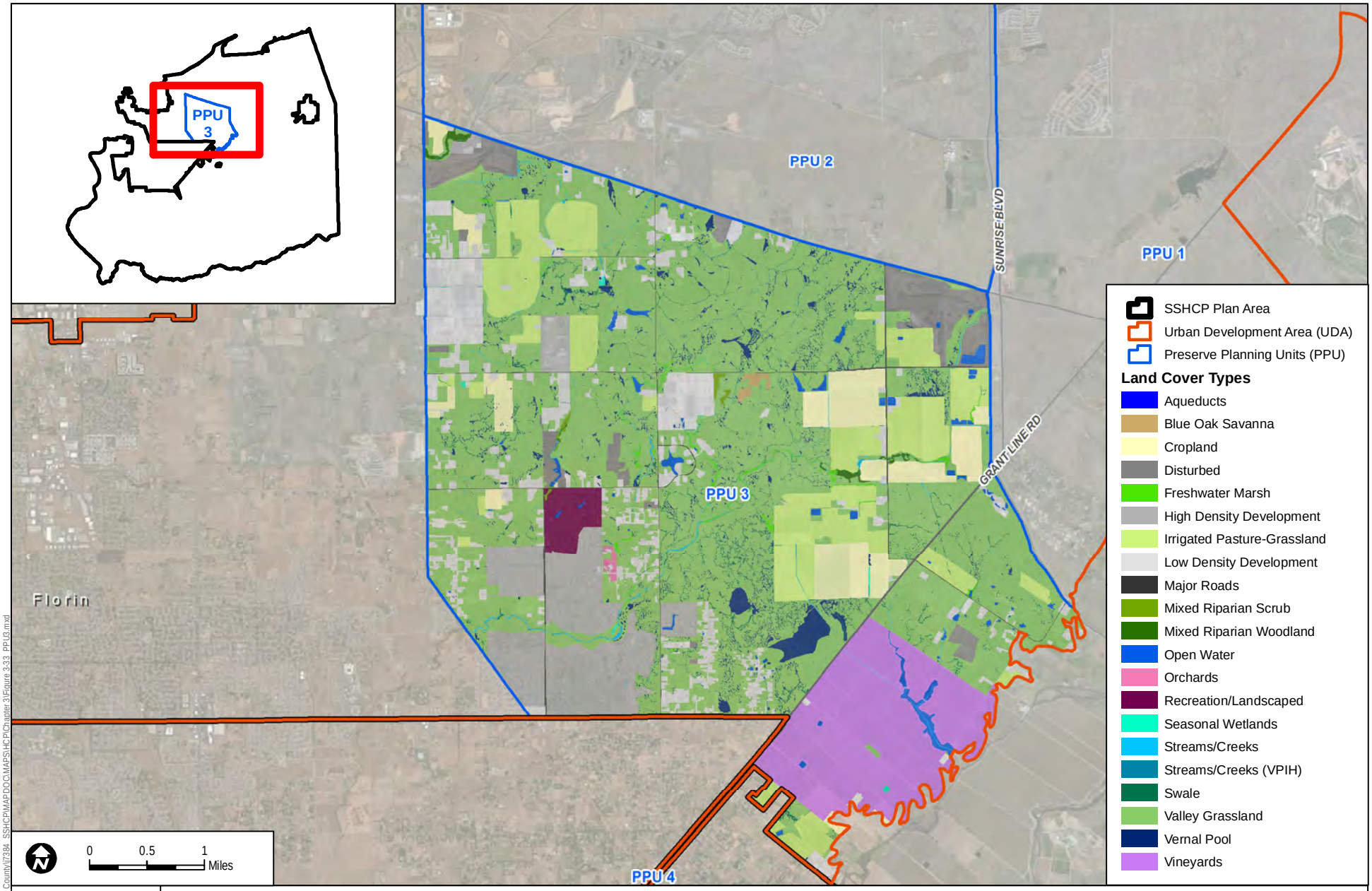

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-33

Preserve Planning Unit 3

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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The dominant land cover in PPU 3 is Valley Grassland, which makes up about 7,072 acres of the Unit. Valley Grassland supports about 341 acres of Vernal Pool and about 167 acres of Swale, making this unit particularly important for vernal pool species. PPU 3 contains substantial urban development with high- and low-density development together totaling about 2,169 acres of the unit. PPU 3 also contains substantial agriculture (Cropland, Irrigated Pasture-Grassland, Orchard, and Vineyard), totaling about 3,409 acres of the unit. Existing Preserve in PPU 3 totals approximately 2,200 acres. Most of the Preserve acres are located within the Vernal Pool Prairie Preserve Area, and includes several mitigation sites (e.g. Klotz Preserve, Were Preserve, Cook Preserve) and two conservation banks (Arroyo Seco Conservation Bank and Bryte Ranch Conservation Bank). This unit also contains Preserves established to protect Laguna Creek. PPU 3 also contains approximately 4,574 acres of the 24,245 acre Mather Core Recovery Area (USFWS 2005b).

PPU 3 contains documented occurrences for many of the Covered Species, including occurrences of Boggs Lake hedge-hyssop, legenere, Sacramento Orcutt grass, Sanford's arrowhead, slender Orcutt grass, mid-valley fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, western spadefoot, and all of the bird Covered Species except ferruginous hawk and greater sandhill crane.

PPU 4 encompasses approximately 5,253 acres and is located in the northwestern portion of the Plan Area (Figure 3-34). PPU 4 includes three disjunct areas that are within the UDA. These areas are physically separated from other locations within the UDA by the City of Elk, which is not participating in the Plan. PPU 4 is generally bordered by the Sacramento City limits to the north, Highway 99 to the east, Eschinger Road to the south and Interstate 5 to the west.

The dominant land cover in PPU 4 is Cropland, which occupies about 1,817 acres. PPU 4 also includes about 1,168 acres of Valley Grassland. There are no existing Preserves within PPU 4.

PPU 4 contains documented occurrences for many of the Covered Species, including legenere, Sanford's arrowhead, vernal pool fairy shrimp, vernal pool tadpole shrimp, giant gartersnake, western pond turtle, and all of the bird Covered Species.

PPU 8 encompasses approximately 7,132 acres and is located in the southern portion of the Plan Area. PPU 8 is entirely within Galt's sphere of influence (Figure 3-35). PPU 8 is bordered by the northern boundary of Galt's sphere of influence to the north, Cherokee Lane to the east, Dry Creek to the south and Sargent Avenue to the west.

PPU 8 is dominated by farmland land cover types, including about 1,773 acres of Cropland and 1,097 acres of Irrigated Pasture-Grassland. Other significant cover types within PPU 8 include approximately 1,488 acres of Valley Grassland and 986 acres of high density development and

1,097 acres of low density development. There is approximately 95 acres of existing Preserve within PPU 2 located mainly along Dry Creek and Deadman Gulch.

PPU 8 contains documented occurrences for several of the Covered Species, but does not support significant occurrence concentrations for any particular species with the exception of Swainson's hawk and greater sandhill crane.

Outside UDA Preserve Planning Units

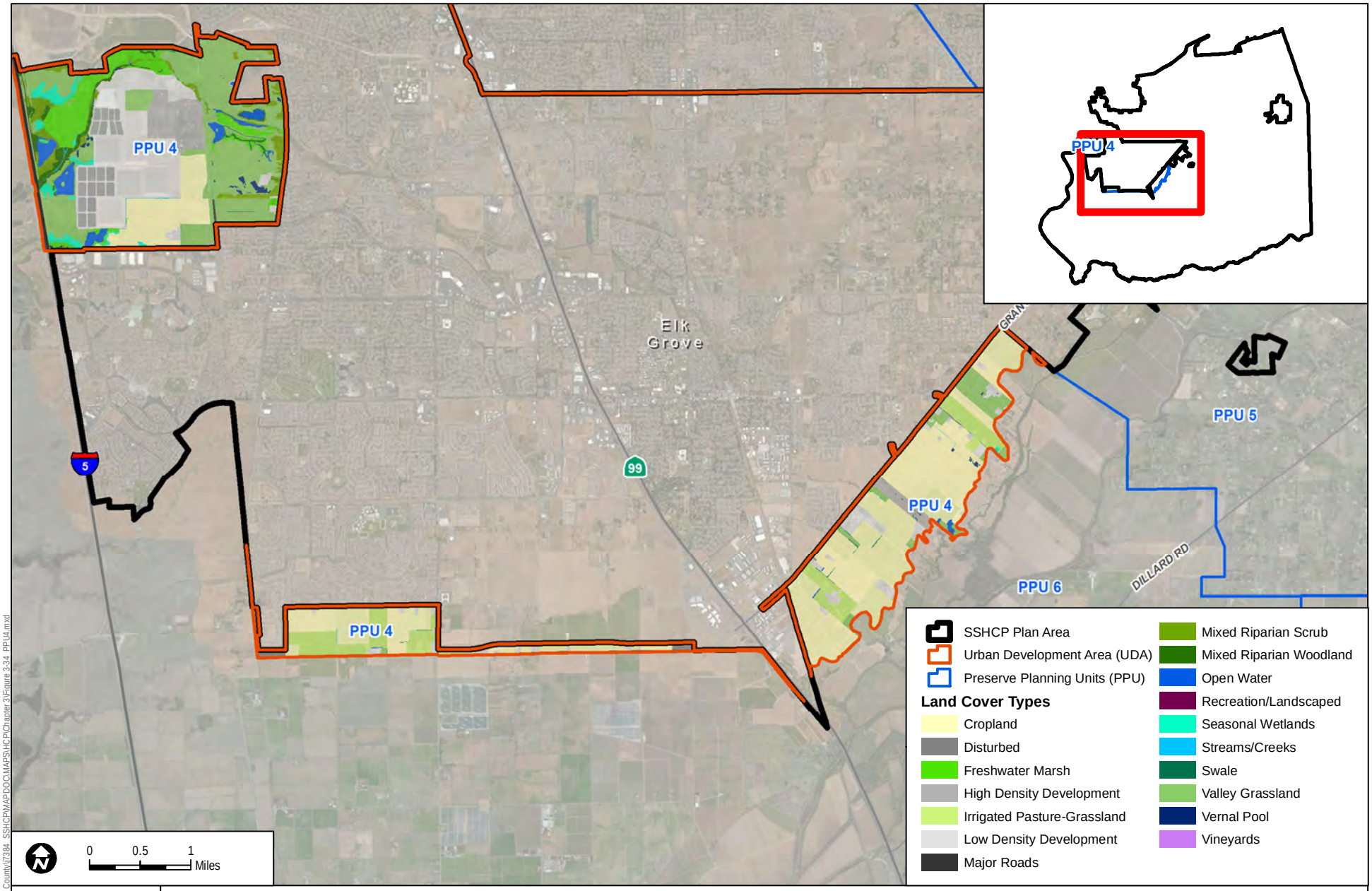
PPU 1 includes approximately 2,156 acres that are outside the UDA boundary (Figure 3-36). PPU 1 outside of the UDA is dominated by Valley Grassland (about 1,468 acres) and disturbed land cover (531 acres) associated with the Kiefer Landfill. There is approximately 500 acres of existing Preserve within PPU 1 including the Kiefer Landfill Preserve south of and adjacent to the UDA boundary at Grant Line Road.

PPU 1 outside of the UDA contains documented occurrences for several of the Covered Species, but does not support significant occurrence concentrations for any particular species with the exception of Sacramento Orcutt grass.

PPU 5 encompasses approximately 52,534 acres in the central-eastern portion of the Plan Area outside the UDA (Figure 3-37). PPU 5 is situated between PPU 7 to the south and the UDA part of PPU 1 to the north, and is bordered by the county line to the east. The dominant land cover in PPU 5 is Valley Grassland (about 27,540 acres). PPU 5 also includes approximately 1,169 acres of Mixed Riparian Woodland, making it import for species dependent on riparian land cover types. There are 6,500 acres of existing Preserves in PPU 5, including the Deer Creek Hills Preserve and several smaller, scattered Preserve sites. PPU 5 also contains 243 acres of the 24,245 acre Mather Core Recovery Area (USFWS 2005b).

PPU 5 contains documented occurrences for many of the Covered Species, including occurrences of legenere, vernal pool fairy shrimp, western spadefoot, western pond turtle and all of the bird Covered Species except greater sandhill crane. PPU 5 is most notable for encompassing most of the Plan Area documented occurrences for valley elderberry longhorn beetle clustered in a reach of the Cosumnes River extending approximately 2 miles west of Jackson.

PPU 6 encompasses approximately 95,196 acres located in the southwestern portion of the Plan Area (Figure 3-38). PPU 6 is generally bound on the west by State Highway 160 and the Sacramento River, on the north by Eschinger Road, on the south by the Mokelumne River west and just east of I-5, and by Dry Creek on the south from its confluence with the Mokelumne River to north-south alignment of Sargent Avenue, which defines its southeastern boundary.



SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-34

Preserve Planning Unit 4

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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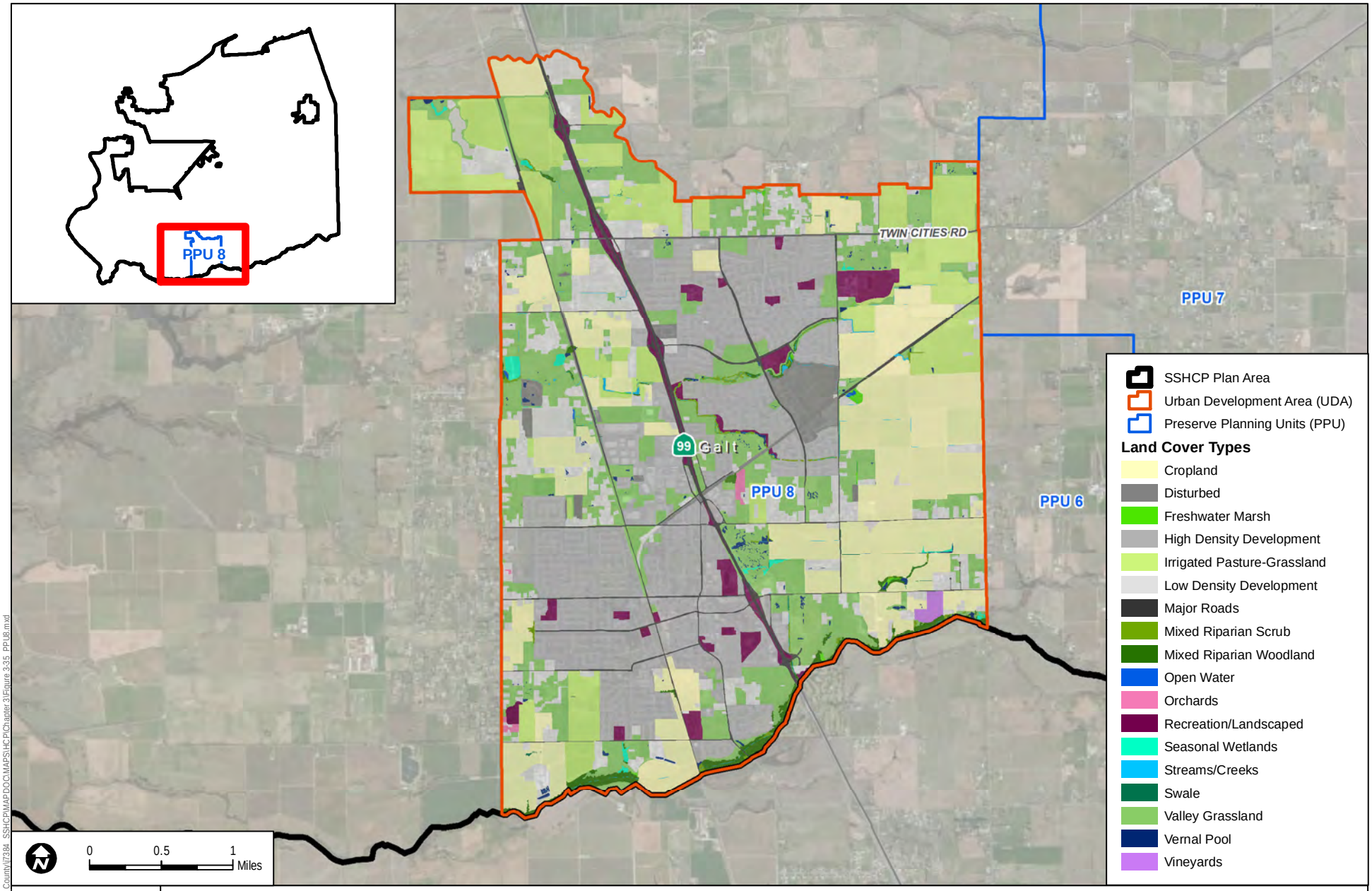

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-35

Preserve Planning Unit 8

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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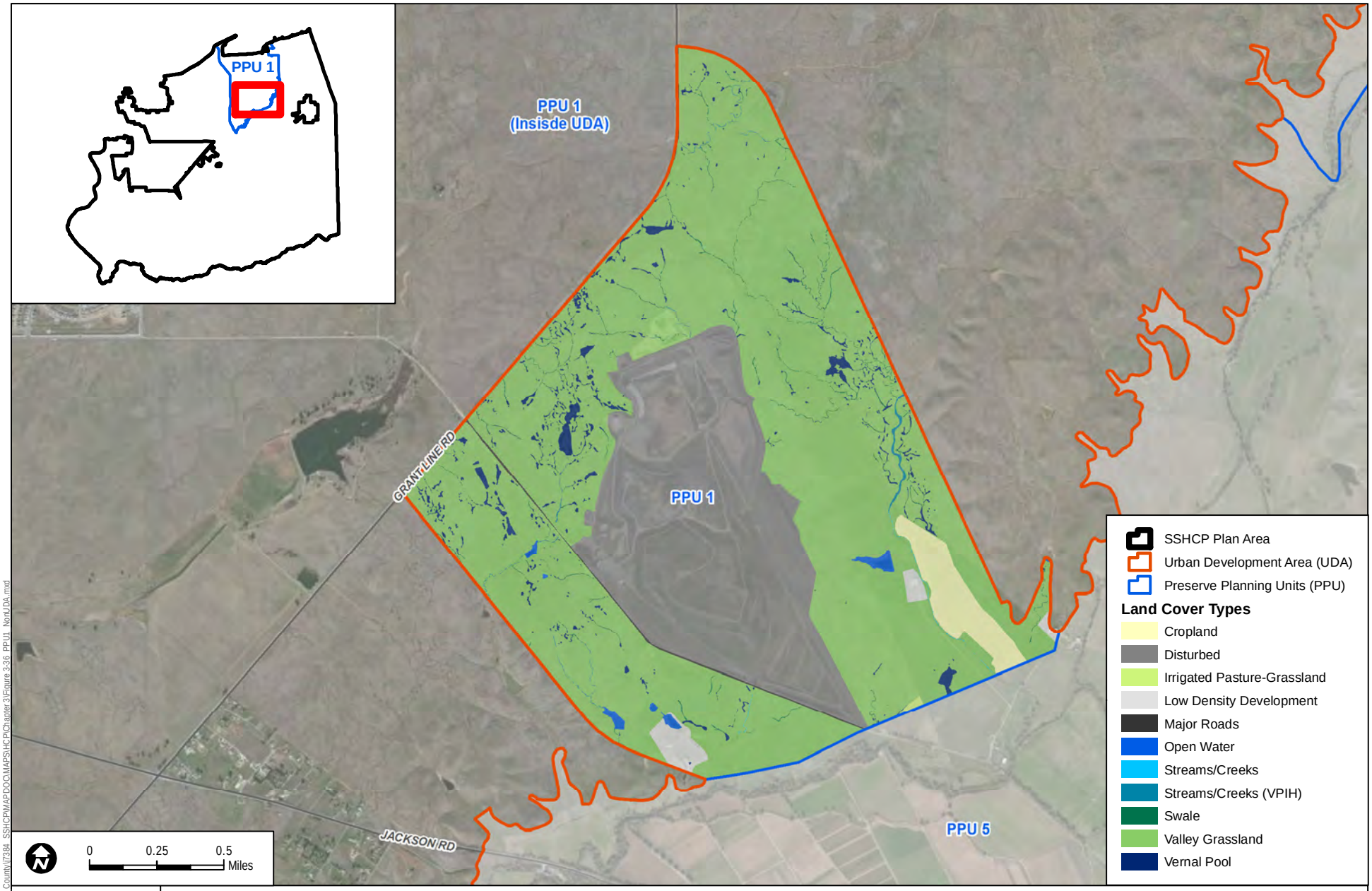

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-36

Preserve Planning Unit 1 - Outside UDA

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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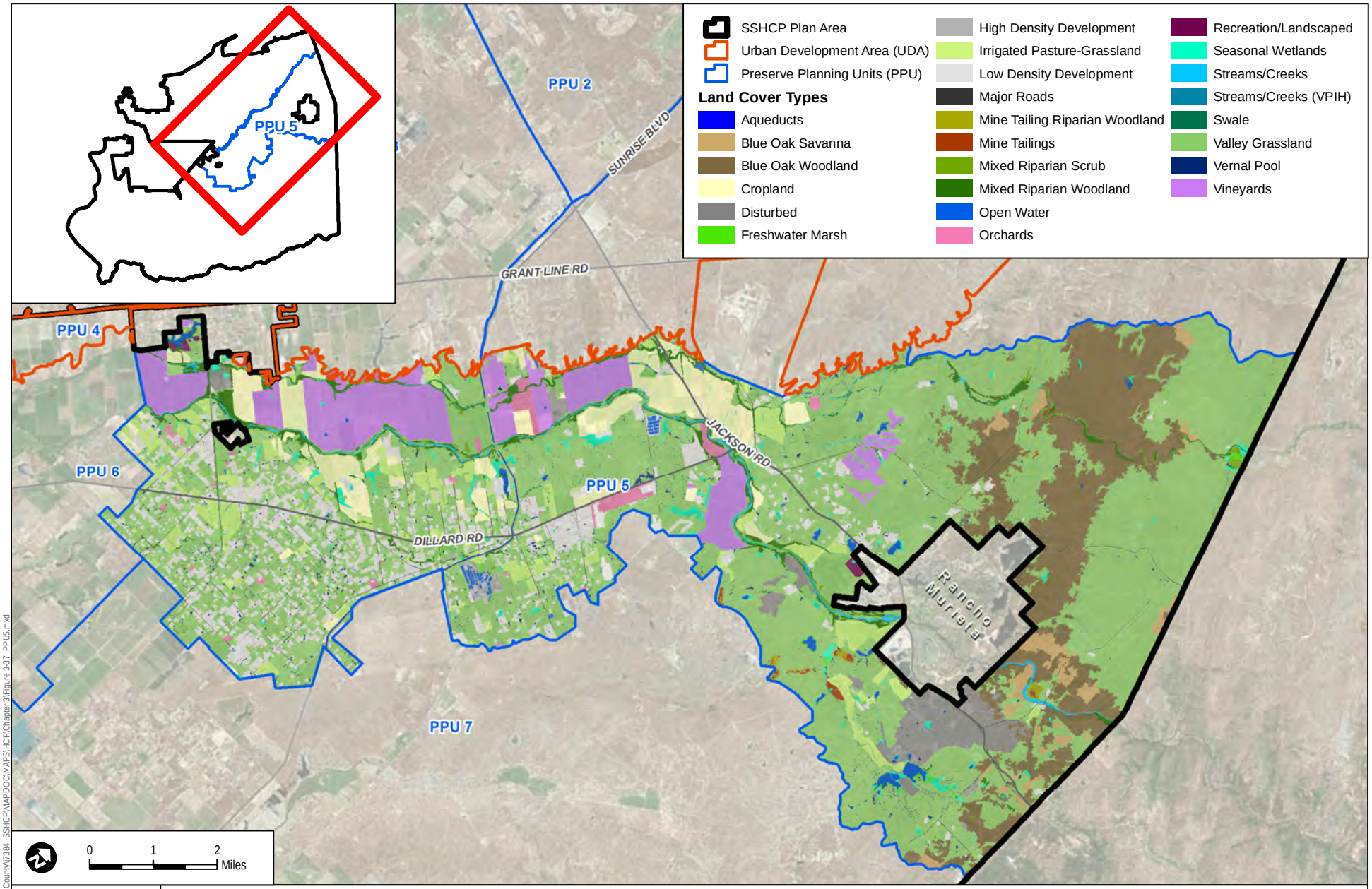

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-37

Preserve Planning Unit 5

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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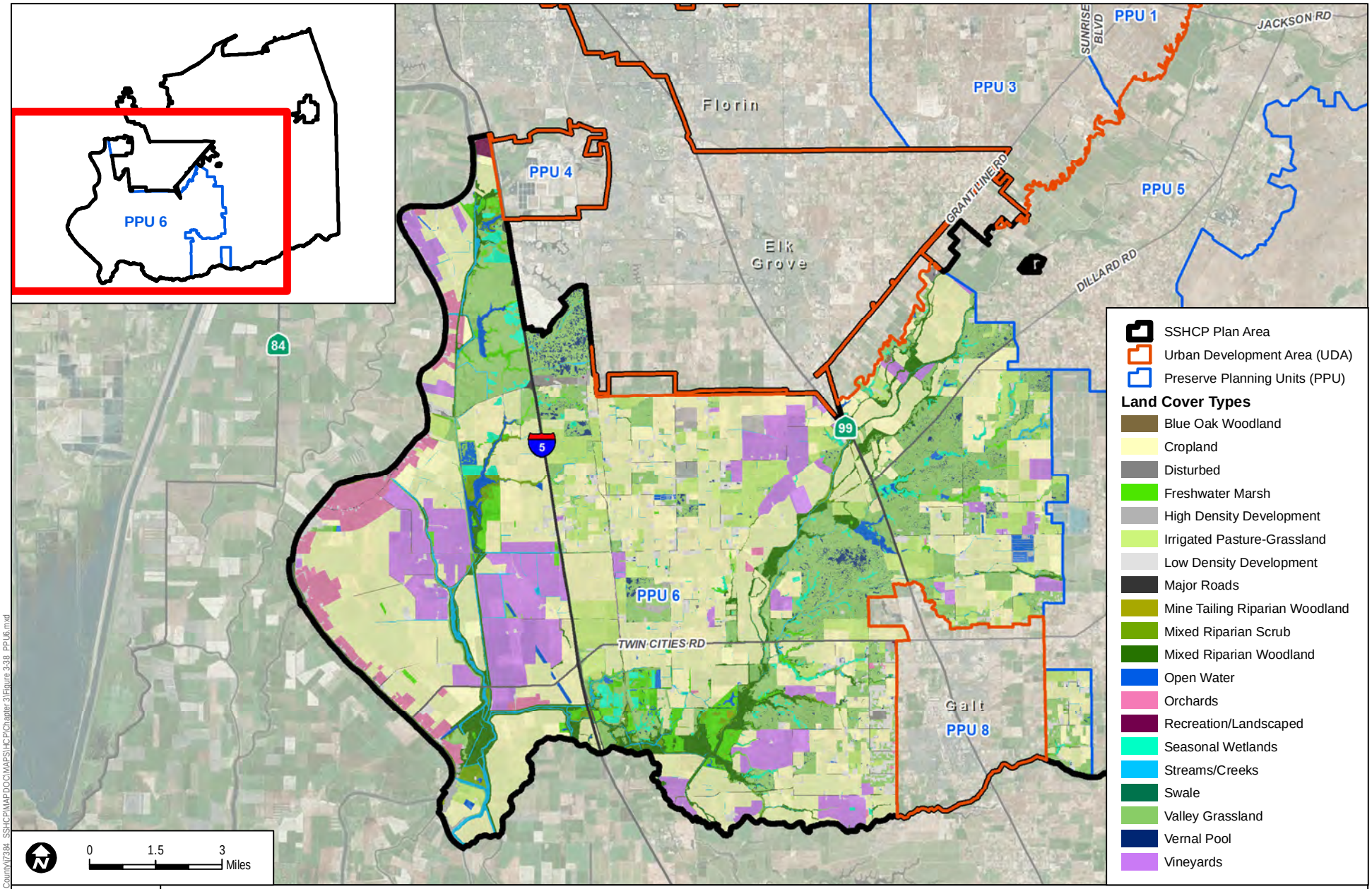

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-38

Preserve Planning Unit 6

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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The dominant land covers in PPU 6 are farmland with about 39,102 acres of Cropland, about 6,948 acres of Irrigated Pasture-Grassland about 2,496 acres of Orchard and about 9,912 acres of Vineyard. The unit also contains approximately 17,633 acres of Valley Grassland with about 944 acres of vernal pools. Notably, PPU 6 contains about 4,096 acres of Mixed Riparian Woodland and about 984 acres of Mixed Riparian Scrub. There are approximately 28,000 acres of existing Preserves in PPU 6. A majority of this acreage is part of the Cosumnes River Preserve and the Stone Lakes National Wildlife Refuge.

PPU 6 contains documented occurrences for many of the Covered Species, including occurrences of dwarf downingia, legenere, Sanford's arrowhead, mid-valley fairy shrimp, Ricksecker's water scavenger beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, giant gartersnake and western pond turtle. PPU 6 is most notable for the high number of bird Covered Species that populate this unit. This unit contains all bird Covered Species and an exceptionally high number of documented occurrences for Swainson's hawk, greater sandhill crane and northern harrier, white-tailed kite and burrowing owl.

PPU 7 encompasses approximately 90,906 acres in the southeastern portion of the Plan Area (Figure 3-39). PPU 7 is bordered by PPU 5 on the north, the county line and Dry Creek to the south, the county line on the east, and the north-south alignments of Cherokee Lane and Davis Road to the west. The dominant land cover in PPU 7 is Valley Grassland, which encompasses 52,278 acres. PPU 7 is most notable for the amount of Vernal Pool (about 2,221 acres) and Swale (531 acres) that it contains. There is also about 11,623 acre of Vineyard within this unit.

There are approximately 26,000 acres of existing Preserves in PPU 7. Preserve in PPU 7 include the Chance Ranch Preserve, Laguna Creek Conservation Bank, Gill Ranch Conservation Bank, Clay Station Conservation Bank, SMUD Preserve and several other smaller Preserve sites. PPU 7 also includes the entire 44,388 acre Rancho Seco Core Recovery Area; the entire California Tiger Salamander Critical Habitat Unit 3 (10,193 acres); the entire Vernal Pool Tadpole Shrimp Critical Habitat Unit 9A (96 acres); 34,880 acres of the 36,996 acre Vernal Pool Tadpole Shrimp Critical Habitat Unit 9B; 34,880 acres of the 36,996 acre Vernal Pool Fairy Shrimp Critical Habitat Unit 14A; the entire Vernal Pool Fairy Shrimp Critical Habitat Unit 14B (96 acres); and 29,870 acres of the 32,086 acre Sacramento Orcutt Grass Critical Habitat Unit 3.

PPU 7 contains documented occurrences for many of the Covered Species including dwarf downingia, legenere, Sacramento Orcutt grass, Sanford's arrowhead, mid-valley fairy shrimp, Ricksecker's water scavenger beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, western spadefoot, giant gartersnake, western pond turtle, western red bat and all of the bird Covered Species with the exception of the white-tailed kite. Most notable is that this is the only unit with pincushion navarretia and is the most important unit for California tiger salamander.

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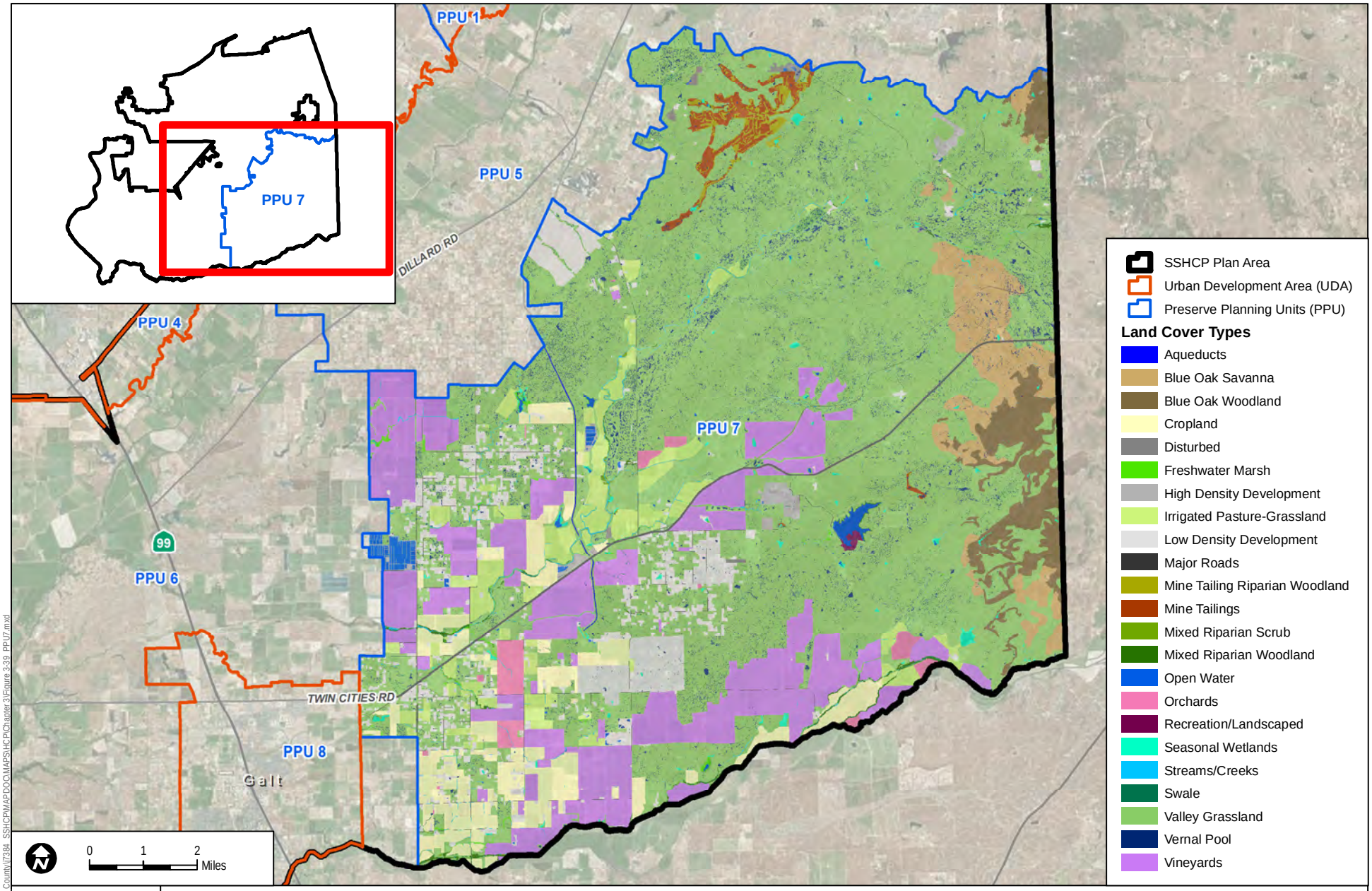

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 3-39

Preserve Planning Unit 7

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

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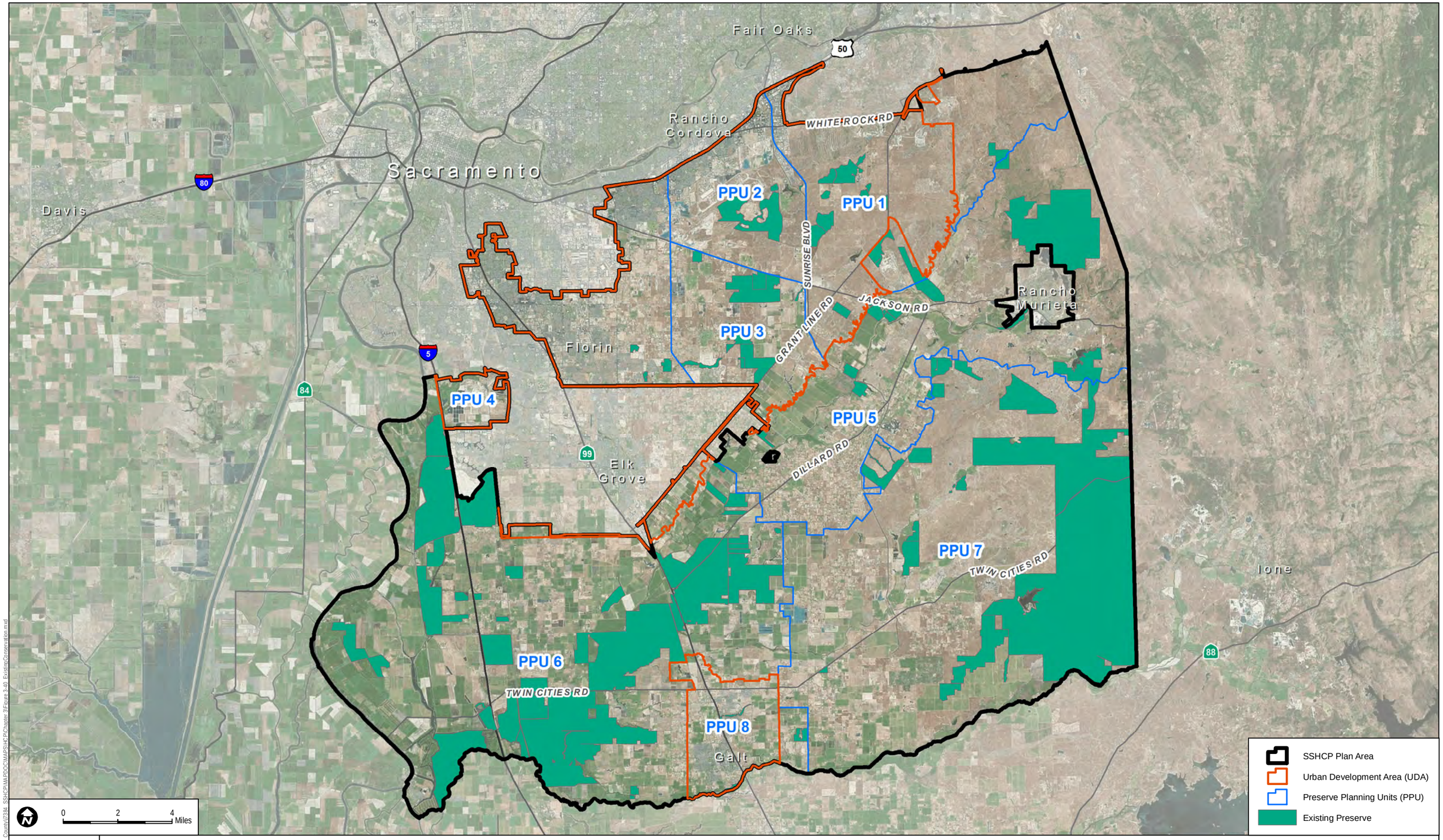

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SOURCE: Bing Maps, County of Sacramento 2014

FIGURE 3-41

Existing Conservation Sites Within the Plan Area

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7 CONSERVATION STRATEGY

The South Sacramento Habitat Conservation Plan (SSHCP) Conservation Strategy includes the Avoidance and Minimization Measures (AMMs) (Section 5.4); the SSHCP Biological Goals and Measurable Objectives (Table 7-1), including the development of the Preserve System (Section 7.4); monitoring and adaptive management programs (Chapter 8), and an Aquatic Resources Program. The SSHCP Conservation Strategy will meet the regulatory requirements of the federal Endangered Species Act (ESA) and California Endangered Species Act (CESA). In addition, as discussed in Chapter 1, the SSHCP Conservation Strategy will "streamline" compliance of third-party projects with Sections 401 and 404 of the Clean Water Act (CWA), with Section 1600 of the California Fish and Game Code, and the California's Porter-Cologne Water Quality Control Act (see Section 1.3.5).

The SSHCP Conservation Strategy mitigates to the maximum extent practicable the impacts of Covered Activities described in Chapter 6, Effects Assessment and Level of Take, including all direct and indirect impacts on Covered Species and their habitats. The SSHCP Conservation Strategy provides for conservation of 28 Covered Species and 17 land cover types; avoids or minimizes impacts of Covered Activities; mitigates for the impacts of Covered Activities on the Covered Species and their habitats on the basis of species and habitat needs; provides a regional approach to the mitigation of impacts and the conservation of species and their habitats; protects wetlands and waters of the Plan Area; and conserves natural communities in the Plan Area.

The SSHCP Conservation Strategy is based on the best scientific data available at the time of its preparation (see Chapter 3, Biological Resources Setting, and Appendix B, Species Accounts, as well as Figure 7-1, Conservation Strategy Conceptual Diagram). The components of the SSHCP Conservation Strategy include the Covered Activity impact AMMs described in Chapter 5; the Biological Goals and Measurable Objectives of the SSHCP described in Section 7.3; and the SSHCP Monitoring and Management Programs (Chapter 8), which includes preparing Preserve Management Plans for all SSHCP Preserve lands. All Preserve Management Plans will include monitoring of land management actions and adaptive management of each SSHCP Preserve.

To achieve the Biological Goals and Measurable Objectives, the SSHCP Conservation Strategy is focused on the following:

- Create an integrated Preserve System that conserves the natural land covers, certain Cropland, and Irrigated Pasture–Grassland in the Plan Area. The Preserve System will preserve at least 34,495 acres of existing habitat and re-establish or establish at least 1,787 acres of habitat for a total Preserve System of 36,282 acres. The Preserve System was developed for the benefit of SSHCP Covered Species, natural communities, biological diversity, and ecosystem functions of the Plan Area.

- Provide for the continued persistence of Covered Species in the Plan Area.
- Protect remaining natural segments of Elder Creek, Frye Creek, Gerber Creek, Morrison Creek, Paseo Central, Sun Creek, and their first and second order tributaries within the Urban Development Area (UDA) portion of the Plan Area.
- Protect all of the Laguna Creek Corridor within the Plan Area.
- Manage preserved lands to enhance populations of Covered Species and maintain biological diversity within the Preserve System.
- Maintain existing watershed functions in the Plan Area to benefit wetlands (aquatic land cover types), and to support aquatic Covered Species and their habitats.
- Re-establish or establish Vernal Pool land cover to ensure the Plan meets County of Sacramento (County), state, and federal requirements for "no-net-loss" of waters and wetlands and to offset impacts to vernal pool Covered Species.
- Re-establish or establish riparian and other aquatic land cover to ensure the Plan meets County, state, and federal requirements for "no-net-loss" of waters and wetlands and to offset impacts to riparian Covered Species.

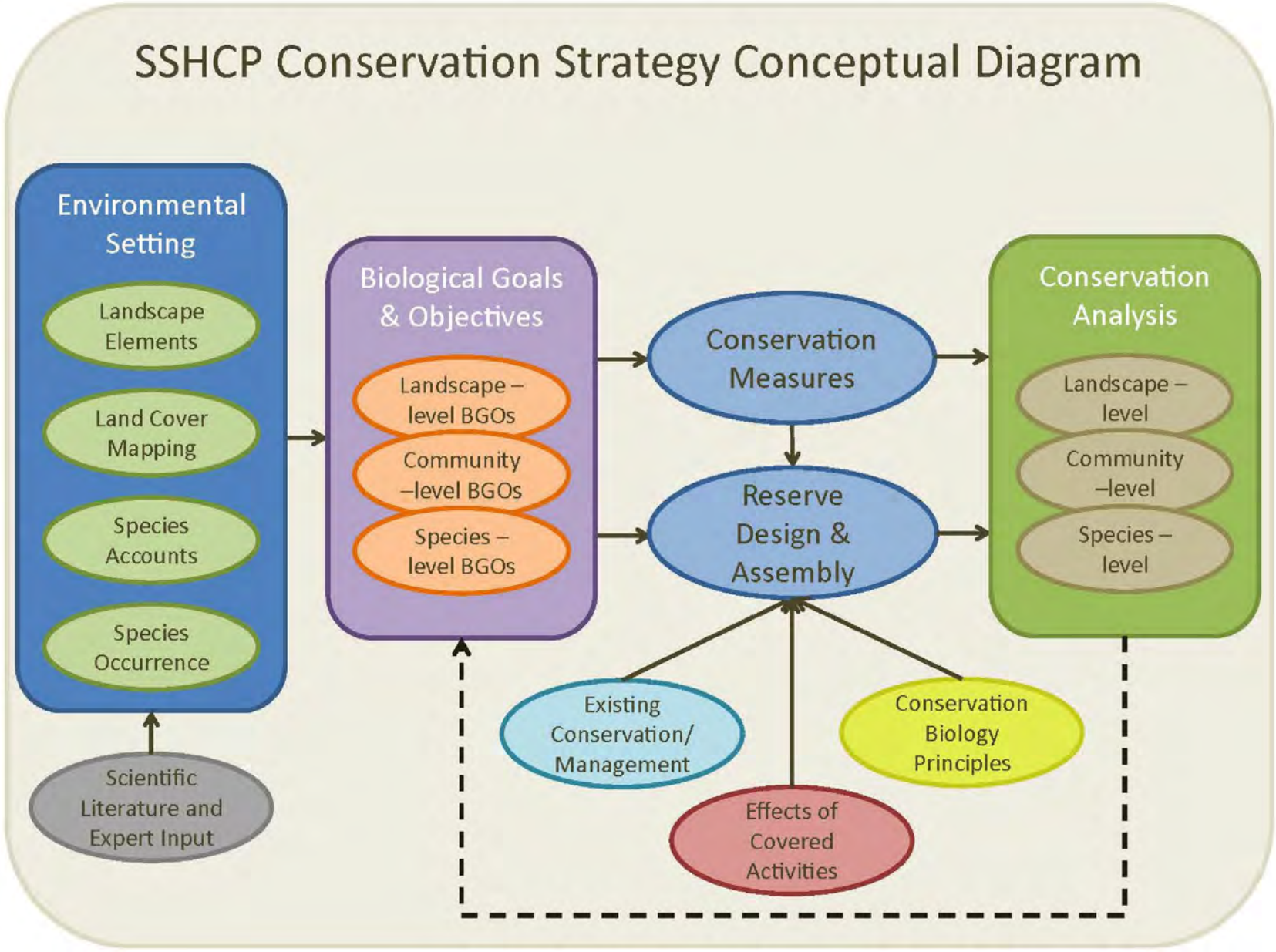

FIGURE 7-1

Conservation Strategy Conceptual Diagram

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7.1 Guiding Principles of the SSHCP Conservation Strategy

The SSHCP Conservation Strategy is based on the principles of conservation biology and landscape ecology and the nature, quality, and geographical distribution of the resources in the Plan Area. The key principles of conservation biology that guide the Conservation Strategy include:

1. **Minimize Habitat Fragmentation.** Habitat fragmentation reduces in size and isolates areas of habitat for species. As habitats become increasingly isolated, species migration, immigration, and dispersal become less common or impossible, thereby limiting or preventing opportunities for populations to exchange individuals and genetic information, escape inhospitable habitats, and recolonize areas. Ultimately, these effects can result in extinction of the species in the fragmented habitat patches. Habitat fragmentation can also alter natural ecosystem functions as well as processes such as the effects of fires and flooding, timing of pollination, habitat recovery, and other stochastic environmental events (e.g., pest outbreaks) that species have adapted to over their evolutionary history. The SSHCP Conservation Strategy minimizes habitat fragmentation by focusing on the establishment of large Preserves, and by linking existing preserves and SSHCP Preserves together to allow wildlife movement:

    a. ***Form Large Preserves***. Larger preserves have several advantages over multiple smaller preserves, even if the total area preserved is the same. Larger preserves have a greater chance of preserving habitat diversity at all scales, support larger local populations, help maintain functioning metapopulations (partially isolated subpopulations of the same species that support immigration and emigration and provide for recolonizations following local extirpations), support greater species genetic diversity, and are more likely to maintain intact watershed functions. They also have less habitat fragmentation and provide greater protection from edge effects due to a larger area-to-perimeter ratio compared to smaller preserves. Additionally, large preserves usually facilitate more cost-effective land management, such as viable livestock grazing operations and controlled fire regimes that are better carried out on a landscape scale.

    b. ***Maintain Habitat Linkages Between Preserves.*** Natural land covers preserved as habitat linkages, including species upland habitats linkages and aquatic/riparian habitat linkages in streams, creeks, and unimproved water channels, should connect larger habitat tracts that would otherwise be isolated to movement of wildlife and movement of plant species pollinators between preserves (i.e., movement corridors). Movement corridors should be as wide, continuous, natural, and vegetatively diverse as practicable to accommodate as many species as possible and protect against adverse edge effects. Some smaller, less mobile species may actually reside in the linkage and larger and/or

more mobile species may only use each linkage as a movement corridor. Redundant or multiple habitat linkages between large blocks of preserved habitat are better than a single linkage, and linkages should ensure regional connectivity to natural habitats outside of the Plan Area, where biologically appropriate, and to the maximum extent practicable.

2. **Protect Watersheds and their Ecosystem Functions.** Watershed and sub-watershed functions are an important determinant for maintaining or enhancing habitat for certain stream- and wetland-dependent and wetland-associated plants and wildlife habitats. In addition, considering watersheds as part of an overall conservation strategy helps maintain ecosystem function and promotes avoidance and minimization of development-related impacts at larger scales. Sufficient sub-watershed areas should be preserved to maintain hydrologic functions such as recharge. Also, development-related increases in surface runoff and non-point source pollution (e.g., runoff from roads, roofs, paved surfaces, utility pipes, landscaped areas) can be addressed through watershed protection. Watershed protection also assists in the conservation of streams and their water quality. The SSHCP Conservation Strategy protects watersheds and their ecosystem functions through Stream Setbacks, preservation and re-establishment of riparian land cover types, and a range of water quality protection measures.

3. **Preserve Irreplaceable and Threatened Resources.** A site with high irreplaceability has unique species or natural communities that cannot be preserved or restored elsewhere. Examples of irreplaceable resources in the study area are slender Orcutt grass (*Orcuttia tenuis*) and Sacramento Orcutt grass (*Orcuttia viscida)*, which have very limited distribution, but occur within this Plan Area. Threatened resources are those most under threat from natural or anthropogenic (human-related) factors. The SSHCP Conservation Strategy will preserve irreplaceable and threatened resources such as slender Orcutt grass and Sacramento Orcutt grass by protecting all occurrences in the Plan Area. The Preserve System will protect biological diversity and natural communities that have a high level of irreplaceability and a high degree of threat.

4. **Minimize Edge Effects.** Edge effects occur at the interface between natural and developed areas. Examples of edge effects are light and noise pollution, vibration, altered surface and subsurface hydrology, runoff and water pollution, dumping of trash and other debris and toxic chemicals, spread of invasive non-native plants and animals, and presence of pets that may adversely affect native species (see Section 6.6 for discussions of indirect effects on Covered Species). Edge effects are most severe along the perimeter of a preserve within the urban boundary. The SSHCP Conservation Strategy addresses edge effects in several ways: during Preserve design by ensuring that SSHCP Preserves are large and minimize the amount of edge area; by providing setbacks between Preserves and development; by requiring development design features that reduce edge

effects (e.g., single-loaded streets, low-impact development measures); by implementing SSHCP Avoidance and Minimization Measures during Covered Activities to reduce or eliminate adverse effects of Covered Activities on adjacent biotic resources and the ecosystem processes that support them; and by monitoring Preserves for potential long-term edge effects that could not be completely eliminated by Preserve design and other Avoidance and Minimization Measures and adaptively managing to take corrective actions. Also see setbacks description (item five in this list).

5. **Utilize Setbacks.** Setbacks will be utilized between urban development and streams and between urban development and SSHCP Preserves or existing preserves. The purpose of the setbacks is to eliminate or reduce edge effects on Covered Species and natural communities, including waters and wetlands, from urban development. Setbacks provide important space between sensitive natural resources present in preserves or streams, and potential anthropogenic edge effects caused by lighting, noise, vibration, invasive species, pets, etc. By restricting the types of recreation facilities and loss of natural land covers within setbacks, the SSHCP setbacks may also provide additional habitat for some native wildlife species and beneficial insects (e.g., pollinators of native plants).

6. **Maintain Plan Area Land Cover Heterogeneity Within Preserves.** Heterogeneous natural communities generally contain greater biodiversity, are more likely to be ecologically complex, and may be more resilient over time when compared to more homogenous areas. Preserving the biotic and abiotic habitat heterogeneity of the Plan Area to the maximum extent practicable increases the likelihood of capturing the ecosystem functions and processes needed for the long-term conservation of Covered Species, their habitat, and overall biodiversity of the Plan Area. The Conservation Strategy is targeted toward maintaining existing heterogeneity of land covers inside and outside the UDA.

7. **Maintain or Increase Population Size.** Species populations with larger numbers of individuals are known to be more stable in the long term, less vulnerable to adverse demographic effects caused by environmental stochasticity (probabilistic events such as floods, fires, and disease), and less vulnerable to extirpation (extermination), when compared to smaller populations. Larger populations tend to possess higher genetic diversity, which can reduce the chance of genetic bottlenecks, genetic drift, and inbreeding depression. Larger populations better cope with and/or adapt to changing environmental conditions and local stochastic effects due to their greater number of individuals and likely greater genetic heterogeneity. For narrowly distributed species such as the Orcutt grasses, all existing occurrences will be preserved to maintain existing population sizes. The Conservation Strategy includes establishment of large and interconnected habitat Preserves that will be actively managed to improve the quality and extent of habitat for all Covered Species populations.

8. **Maintain Species Distribution in the Plan Area.** Maintaining population distributions over a landscape may limit the effects of stochastic disturbances to localized sub-populations (e.g., local extirpations). If populations persist in areas that escaped the stochastic disturbance, they may serve as sources for natural recolonizations of suitable habitat formerly occupied by the extirpated population. Maintaining population distributions also helps assure preservation of the species' genetic diversity, which may provide inherent resilience that would allow the species to adapt to changing environmental conditions. The Conservation Strategy includes establishment of large and interconnected habitat preserves throughout the Plan Area that will be actively managed to maintain viable populations of Covered Species consistent with their existing distribution in the Plan Area.

These guiding principles provided the conceptual foundation for the development of the Biological Goals and Measurable Objectives described in Section 7.3. Although the SSHCP is not a state Natural Community Conservation Plan (NCCP), the guiding principles of the SSHCP Conservation Strategy are consistent with six requirements of the NCCP Act (Fish and Game code 2820 (a)(4)]): (1) conserve, restore, and provide for the management of representative natural and semi-natural landscapes; (2) establish preserves that provide conservation of covered species within the Plan Area and linkages to adjacent habitat outside the Plan Area; (3) protect and maintain habitat areas that are large enough to support sustainable populations of covered species; (4) incorporate in the preserves a range of environmental gradients and high habitat diversity to provide for shifting species distributions in response to changing circumstances; (5) sustain the effective movement and interchange of organisms between habitat areas; and (6) contribute to species recovery to help to delist the listed species and prevent the listing of non-listed species through the protection, restoration, and enhancement of natural communities and species habitat. Although species recovery is not a statutory requirement of habitat conservation plans (HCPs), the SSHCP will provide additional habitat conservation for some amphibian, reptile, bird, and mammal Covered Species (beyond that required to mitigate impacts of Covered Activities, and the Conservation Strategy will conserve all Covered Species in the Plan Area. Further, the U.S. Fish and Wildlife Service (USFWS) recognizes that HCPs may present opportunities to conserve species habitat and meet the rationales for the species-specific recovery criteria (see Section 7.6.2.1).

7.2 Information Relevant to Conservation Strategy Development

The SSHCP Conservation Strategy was developed using a compilation of the best available scientific information, including the following:

- **Mapping of Land Covers within the Plan Area** – Color and black and white aerial photographs of the Plan Area spanning several years were reviewed and interpreted to identify the types and extent of Plan Area land covers (Section 3.2).

- **Existing Conditions of Species and Habitat at the Time of Plan Preparation** – The existing condition of the natural resources in the Plan Area (e.g., species occurrence data, topographic data, hydrologic unit code (HUC) 10 watersheds, soil types, existing preserves) was compiled, species accounts were developed for potential Covered Species (Appendix B), and SSHCP land cover types/natural communities were defined and described (Chapter 3). A vernal pool density analysis was conducted (Dittes et al. 2007). In 2014 and 2015, light detection and ranging (LIDAR) technology was used to further identify vernal pool complexes and define vernal pool micro-watersheds in the Plan Area (Section 3.2.3 and Appendix E).
- **Regional Threats and Environmental Stressors** – Stressors that might affect the persistence and population size of each Covered Species were considered when developing the Biological Goals and Measurable Objectives. Information in the most recent USFWS species 5-Year Reviews was used to identify threats and stressors for each federally listed Covered Species. Some of these threats are common across the range of each species (e.g., loss of vernal pools due to land conversion) and some are more Plan Area-specific (e.g., disturbance to particular creeks relied upon by giant gartersnake (*Thamnophis gigas*)). Biological Objectives (Table 7-1) were developed to completely avoid or to minimize the effects of these local stressors.
- **Recovery Plans and Reviews** – Existing conservation needs or management recommendations for covered species in state or federal recovery plans, federal 5-Year Reviews, or State Status Reviews, including the following:
    - *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005a), which describes conservation measures for most of the vernal pool plant and animal species that are Covered Species under the SSHCP
    - *Draft Recovery Plan for the Giant Garter Snake* (Thamnophis gigas) (USFWS 1999a)
    - *Valley Elderberry Longhorn Beetle Recovery Plan* (USFWS 1984)
    - Most recent USFWS 5-Year Reviews of each federally listed Covered Species:
        - *Slender Orcutt Grass (*Orcuttia tenuis*) 5-Year Review: Summary and Evaluation* (USFWS 2009)
        - *Orcuttia viscida (*Sacramento Orcutt Grass*) 5-Year Review: Summary and Evaluation* (USFWS 2008)
        - *California Tiger Salamander Central California Distinct Population Segment (*Ambystoma californiense*) 5-Year Review: Summary and Evaluation* (USFWS 2014)
        - *Giant Garter Snake* (Thamnophis gigas) *5-Year Review: Summary and Evaluation* (USFWS 2006a)

- *Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) 5-Year Review: Summary and Evaluation* (USFWS 2006b)
- *Vernal Pool Fairy Shrimp* (Branchinecta lynchi) *5-Year Review: Summary and Evaluation* (USFWS 2007a)
- *Vernal Pool Tadpole Shrimp* (Lepidurus packardi) *5-Year Review: Summary and Evaluation* (USFWS 2007b)

o *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States* (USFWS 2003)

o *A Status Review of the California Tiger Salamander* (Ambystoma californiense) (CDFG 2010).

As applicable, recovery needs for this region identified in the recovery plans and reviews informed and are incorporated into the SSHCP Conservation Strategy. Some of the Biological Goals and Measurable Objectives listed in Table 7-1 directly reflect recovery needs, such as Objective VP1, which requires preservation within or adjacent to the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Recovery Area.

- **Critical Habitat** – The Plan Area contains designated Critical Habitat for four federally listed vernal pool plants and animals (i.e., vernal pool tadpole shrimp, vernal pool fairy shrimp, Sacramento Orcutt grass, and slender Orcutt grass), as well as designated Critical Habitat for the federally listed California tiger salamander (USFWS 2005b). This Critical Habitat was identified as a priority for preservation, so Measurable Objectives were established that require preservation of a particular acreage of each Critical Habitat Unit (CHU) within the Plan Area.

Each of these elements was incorporated into an SSHCP geographic information system (GIS) database (Section 7.2.1) that was used to develop the SSHCP Biological Goals and Measurable Objectives (Section 7.3) and to inform the SSHCP Preserve System (Sections 7.4 and 7.5).

7.2.1 SSHCP GIS Database

Based on the best available scientific information identified above, the Plan Permittees developed a GIS spatial database including, but not limited to, maps of the following parameters:

- SSHCP land cover types for the Plan Area
- Preserve Planning Unit boundaries (see Section 7.2.1.1)
- Modeled habitat for each Covered Species, including high-value habitat (see Section 3.4)
- Infrastructure and urban development Covered Activity project footprints

- Areas of planned urban development in the UDA
- Existing preserves
- USFWS-designated Critical Habitat
- USFWS-designated Core Recovery Areas
- Watersheds, including large HUC-10 watersheds, and small micro-watersheds for individual vernal pools mapped by LIDAR technology (see Appendix E).

This GIS spatial database was used by the Plan Permittees to develop a Conservation Strategy, including Biological Goals and Measurable Objectives (Section 7.3), and to inform the Preserve System (Sections 7.4 and 7.5).

7.2.1.1 Plan Area Subdivisions

To assist with development of an adequate SSHCP Conservation Strategy, the Plan Area was further divided into eight Preserve Planning Units (PPUs) that encompass areas where important Covered Species resources are present and where habitat preservation would occur (see Figure 1-1). These eight SSHCP PPUs are geographic subdivisions of the Plan Area and were delineated to ensure that adequate Biological Goals and Measurable Objectives (Section 7.3) would be developed for biological resources in all parts of the Plan Area, including the location and implementation of the Preserve System.

PPUs were delineated to capture specific habitat or agricultural land cover types or areas identified as being important for a specific suite of species. For instance, PPU 7, which is located in the southeastern portion of the Plan Area, was delineated to encompass the vast majority of Valley Grassland in the Vernal Pool Ecosystem remaining in the County. PPU 7 also contains the designated Cosumnes/Rancho-Seco Core Recovery Area (USFWS 2005a). PPU 2 contains the designated Mather Core Recovery Area (USFWS 2005a). PPU 6, located in the southwestern portion of the Plan Area, was delineated to encompass a vast majority of agricultural land cover types that provide foraging habitat for many covered raptor species. Although geopolitical or physical landmarks were used to delineate some PPU boundaries, this was done for ease of mapping and to make locating PPU boundaries in the field easier.

PPUs 1 through 4 and PPU 8 are within the UDA. However, a small portion of PPU 1 (2,156 acres near the County landfill) is located outside of the UDA. PPUs 5, 6, and 7 are outside the UDA.

A portion of the Plan Area in the middle of the UDA (14,085 acres) and a small portion of the area outside of the UDA in the extreme northeastern portion of the Plan Area (9,245 acres) are not within a PPU (see Figure 1-1). These areas are not within a PPU as there are no resources identified for protection in these locations. A complete description of each PPU, including

species occurrences and land cover types within each PPU, can be found in Chapter 3, Biological Resources Setting. Section 7.5 describes the Conservation Strategy for each PPU.

7.2.1.2 SSHCP Covered Species Models

As described in Section 3.4, suitable Covered Species habitat within the Plan Area was modeled and then mapped for each Covered Species. Areas of modeled habitat for each Covered Species were used to guide development of Measurable Objectives.

Modeled habitat mapped for western pond turtle (*Actinemys marmorata*), giant gartersnake, Swainson's hawk (*Buteo swainsoni*), and greater sandhill crane (*Grus canadensis*) also include areas of "high-value habitat" for those species. High-value habitat is defined as an area/location of the Covered Species modeled habitat (Section 3.4) that is highly suitable for one or more biological needs of the Covered Species (e.g., nesting, roosting, or foraging). The habitat value of a particular area was determined by the Permittees, Wildlife Agencies, and species experts during their reviews of the best available information (summarized in Chapter 3 and the species accounts in Appendix B), information used to define and delineate Covered Species modeled habitat, and other factors, such as proximity to water sources, distance from development, and other relevant Plan Area factors.

7.2.2 SSHCP Preserve Categories

The SSHCP Permittees have identified seven categories of Preserves to help the SSHCP Conservation Strategy conform with the SSHCP mission statement (Section 1.1.1), and the SSHCP guiding principles (Section 7.1), and meet the Biological Goals and Measurable Objectives for the operating SSHCP (Section 7.3.2):

- **Landscape Preserve:** Preserves that are at least 10,500 acres in size and containing extensive areas of contiguous natural land covers where natural ecological functions can continue to operate, typically without extensive land management activities. Because existing development has already fragmented much of the remaining habitat within the UDA, the Landscape Preserve will be located outside the UDA.
- **Core Preserve:** Preserves that are at least 800 acres in size and contain extensive areas of contiguous habitat. Most Core Preserves will be located within the UDA.
- **Minor Preserve:** Preserves that are between 250 and 800 acres in size that contain populations that are important to the viability of a Covered Species, have unusually high biological diversity, and/or have a high concentration of sensitive biological resources. Minor Preserves will be required to connect to existing preserves and/or to the new SSHCP Core Preserves via Linkage Preserves. Most Minor Preserves will be located within the UDA.

- **Satellite Preserve:** Preserves that are smaller than Core and Minor Preserves (i.e., less than 250 acres), but contain populations that are important to the viability of a Covered Species in the Plan Area or have a particularly high concentration of sensitive biological resources. Satellite Preserves may not have the biological diversity of Core and Minor Preserves and may or may not be connected to other Preserves by habitat linkages due to other planning constraints (e.g., existing development, highly parcelized areas). Most Satellite Preserves will be located within the UDA.
- **Linkage Preserve:** Preserves that are generally more linear-shaped landscape features that connect large habitat blocks (e.g., Core and Minor Preserves) and are designed to provide for dispersal and movement of species between Preserve areas. Linkage Preserves have a minimum width of 600 feet.
- **Wildlife Movement Corridor:** There will be a minimum of two Wildlife Movement Corridors. The Laguna Creek Wildlife Movement Corridor is an important landscape feature in the Plan Area and will be an important component of the Preserve System for maintaining movement and resident habitat for wildlife, preserving riparian habitat, and maintaining hydrologic connections between preserves inside the UDA. Outside the UDA, the Cosumnes River/Deer Creek Wildlife Movement Corridor will serve a similar function.
- **Cropland Preserve:** Preserves consisting of existing agricultural lands mostly in PPU 6 that have been identified as uniquely important foraging and roosting habitat in the Plan Area for some Covered Species, including Swainson's hawk, white-tailed kite (*Elanus leucurus*), and greater sandhill crane. Cropland Preserves can be any acreage or shape.

In addition to these seven main Preserve categories, 500 acres of "flexible" Preserve are included in the SSHCP Conservation Strategy to assure that the operational Preserve System is providing the conservation benefits to the Vernal Pool Ecosystem within the Mather Core Recovery Area anticipated at the time of SSHCP preparation. Flexible Preserves can be of any SSHCP Preserve size category (Core, Minor, Satellite, Linkage) but must be within 1 mile of the Mather Core Recovery Area in PPUs 1, 2, or 3; and adjacent to a SSHCP Preserve or existing preserve. The 500 acres of Flexible Preserve is primarily intended to preserve existing Vernal Pool Ecosystem, but Flexible Preserve can also be used to preserve areas that previously supported vernal pools that can be used for vernal pool re-establishment/establishment. If Flexible Preserve is being used for re-establishment or establishment of vernal pools, the Flexible Preserve site must meet the requirements of AMM RE-ESTABLISHMENT/ESTABLISHMENT-1 (Vernal Pool) in Section 5.4. Flexible Preserves will complement the SSHCP Preserve System (Section 7.5) to ensure the Implementing Entity can meet all of the Biological Goals and Measurable Objectives for conservation of vernal pool species.

7.3 Biological Goals and Measurable Objectives

Biological Goals provide the broad guiding principles of an HCP's operating conservation strategy and are required to be included in all HCPs (USFWS and NOAA 2000). For more complex HCPs such as the SSHCP, Measurable Objectives are used to "step down" a Biological Goal to smaller, more understandable and directly measurable units. Measurable Objectives can be described as a condition to be met or a change to be achieved relative to the existing condition (USFWS and NOAA 2000). Measurable Objectives should include all of the following: species or habitat indicator, location, an action, a quantity/state, and the timeframe needed to meet the objective. Measurable Objectives are quantitative; they clearly state a desired result and will collectively achieve the Biological Goal (USFWS and NOAA 2000).

7.3.1 Identification of SSHCP Biological Goals and Measurable Objectives

The SSHCP Biological Goals and Measurable Objectives were developed by the Plan Permittees at a series of meetings with Plan Permittee staff, local species experts and stakeholders, and biologists and species experts familiar with the Plan Area, and with assistance from USFWS, the California Department of Fish and Wildlife (CDFW), and the U.S. Army Corps of Engineers.

Development of the Conservation Strategy began with a review of the Plan Area's natural communities and species, as described in Section 7.2, including key existing threats and ecological and conservation needs of Plan Area species. The Permittees articulated the SSHCP mission statement (Section 1.1.1), defined the SSHCP land cover types (Section 3.2), identified appropriate SSHCP Covered Species (Section 1.2.4), defined Covered Species modeled habitats (Section 3.4) and articulated the guiding principles of the SSHCP Conservation Strategy (Section 7.1) to clarify the purpose and direction of the operating SSHCP Conservation Strategy.

Permittees then identified broad Biological Goals at three spatial scales: landscape-level, natural-community-level (SSHCP Land Covers), and Covered-Species-level. The Permittees formulated manageable and Measurable Objectives that specify the different components needed to achieve each SSHCP Biological Goal. Discussions and revisions of each SSHCP Biological Goal and each Measurable Objective were iterative, and continued until the Plan Permittees and all participants were satisfied that the Biological Goals and Measurable Objectives were consistent with the SSHCP mission statement and guiding principles, and clearly defined the desired outcome of the operating SSHCP Conservation Strategy.

Because of the size and complexity of the SSHCP, each Measurable Objective was further "stepped down" into smaller "Conservation Actions" that provide requirements for implementing the Measurable Objective within the operating Conservation Strategy. These Conservation Actions include tools, strategies, comprehensive programs, and actions to protect natural communities, habitats, and landscape-level processes that would achieve that Measurable Objective. Because they

"tier" from the Biological Goals and Measurable Objectives, the Conservation Actions also occur at the landscape-level, natural-community-level, and species-level.

7.3.2 SSHCP Biological Goals and Measurable Objectives

The Biological Goals for the SSHCP include goals pertaining to the Plan Area's landscape functions, the Plan Area's natural communities (i.e., SSHCP land cover types), and the Plan's Covered Species, as follows:

- **Biological Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.**

  The intent of Biological Goal 1 is to maintain the existing heterogeneity of natural land covers (and their associated geologic formations and landforms) present within the Plan Area, minimize habitat fragmentation, and maintain landscape ecosystem functions by establishing a system of large and interconnected preserves. Biological Goal 1 is a landscape-level Biological Goal.

- **Biological Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.**

  The intent of Biological Goal 2 is to avoid or minimize impacts of future Covered Activities on Plan Area aquatic resources and to ensure "no net loss" of aquatic resources and aquatic functions by preserving existing aquatic resources and by re-establishing or establishing aquatic resources within the Plan Area. Biological Goal 2 is a landscape-level Biological Goal.

- **Biological Goal 3. Preserve, re-establish, and establish natural land covers (including cropland and irrigated pasture-grassland) that provide habitat for Covered Species.**

  The intent of Biological Goal 3 is to ensure that adequate acreage of each SSHCP natural land cover remains in the Plan Area to provide necessary breeding, foraging, and/or sheltering habitat for the Covered Species and other Plan Area native species that are associated with that land cover type. Biological Goal 3 is a Natural-Community-level Biological Goal.

- **Biological Goal 4. Maintain or improve habitat value of natural land covers (including cropland and irrigated pasture-grassland) that are preserved within the Plan Area.**

  Biological Goal 4 provides appropriate management and monitoring of lands preserved by the SSHCP to ensure that natural communities remain functional in perpetuity for the benefit of Covered Species and other Plan Area native species. Biological Goal 4 is a Natural-Community-level Biological Goal.

- **Biological Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.**

  The intent of Biological Goal 5 is to ensure that each Covered Species persists within the Plan Area in perpetuity, and that unoccupied but suitable habitat for each Covered Species is preserved or re-established to provide for future Covered Species population growth and dispersal. Biological Goal 5 is a species-level Biological Goal.

For some Covered Species, the landscape- and/or natural community-level Measurable Objectives will be sufficient to achieve the SSHCP's Biological Goal for that species. For example, preserving and managing large amounts of the Valley Grassland land cover type within the Vernal Pool Ecosystem (Objective VG1 under Biological Goal 3) will also maintain winter foraging habitat for ferruginous hawk (*Buteo regalis*) (Objective FH1 under Biological Goal 5). However, where portions of the Plan Area are critical for conserving a particular Covered Species, then the Permittees identified species-specific Measurable Objectives for those areas. For example, for giant gartersnake, specific Plan Area creeks will be protected under Objective GGS1 to achieve Biological Goal 5 for this species.

The SSHCP landscape-level, natural-community-level, and Covered Species-level Biological Goals and Measurable Objectives are listed and described in Table 7-1 and Section 7.6. For each Biological Goal, there is a set of Measurable Objectives and Conservation Actions to achieve that goal.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	
Objective L1. Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or establishes 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment, at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.	L1.1. The minimum land acquisition required under the SSHCP for natural land cover types is 33,796 acres. Additional minimum land acquisition requirements will apply to some conservation analysis zones and for aquatic land cover types, as described below. Actual acquisition of some land cover types will likely be greater than the combined minimum requirements because parcel boundaries typically do not follow ecological boundaries, and the boundaries of acquired parcels will include land cover types that are not specified by acquisition requirements (e.g., minor roads, aqueducts). In addition, qualitative requirements for habitat connectivity or for preservation of plant occurrences could require additional acreage. All SSHCP land acquisitions must be accomplished by Year 45 of the Permit Term to ensure that all Preserve lands have at least 5 years to be managed, enhanced, and monitored according to the terms of the SSHCP. This time period will enable the Permitting Agencies to closely monitor the final land acquisitions to ensure that the Implementing Entity will complete the land acquisition strategy and achieve the final Biological Goals and Objectives. Management of these lands, however, will occur in perpetuity. Refer to Objectives under Goal 3 for minimum preservation and re-establishment/establishment requirements for individual SSHCP natural land cover types. Re-establishment/establishment requirements are separate and distinct from preservation requirements and cannot overlap.
Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).	L2.1. The Implementing Entity will acquire lands to link SSHCP Preserves and existing preserves in the Plan Area via Linkage Preserves. Linkage Preserves will have a minimum width of 600 feet. The Implementing Entity will select Linkage Preserve sites considering the following criteria: • Connects SSHCP Preserves together or connects SSHCP Preserve to existing preserves. • Provides known connectivity for Covered Species and other native terrestrial species. • Includes Covered Species modeled habitat.
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	
Objective W1. Ensure that during implementation of Objective L2 (establishing minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.	W1.1. Implement Stream Setback requirements in the UDA pursuant to Table 5-1.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective W2. Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (Low-Impact Development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)	W2.1. Each Urban Development Covered Activity will implement LID AMMs in accordance with Section 5.4.
	W2.2. Each ground-disturbing Covered Activity will implement BMP measures (see Section 5.4).
	W2.3. Each urban development road construction and rural transportation Covered Activity will implement ROAD and BMP measures for road siting, design, pre-construction, construction, post-construction, and maintenance requirements (see Section 5.4).
Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams, as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.	W3.1. Implement AMMs STREAM-1, STREAM-2, STREAM-3, and STREAM-4.
Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).	W4.1. The Implementing Entity will select Preserve sites for Valley Grassland within the Vernal Pool Ecosystem considering certain criteria, including the following: • Known to include herbaceous native plant species. • Includes Covered Species modeled habitat. • Adjacent to currently preserved lands. • On parcels 20 acres or greater and/or occurring within a larger open space area.
	W4.2. The Implementing Entity will select Preserve sites for Vernal Pool and Swale habitat considering certain criteria including, the following: • Includes Covered Species modeled habitat. • Has naturally occurring high densities of vernal pools. • Has heterogeneity in vernal pool size, depth, and density. • Contains large or deep vernal pools. • Adjacent to currently preserved lands.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	• Contains a soil type that is not currently preserved in the Plan Area or is underrepresented in the Preserve System; • On parcels 20 acres or greater and/or occur in larger, open space areas. • Can be managed to enhance or restore natural Vernal Pool Ecosystem processes.
	W4.3. The Implementing Entity will select Preserve sites for Seasonal Wetland and Stream/Creek (VPIH) habitat considering certain criteria, including the following: • Links preserved vernal pools. • Includes Covered Species modeled habitat. • On parcels 20 acres or greater and/or occur in larger, open space areas.
	W4.4. The Implementing Entity will select Preserve sites for Freshwater Marsh considering certain criteria, including the following: • Includes Covered Species modeled habitat. • Can be managed to enhance or restore natural Freshwater Marsh ecosystem processes.
	W4.5. The Implementing Entity will select Preserve sites for Stream/Creek considering certain criteria, including the following: • Located in modeled habitat for aquatic Covered Species (particularly giant gartersnake and western pond turtle). • Proximity to the mouth of the stream/creek to benefit giant gartersnake and western pond turtle. • Adjacent to an existing preserve. • Water present during early spring through mid-fall (April through October). • Can be managed to enhance or restore natural Stream and Creek Ecosystem processes.
	W4.6. The Implementing Entity will select Preserve sites for Open Water considering certain criteria, including the following: • Includes Covered Species modeled habitat. • Can be managed to enhance or restore natural Open Water Ecosystem processes.
	W4.7. The Implementing Entity will select Preserve sites for Riparian land cover types considering certain criteria, including the following: • Includes Covered Species modeled habitat. • Located within 3 miles of foraging habitat for bird Covered Species that use Riparian habitat for nesting and/or roosting. • Closed canopy consisting of multiple vegetation layers and includes mature trees. • Large, relatively unfragmented, and connected to Valley Grassland and Agriculture areas. • Can be managed to enhance or restore Riparian land cover type ecosystem processes.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective W5. Ensure that aquatic resources are re-established and/or established at a minimum 1:1 ratio during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in this table (see Objectives VP2, VP5, SW2, FWM2, OW2, RIP2, and RIP4).	Refer to Conservation Actions VP2.1, VP5.1, SW2.1, FWM 2.1, OW2.1, RIP2.1, and RIP4.1.
Objective W6. Covered Activities will avoid a minimum of 20% of first and second order tributaries to Elder Creek, Frye Creek, Gerber Creek, Morrison Creek, Paseo Central, and Sun Creek in the UDA.	W6.1. Required avoidance will comply with requirements of AMM STREAM-3.
Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment will occur within the Morrison Creek Watershed.	Refer to Conservation Actions VP2.1, VP5.1, and FWM 2.1,
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture/Grassland) that provide habitat for Covered Species.	
Aquatic	
Objective VG1. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	VG1.1. Prioritize selection of Preserve sites for Valley Grassland prioritized based on the following criteria: • Located in Vernal Pool Ecosystem. • Known to support native herbaceous plants in uplands. • Adjacent to currently preserved lands. • On parcels 20 acres or greater and/or occurring within larger open space area. • Management could enhance natural ecosystem processes of the Vernal Pool landscape.
Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area.	VP1a.1. Prioritize selection of Preserve sites for vernal pools based on the following criteria: • Includes modeled habitat for vernal pool Covered Species. • Ecosystem functions of the uplands, micro-watersheds, and perched aquifer surrounding the vernal pools are undisturbed.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	• Adjacent to currently preserved lands. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Can be managed to maintain natural Vernal Pool Ecosystem processes. • Depending on what is already preserved in the Plan Area, prioritize either naturally occurring high-density vernal pool complexes or more isolated pools to ensure heterogeneity of spatial patterns and connectivity. • Depending on what is already preserved in the Plan Area, prioritize preservation of pools with each of the different landforms, geologic formations, floristic assemblages, and vernal pool sizes/depths. • Has available water for grazing animals on Preserves.
Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area.	VP1b.1 Prioritize selection of Preserve sites for vernal pools in Recovery Areas based on the following criteria: • Is within the Mather Core Recovery Area or Cosumnes/Rancho-Seco Recovery Area. • If not within the recovery areas, is within 1 mile of one of the two recovery areas. • Includes modeled habitat for vernal pool Covered Species. • Ecosystem functions of the uplands, micro-watersheds, and perched aquifer surrounding the vernal pools are undisturbed. • Adjacent to currently preserved lands. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Can be managed to maintain natural Vernal Pool Ecosystem processes. • Depending on what is already preserved in the Plan Area, prioritize either naturally occurring high-density vernal pool complexes or more isolated pools to ensure heterogeneity of spatial patterns and connectivity. • Depending on what is already preserved in the Plan Area, prioritize preservation of pools with each of the different landforms, geologic formations, floristic assemblages, and vernal pool sizes/depths. • Has available water for grazing animals on Preserves.
Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area.	VP2.1. Implement vernal pool re-establishment and establishment consistent with the requirements of AMM RE-ESTABLISHMENT/ESTABLISHMENT-1 and -2. Adhere to specific protocols, described in detail in Appendix D of the Aquatic Resources Program, and outlined in 33 CFR Part 325 Sections 332.4(c)(2) through (c)(14) of the USACE's Mitigation Rule.
Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in this table and in	VP3.1. Prioritize selection of Preserve sites for Swale or Stream/Creek (Vernal Pool Invertebrate Habitat (VPIH)), based on the following criteria: • Located in Vernal Pool Ecosystem. • Links existing preserved Vernal Pool areas.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
accordance with Section 7.5.	• Includes Covered Species modeled habitat. • On parcels 20 acres or greater and/or occurs in larger, open space areas.
Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	VP4.1. Prioritize selection of Preserve sites for Swale or Stream/Creek (VPIH) based on the following criteria: • Located in Vernal Pool Ecosystem. • Swale preservation is preferred over preservation of Stream/Creek (VPIH). • Links existing preserved Vernal Pool areas. • Includes Covered Species modeled habitat. • On parcels 20 acres or greater and/or occurs in larger, open space areas.
Objective VP5. Re-establish and/or establish a minimum of 256 acres of Swale or vernal pool for impacts to the Swale and Stream/Creek (VPIH) land covers. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.	VP5.1. Prioritize selection of re-establishment/establishment sites for Swale based on the following criteria: • Located in Vernal Pool Ecosystem. • Links existing preserved Vernal Pool areas • Includes Covered Species modeled habitat. • On parcels 20 acres or greater and/or occurs in larger, open space areas.
Objective VP6. Re-establish and/or establish a minimum of 300 acres of functional Vernal Pool Ecosystem within or adjacent to (within 1 mile of) the Mather Core Recovery Area.	VP2.1. Implement vernal pool re-establishment and establishment consistent with the requirements of AMM RE-ESTABLISHMENT/ESTABLISHMENT-1 and -2. Adhere to specific protocols, described in detail in Appendix D of the Aquatic Resources Program, and outlined in 33 CFR Part 325 Sections 332.4(c)(2) through (c)(14) of the USACE's Mitigation Rule.
Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	SW1.1. Prioritize selection of Preserve sites for Seasonal Wetland based on the following criteria: • Includes Covered Species modeled habitat. • On parcels 20 acres or greater and/or occurs in larger, open space areas, to the maximum extent feasible.
Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.	SW2.1. Prioritize selection of re-establishment and/or establishment sites for Seasonal Wetland based on the following criteria: • Links existing preserved areas of Seasonal Wetland or other aquatic land cover types that provide modeled species habitat. • On parcels 20 acres or greater and/or occurs in larger, open space areas, to the maximum extent feasible. • Supports soils and topography modeled for re-establishing and/or establishing Seasonal Wetland.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	FWM1.1. Prioritize selection of Preserve sites for Freshwater Marsh based on the following criteria: • Includes Covered Species modeled habitat. • Currently exhibits hydrology sufficient to support perennial Freshwater Marsh habitat. • Currently supports emergent vegetation such as tules and cattails.
Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.	FWM2.1. Prioritize selection of re-establishment and/or establishment sites for Freshwater Marsh based on the following criteria: • Historically supported Freshwater Marsh habitat. • Has soils and topography consistent with the Freshwater Marsh land cover type modeled for re-establishment and/or establishment of Freshwater Marsh. • Site links existing preserve areas of Freshwater Marsh other aquatic land cover types that provide modeled species habitat. • After re-establishment and/or establishment, would provide Covered Species modeled habitat. • Has hydrology sufficient to support perennial Freshwater Marsh habitat or a water source to re-establish historical hydrology of the site.
Objective SC1. Preserve a minimum of 117 acres of the Stream/Creek land cover. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	SC1.1. Prioritize selection of Preserve sites for Stream/Creek based on the following criteria: • Potential to support Covered Species (particularly giant gartersnake and western pond turtle). • Proximity to the mouth of the stream/creek. • Adjacent to an existing preserve. • Water present during early spring through mid-fall (April through October). • Management can be used to enhance natural stream and creek ecosystem processes.
Objective SC2. Re-establish and/or establish a minimum of 117 acres of the Stream/Creek land cover. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.	SC2.1. Prioritize selection of re-establishment and/or establishment sites for Stream/Creek based on the following criteria: • Potential to support Covered Species (particularly giant gartersnake and western pond turtle). • Site links existing preserve areas of Aquatic land cover types that provide modeled species habitat. • Proximity to the mouth of the stream/creek. • Adjacent to an existing preserve. • Water present during early spring through mid-fall (April through October). • Management can be used to enhance natural stream and creek ecosystem processes.
Objective OW1. Preserve a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of	OW1.1. Prioritize selection of Preserve sites for Open Water based on the following criteria: • Includes Covered Species modeled habitat. • Site links existing preserved land cover types that provide modeled species habitat.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	• Management can be used to enhance or restore natural ecosystem processes.
Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.	• OW2.1. Prioritize selection of re-establishment and/or establishment sites for Open Water based on the following criteria: Site links existing preserve areas of Aquatic land cover that provide Covered Species modeled habitat. • Management can be used to enhance or restore natural ecosystem processes.
Objective RIP1. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	RIP1.1. Prioritize selection of Preserve sites for Mixed Riparian Woodland or Mixed Riparian Scrub based on the following criteria: • Includes Covered Species modeled habitat. • Located within 3 miles of foraging habitat for Covered Species that use Riparian habitat for nesting and/or roosting. • Closed canopy consisting of multiple vegetation layers and includes mature trees. • Large, relatively unfragmented and connected to Valley Grassland and Agriculture areas. • Management can be used to enhance or restore natural ecosystem processes.
Objective RIP2. Re-establish and/or establish a minimum of 591 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.	• RIP2.1. Prioritize selection of re-establishment and/or establishment sites for Mixed Riparian Woodland or Mixed Riparian Scrub based on the following criteria: Potential re-establishment/establishment sites will fill gaps between existing Mixed Riparian Woodland or Mixed Riparian Scrub land cover sites, or establish a link between existing Riparian Woodland or Mixed Riparian Scrub land cover sites. • Includes Covered Species modeled habitat. • Located within 3 miles of foraging habitat for Covered Species that use Riparian habitat for nesting and/or roosting. • Closed canopy consisting of multiple vegetation layers, including mature trees. • Large, unfragmented and connected to Valley Grassland and Agriculture areas. • Management can be used to enhance or restore natural ecosystem processes.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	• Re-establishment sites will be located along existing Riparian corridors where habitat likely existed in the past, such as areas along the Cosumnes River, Deer Creek, South Laguna Creek, Willow Slough, North Badger Creek, South Badger Creek, Deadman's Gulch, or Skunk Creek. • Re-establishment will avoid locations preserved or restored for giant gartersnake. • Establishment of riparian communities will avoid locations that historically did not support Riparian vegetation. • Establishment of Riparian communities will avoid any existing Vernal Pool landscapes. • Re-establishment will use the historical signature of Riparian communities and aim to restore the historical conditions. • Re-establishment and establishment sites will be located within an SSHCP Preserve. • Re-establishment and establishment sites will support soils and topography modeled for re-establishment and/or establishment of Riparian communities. • Re-established and established Riparian communities will be designed and constructed to avoid or minimize direct or indirect impacts on existing functioning habitat.
Terrestrial	
Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	BOW1.1. Prioritize selection of Preserve sites for Blue Oak Woodland/Savanna that expand on or link to the Deer Creek Hills Preserve to the maximum extent feasible.
Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.	BOW2.1. Prioritize selection of re-establishment/establishment sites for Blue Oak Woodland/Savanna that will expand the existing Deer Creek Hills Preserve to the maximum extent feasible, or will establish a habitat link between a SSHCP preserve and the existing Deer Creek Hills Preserve. Any potential re-establishment/establishment sites will fill gaps between existing preserved Mixed Blue Oak Woodland or Blue Oak Savanna land covers, or would link existing preserved Blue Oak Woodland or Blue Oak Savanna land covers. Re-establishment is preferred over establishment.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	AG1.1. The Implementing Entity will select Preserve sites with existing agriculture land covers considering certain criteria, including the following: • Contains margins that support suitable nesting trees and/or could support plantings of additional trees and shrubs for future use as nesting or perching habitat and/or habitat for prey. • Contains soils identified in the Soil Survey of Sacramento County as highly productive. • Has existing irrigation system that is engineered to provide for crop production. • The site supports high prey densities for avian Covered Species or is capable of supporting crops that support high prey densities. • Management can be used to enhance or restore natural ecosystem processes.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture/Grassland) that are preserved within the Plan Area.	
Objective HAB1. Develop Preserve Management Plans for the benefit of Covered Species.	HAB1.1. Prepare a Preserve Management Plan for each Preserve within 1 year of acquisition. The Preserve Management Plans will identify Preserve-specific preservation objectives for Covered Species and habitats, and will be consistent with the Preserve System Management Program.
Objective HAB2. Assess whether SSHCP Preserves are being managed and maintained for the benefit of Covered Species.	HAB2.1. Individual Preserve Management Plans will be reviewed periodically (e.g., every 3–5 years) after development in coordination with the Preserve System Management Program. If Preserve sites are not meeting habitat success standards as determined by the TAC, modifications such as remedial actions (e.g., adaptive management) or other additional preservation actions (e.g., adding acreage) will be implemented.
Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing Initial Preserve Management Plan (PMP).	HAB 3.1. Implementing Entity will interview individuals that have been involved in management of acquired parcels, to the maximum extent feasible. This could include landowners, property managers, ranch managers, and any others with management responsibility. For parcels that are part of a group (e.g., a ranch), separate reports for each parcel need not be prepared, but any variation in management treatment between the component parcels should be noted. To the maximum extent feasible, interviews will be audio or video recorded and summarized in a memorandum. Those memoranda will be reviewed, and any relevant information should be included as appendices in the Initial and Individual Preserve Management Plan. Preserve Managers will not change the management approach from existing management without a sound scientific basis for the change.
Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. The program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.	HAB4.1. Include invasive plant and wildlife control strategies in all Preserve Management Plans. These strategies may include site-specific grazing regimes, controlled burning protocols, and mowing/mechanical maintenance guidelines consistent with native plant re-establishment needs, invasive plant and wildlife removal, and consideration of endemic plant and wildlife species population needs.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter)	HAB5.1. Include in Preserve Management Plans a requirement to regularly monitor noise and light intensity, frequency and quantity of trash, qualitative hydrology changes, and other issues along a transect from the boundary toward the interior. Preserve Managers will include this information in annual reports, noting any changes in these attributes over time. Quantitative monitoring for edge effects will occur on the same Preserves hosting permanent plots for vernal pool plants and invertebrate species, and will be timed to allow for correlational analysis between edge effects and species presence or abundance over the long term.
Objective HAB6. Collect weather data throughout Sacramento County to assist in developing status and trends and tracking climate change and data.	HAB6.1. During assembly of the SSHCP Preserve System, install weather stations at selected Preserves for fine-scale monitoring of climate trends and combine with data from existing weather stations to provide a comprehensive weather dataset. Preserves will be selected to receive weather stations based on gaps in geographic coverage of existing weather stations in Sacramento County.
Objective HAB7. Monitor vegetation biomass within Grassland land covers.	HAB7.1. During assembly of Flexible Preserves (Valley Grassland, Blue Oak Savanna, Valley Grassland), measure vegetation biomass. Measurement will be by releve, residual dry matter (RDM), or similar technique. Technique selected will be used consistently across Preserves on an annual basis at the end of the growing season (i.e., September or October).
Objective AG2. Of the 9,696 acres preserved under Objective AG1, maintain at least 2,000 of those acres of high-quality foraging crops (such as corn, alfalfa, or wheat) preferred by tricolored blackbird (*Agelaius tricolor*), greater sandhill crane (*Grus canadensis*), and the Covered raptor species. The 2,000 acres will be distributed in strategic locations throughout PPUs 4, 5, or 6 in plots of 20 acres or more. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.	AG2.1. Maintain a minimum of 2,000 acres as food plots that are planted with crops preferred by avian Covered Species as foraging habitat such as corn, alfalfa, or wheat. Food plots will be distributed throughout PPUs 4, 5, or 6 at a minimum of 10 different locations, none of which will be less than 20 acres.
Objective AG3. Maintain or increase raptor prey availability and improve raptor foraging habitat by strategically planting 10,000 linear feet of shrub or other substrate that provides cover and refugia for fossorial mammals and other prey species.	AG3.1. Plant 10,000 linear feet of shrub or other substrate that provides cover and refugia for fossorial mammals and other small prey (e.g., amphibians, reptiles) within and on the borders of Cropland Preserves within PPUs 4, 5, and/or 6 to increase prey availability for Covered avian species. One hundred linear feet of hedgerow will be planted each year until 5,000 linear feet is established within the Plan Area. Planting of hedgerows can be delayed for up to 5 years after issuance of permits to allow time to acquire Preserves where hedgerows can be planted. At least 1,000 feet must be planted within 10 years after issuance of permits. Acceptable hedgerow plants include native trees, shrubs, and grasses as approved by the TAC. Hedgerows must grow to be at least 5 feet in width and must be located on upland areas not prone to inundation from normal irrigation practices. Hedgerows that fail to establish or succumb to disease or other causes will be replaced within 1 year of removal or failure. Providing refuge habitat for prey species adjacent to agricultural settings will allow areas that have been harvested or with temporarily reduced or eliminated populations of prey to re-establish more quickly.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective RIP5. Monitor groundwater table as it relates to status and trends for Riparian habitat.	RIP5.1. During assembly of the SSHCP Preserve System, identify parcels that have existing water wells. To the maximum extent feasible, obtain history of depth to groundwater table from property owners or managers. During assembly of the SSHCP Preserve System, take a reading of depth to groundwater at each existing well. Repeat measurement annually at a consistent time of year to allow comparison between years, and monitor any groundwater depletion or recharge.
	RIP5.2. During assembly of the SSHCP Preserve System, ensure availability of water for grazing animals on Preserves, Cropland Preserves, and habitat restoration.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	
Plant Covered Species	
Objective VPP1. Protect the one currently documented unpreserved occurrence of Ahart's dwarf rush in the Plan Area. Prior to take of any occurrence of Ahart's dwarf rush (*Juncus leiospermus*), protect six currently unpreserved[1] and "biologically equivalent or superior" (as defined by the TAC) occurrences of Ahart's dwarf rush within the Plan Area. After six currently unpreserved occurrences are protected, prior to take of an occurrence of Ahart's dwarf rush, protect one currently unpreserved and "biologically equivalent or superior" (as defined by the TAC) occurrence of Ahart's dwarf rush within the Plan Area.	VPP1.1. Conduct surveys in modeled habitat (and suitable habitat identified by the approved project biologist at the time of the survey) during the appropriate time of year when Ahart's dwarf rush are observable. If detected in an area proposed to be disturbed by a Covered Activity, prior to take of Ahart's dwarf rush, identify one unprotected occurrence of the species and protect within a new Preserve.
Objective VPP2. Prior to take of any occurrence of Boggs Lake hedge-hyssop (*Gratiola heterosepala*), protect one currently unpreserved[1] and "biologically equivalent or superior" (as defined by the	VPP2.1. Conduct surveys in modeled habitat (and suitable habitat identified by the approved biologist at the time of the survey) during the appropriate time of year when Boggs Lake hedge-hyssop are observable. If detected in an area proposed to be disturbed by a Covered Activity, prior to take of Boggs Lake hedge-hyssop, identify one unprotected occurrence of the species and protect within a new Preserve.

[1] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the SSHCP Plan Area.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
TAC) occurrence of Boggs Lake hedge-hyssop within the Plan Area.	
Objective VPP3. Prior to take of any occurrence of dwarf downingia (*Downingia pusilla*), protect one currently unpreserved[1] and "biologically equivalent or superior" (as defined by the TAC) occurrence of dwarf downingia within the Plan Area.	VPP3.1. Conduct surveys in modeled habitat (and suitable habitat identified by the approved project biologist at the time of the survey) during the appropriate time of year when dwarf downingia are observable. If detected in an area proposed to be disturbed by a Covered Activity, prior to take of dwarf downingia, identify one unprotected occurrence of the species and protect within a new Preserve.
Objective VPP4. Protect and maintain in perpetuity a minimum of 14 occurrences of legenere (*Legenere limosa*) within the SSHCP Preserve System. Legenere occurrences will be preserved in accordance with the Conservation Actions described in this table. Prior to take of any occurrence of legenere, one currently unpreserved and "biologically equivalent or superior" (as defined by the TAC) occurrence of legenere will be preserved and maintained within the Plan Area.	VPP4.1. Preserve and maintain in perpetuity at least fourteen occurrences of legenere within the SSHCP Preserve System. Conduct surveys in modeled habitat (and suitable habitat identified by the approved project biologist at the time of the survey) during the appropriate time of year when legenere are observable. If detected in an area proposed to be disturbed by a Covered Activity, prior to take of legenere, identify one unprotected occurrence of the species and protect within a new Preserve.
Objective VPP5. Prior to take of any occurrence of pincushion navarretia (*Navarretia myersii* ssp. *myersii*), protect one currently unpreserved[2] and "biologically equivalent or superior" (as defined by the TAC) occurrence of pincushion navarretia within the Plan Area.	VPP5.1. Conduct surveys in modeled habitat (and suitable habitat identified by the approved biologist at the time of the survey) during the appropriate time of year when pincushion navarretia are observable. If detected in an area proposed to be disturbed by a Covered Activity, prior to take of pincushion navarretia, identify one unprotected occurrence of the species and protect within a new Preserve.
Objective VPP6. Protect and maintain in perpetuity all known currently unprotected	VPP6.1. Preserve and maintain in perpetuity all known occurrences of Sacramento Orcutt grass in the Plan Area. Prior to proposed disturbance of a site associated with a Covered Activity, conduct surveys in modeled habitat (and suitable habitat

[2] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
occurrences of Sacramento Orcutt grass (*Orcuttia viscida*) in the Plan Area to preserve existing distribution, and any currently unknown sites discovered in locations subject to an SSHCP Covered Activity.	identified by the approved project biologist at the time of the survey) during the appropriate time of year when Sacramento Orcutt grass are observable. Over the Permit Term, all plant surveys will comply with CDFW's most recent Survey Protocols for Sensitive Plants. If a species is found, the project proponent will protect the occurrence within a minimum satellite-sized Preserve that encloses the entire vernal pool watershed. Surveys will be conducted after the first year of preservation and every 5 years thereafter to monitor persistence. If, after the first year, Sacramento Orcutt grass is not persisting, or any 5-year interval thereafter, the preservation effort will be deemed to have failed. Remediation (e.g., re-establishment at another location) must occur within 1 year after efforts are deemed unsuccessful.
Objective VPP7. Protect and maintain in perpetuity all known currently unprotected occurrences of slender Orcutt grass in the Plan Area to preserve existing distribution, and any currently unknown sites discovered in locations subject to an SSHCP Covered Activity.	VPP7.1. Preserve and maintain in perpetuity all known occurrences of slender Orcutt grass in the Plan Area. Prior to proposed disturbance of a site associated with a Covered Activity, conduct surveys in modeled habitat (and suitable habitat identified by the approved project biologist at the time of the survey) during the appropriate time of year when slender Orcutt grass are observable. Over the Permit Term, all plant surveys will comply with CDFW's most recent Survey Protocols for Sensitive Plants. If the species is found, the project proponent will protect the occurrence within a minimum satellite-sized Preserve that encloses the entire vernal pool micro-watershed. Surveys will be conducted after the first year of preservation and every 5 years thereafter to monitor persistence. If, after the first year, slender Orcutt grass is not persisting, or any 5-year interval thereafter, the preservation effort will be deemed to have failed. Remediation (e.g., re-establishment at another location) must occur within 1 year after efforts are deemed unsuccessful.
Objective SA1. Prior to take of an occurrence of Sanford's arrowhead (*Sagittaria sanfordii*), protect one currently unpreserved[3] and "biologically equivalent or superior" (as defined by the TAC) occurrence of Sanford's arrowhead within the Plan Area.	SA1.1. Conduct surveys in modeled habitat (and suitable habitat identified by the approved biologist at the time of the survey) during the appropriate time of year when Sanford's arrowhead are observable. If detected in an area proposed to be disturbed by a Covered Activity, prior to take of Sanford's arrowhead, identify one unprotected occurrence of the species and protect within a new Preserve.
Objective SA2. During re-establishment and/or establishment of Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek, translocate impacted Sanford's arrowhead from other sites.	SA1.2. The Implementing Entity will select translocation sites for Sanford's arrowhead in emergent marsh vegetation, including the margins of rivers, streams, ponds, reservoirs, irrigation and drainage canals, ditches, and stock-ponds Freshwater Marsh considering certain criteria, including the following: • Known to support Sanford's arrowhead. • Proposed for re-establishment/establishment. • Area can be re-established to support Sanford's arrowhead populations and natural ecosystem processes.

[3] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Aquatic Animal Covered Species	
Objective VPI1. Protect and maintain in perpetuity 1,270 acres of Vernal Pool tadpole shrimp modeled aquatic habitat within the Plan Area to preserve existing distribution.	VPI1.1. The Implementing Entity will select Preserve sites containing modeled habitat for vernal pool invertebrates considering certain criteria, including the following: • Vernal pool complexes with known occurrences of Covered vernal pool invertebrates. • Represents diversity of vernal pool depth, size, density, geologic formations, and soil types within the Plan Area. • Vernal Pool habitats embedded in Valley Grassland within Vernal Wetland Acre/Density Index (VWADI) Category 1–3 land analysis units (LAUs) that provide high-quality Vernal Pool habitat. • Adjacency of other suitable habitat. • Modeled habitat within the USFWS Recovery Areas and Critical Habitat for vernal pool invertebrate species.
	VPI1.2. Preserve a minimum of 90% of the watershed of each preserved vernal pool and maintain a minimum 50-foot setback outside the Preserve boundary.
Objective VPI2. Protect and maintain in perpetuity 1,270 acres of Vernal Pool fairy shrimp (*Branchinecta lynchi*) modeled aquatic habitat within the Plan Area to preserve existing distribution.	See Conservation Actions VPI1.1 and VPI1.2.
Objective VPI3. Protect and maintain in perpetuity 1,059 acres of mid-valley fairy shrimp (*Branchinecta mesovallensis*) modeled aquatic habitat within the Plan Area to preserve existing distribution.	See Conservation Actions VPI1.1 and VPI1.2.
Objective VPI4. Protect and maintain in perpetuity 1,245 acres of Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*) modeled aquatic habitat within the Plan Area to preserve existing distribution.	See Conservation Actions VPI1.1 and VPI1.2.
Objective VPI5. Ensure that during implementation of Objective VP2, re-established or established vernal pools are inoculated with soils from impacted vernal pools within 1 mile of re-establishment/	Implement vernal pool re-establishment and establishment consistent with the requirements of AMM RE-ESTABLISHMENT/ ESTABLISHMENT-1 and -2.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
establishment in accordance with the Conservation Actions in this table.	
Objective CTS1. Preserve at least five occupied California tiger salamander breeding ponds.	CTS1.1. The Implementing Entity will select breeding ponds for preservation considering certain criteria, including the following: • Located within USFWS Critical Habitat. • Surveys indicate active use of breeding pond within each of prior 3 years. • Breeding pond can sustain inundation for a minimum of 70 days during an average rainfall year. • Surrounding uplands no more than 0.5 mile away contain Blue Oak Savanna, Blue Oak Woodland, and Valley Grassland with adequate burrows and refugia sites. • Predatory fish and bullfrogs (*Rana catesbeiana*) are absent.
Objective CTS2. During assembly of the SSHCP Preserve System, ensure that modeled aquatic and upland habitat for California tiger salamander is preserved. Minimum preservation will total • 141 acres of aquatic habitat and • 1,677 acres of upland habitat. Ensure that mitigation for modeled high-value habitat impacted within California tiger salamander Critical Habitat occurs within California tiger salamander Critical Habitat (see Objectives BOW1, VP1, SW1, and VG1).	CTS2.1. Preserve California tiger salamander aquatic habitat (Vernal Pool and Seasonal Wetland). The Implementing Entity will select Preserve sites considering certain criteria, including the following: • Modeled habitat within USFWS Critical Habitat. • Contain modeled wetlands and surrounding uplands no more than 0.5 mile from aquatic habitat. • Wetlands must be able to sustain inundation for a minimum of 70 days during an average rainfall year. • Permanent impoundments are appropriate as long as predatory fish and bullfrogs are absent.
	CTS2.2. Preserve California tiger salamander upland habitat (Blue Oak Woodland, Blue Oak Savanna, and Valley Grassland). The Implementing Entity will select Preserve sites considering certain criteria, including the following: • Modeled habitat within USFWS Critical Habitat. • Contains Blue Oak Savanna, Blue Oak Woodland, and Valley Grassland no more than 0.5 mile from known breeding pond. • Contains burrows that are dry during the summer and fall months in Open Grassland or under isolated oaks. • Supports fossorial mammals to create upland burrows. • Within 1.5 miles of Vernal Pool and Seasonal Wetland that are considered Aquatic habitat.
	CTS2.3. Preserve California tiger salamander aquatic or upland habitat at a ratio of 1 acre for every 1 acre that is lost (1:1) within PPU 7. Conduct surveys after the first year and every 5 years thereafter to monitor occupancy of habitat.
Objective CTS3. Rural transportation project Covered Activities within California tiger salamander modeled habitat will be designed to allow California tiger salamander movement across the roadway area.	CTS3.1. The Implementing Entity will retain an approved biologist to prepare targeted species mobility studies to determine if California tiger salamander mobility between breeding ponds or between breeding ponds and upland refugia will be affected by rural transportation Covered Activities within California tiger salamander modeled habitat. Data relevant to determining California tiger salamander movement must be collected for at least 3 years, and the study will be updated through new data collection and consultation with USFWS and CDFW every 10 years. The mobility study methodology will be prepared in consultation with USFWS and CDFW, and will need approval from USFWS and CDFW prior to implementation. The data will be used by the project

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	proponent to select the most appropriate design requirements to maintain and facilitate California tiger salamander movement. Modeled habitat near each of the following roadways will be the subject of targeted species mobility studies for California tiger salamander: • Twin Cities Road east of State Route 99 • Ione Road within PPU 7 • Clay Station Road from Dillard Road south to Sacramento County line with San Joaquin County (Plan Area boundary) After construction is complete, California tiger salamander movement across and along the road will be monitored to assess how their movement changed in response to the project, and if additional design considerations will be used as future projects are implemented along the roadway.
Objective WS1. During assembly of the SSHCP Preserve System, ensure that modeled aquatic and upland habitat for western spadefoot (*Spea hammondii*) is preserved. Minimum preservation will total: • 1,531 acres of aquatic habitat and • 22,044 acres of upland habitat. Ensure that mitigation for modeled high-value habitat impacted within the Mather Core or Cosumnes/Rancho-Seco Core Recovery Areas occurs within the Core Recovery Areas (see Objectives BOW1, VP1, VP3, SW1, SC1, OW1, and VG1).	WS1.1. The Implementing Entity will select Preserve sites for aquatic and adjacent upland habitat considering certain criteria, including the following: • Habitat is located in the Mather Core or Cosumnes/Rancho-Seco Core Recovery Areas. • Aquatic habitat will include temporary pools and drainages. • Quiet streams that form following winter or spring rains. • Upland habitat surrounding aquatic breeding sites. • Friable soils suitable for burrow creation. • Soils maintain some degree of moisture. • Located away from areas that are subject to vibrations that simulate rainfall such as roadways with heavy traffic.
Objective WS2. During assembly of the SSHCP Preserve System, ensure that modeled aquatic habitat for western spadefoot is re-established and/or established. Minimum re-establishment and/or establishment will total 906 acres of aquatic habitat. Ensure that mitigation for modeled high-value habitat impacted within the Mather	WS2.1. The Implementing Entity will select re-establishment and establishment sites considering certain criteria, including the following: • Habitat is located in the Mather Core or Cosumnes/Rancho-Seco Core Recovery Areas. • Aquatic habitat will include temporary pools and drainages. • Quiet streams that form following winter or spring rains. • Upland habitat available no more than 500 feet away from preserved aquatic habitat. • Friable soils suitable for burrow creation. • Soils maintain some degree of moisture.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Core or Cosumnes/Rancho-Seco Core Recovery Areas occurs within the Core Recovery Areas (see Objectives VP2, SW2, and OW2).	• Site links existing natural land covers that provide Covered Species modeled habitat. • Located away from areas that are subject to vibrations that simulate rainfall such as roadways with heavy traffic. Surveys will be conducted after the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the restored habitat is not meeting re-establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed re-establishment/establishment efforts must occur within 1 year after efforts are deemed unsuccessful.

Objective GGS1. During assembly of the SSHCP Preserve System, ensure that modeled habitats for giant gartersnake are preserved along the following creeks (or other creeks that are determined by the TAC to provide similar giant gartersnake habitat value):
• Lower Laguna Creek, mainly between Twin Cities Road (State Route 104) and Miess Road;
• Skunk Creek, which flows into the Cosumnes River northwest of the City of Galt;
• the short Willow Creek and tributaries of Badger Creek, which are to the north of the lower Laguna Creek and west of the Folsom South Canal; and
• Badger Marsh.
Mitigation for impacts to modeled habitats for giant gartersnake that occur along Badger Creek and Stone Lakes will occur along these drainages.
Minimum preservation will total
• 170 acres of giant gartersnake high-value aquatic habitat and
• 2,323 acres of giant gartersnake high-
	GGS1.1. The Implementing Entity will select Preserve sites for aquatic modeled habitat considering certain criteria, including the following:
	• Stream/Creek, Freshwater Marsh, Open Water, and Seasonal Wetland located entirely inside or within 0.25 mile of the following reaches:
	  ○ A prominent drainageway on the Elliot mitigation site, which links to Stone Lakes National Wildlife Refuge (NWR) and is wet year-round.
	  ○ Drainage canals south of Elk Grove, which have a past occurrence and link to Stone Lakes NWR; the perennial segments of these canals are suitable habitat.
	  ○ Badger Creek and all other creeks that drain into the marsh at the Cosumnes River Preserve, which are likely high-quality habitat due to proximity and connectivity to a significant population of giant gartersnakes; the perennial segments of these creeks are suitable habitat.
	  ○ The perennial segments of Laguna Creek (south) and tributaries are suitable habitat due to presence of freshwater marsh habitat and proximity to known documented occurrences.
	  ○ The perennial segments of drainages and canals leading from the Cosumnes River Preserve, including Deadman's Gulch, which provides suitable habitat.
	• Contains adequate water during the snake's active season (early spring through mid-fall) to provide food and cover.
	• Emergent, herbaceous wetland vegetation for escape cover and foraging habitat during the active season.
	• Grassy banks and openings in waterside vegetation for basking.

	GGS1.2. The Implementing Entity will select Preserve sites with stream reaches that contain upland modeled habitat within 200 feet of the stream, including Mixed Riparian Scrub and Valley Grassland, considering the following criteria: • A stream reach at least 600 feet in length. • Near foraging and breeding habitat. • Support higher-elevation uplands for cover. • Provide refuge from flood waters during the snake's dormant season in the winter. • Upland habitat can link isolated and disjunct giant gartersnake aquatic habitat.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
value upland habitat. (See Objectives AG1, FWM1, SW1, SC1, OW1, RIP1, RIP3, and VG1.)	• A minimum 300-foot setback on at least one side of stream reaches.
Objective GGS2. During assembly of the SSHCP Preserve System, ensure that modeled habitats for giant gartersnake are re-established and/or established along the following creeks (or other creeks that are determined by the TAC to provide similar habitat value): • Lower Laguna Creek, mainly between Twin Cities Road (State Route 104) and Miess Road; • Skunk Creek: this creek flows into the Cosumnes River northwest of the City of Galt; • north of Lower Laguna Creek and west of the Folsom South Canal are several small creeks—the short Willow Creek and tributaries of Badger Creek; and • Badger Marsh. Mitigation for impacts to modeled habitats for giant gartersnake that occur along Badger Creek and Stone Lakes will occur along these drainages. Minimum re-establishment and/or establishment will total • 170 acres of high-value aquatic habitat and • 134 acres of high-value upland habitat. (See Objectives SW2, OW2, RIP2, and RIP4.)	GGS2.1. The Implementing Entity will select re-establishment and establishment sites for aquatic habitat that include Freshwater Marsh, Open Water, Stream/Creek, and Seasonal Wetland considering the following criteria: • Contains a supply of perennial water that can maintain emergent vegetation. • Sites near (within 250 meters) the mouth of stream/creeks that are near potential upland habitat and adjacent to existing modeled upland habitat. • Sites can link isolated and disjunct giant gartersnake habitat. • Re-established sites located along those portions of a stream corridor that have been identified as Preserves for giant gartersnake that provide upland habitat modeled for aestivation and/or basking at intervals no greater than 600 feet. Giant gartersnake habitat re-establishment or establishment will occur only where non-modeled habitat is converted to modeled habitat, defined by the following criteria: • Located in intervals along the stream channel that are no closer to one another than 300 feet. • At least 0.2 acre at any given location along the stream channel, but not to exceed 1 acre. • Provides perennial aquatic habitat. • Provides emergent vegetation (i.e., tules and/or cattails). • Provides grassy banks and openings in the waterside vegetation (e.g., bulrush, cattails, waterweed, or other floating vegetation). • Supports soils and topography modeled for re-establishing target habitat. • Designed and constructed to avoid or minimize direct or indirect impacts on existing functioning habitat. • Provides a minimum 300-foot setback on at least one side of re-established stream reaches. Surveys will be conducted after the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the restored habitat is not meeting re-establishment or establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed re-establishment/establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
	GGS2.2. The Implementing Entity will select re-establishment or establishment sites for aquatic habitat that include Mixed Riparian Scrub and Valley Grassland considering the following criteria: • Directly connected to (and within 0.25 mile of) aquatic habitat. • Higher elevation uplands to provide refuge from flood waters during the snake's dormant season in the winter. • Sites can link isolated and disjunct giant gartersnake habitat.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	• Re-established sites located along those portions of a stream corridor that have been identified as Preserves for giant gartersnake that provide upland habitat modeled for aestivation and/or nesting. Giant gartersnake habitat re-establishment or establishment will occur only where non-modeled habitat is converted to modeled habitat, defined by the following criteria: • Supports soils and topography modeled for restoring target habitat. • Designed and constructed to avoid or minimize direct or indirect impacts on existing functioning habitat. Surveys will be conducted after the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the re-established or established habitat is not meeting re-establishment or establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed re-establishment or establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Objective GGS3. Plan Permittees will conduct a study to establish hydrologic baseline conditions along Badger Creek to identify what level of hydrology is necessary to support giant gartersnake and acquire a water source to maintain the minimum level of hydrology during the summer months when agricultural runoff may wane.	GGS3.1. Measure hydrologic parameters (e.g., flow rate, temperature) within Badger Creek in locations known to be occupied by giant gartersnake. Three monthly hydrologic measurements will be made during the dry season of an average or better rainfall year. Each recording will occur over a full week to identify any regular interruptions in flow or changes in conditions due to diversions or inflows.
	GGS3.2. Acquire water rights adequate to maintain baseline dry season flows within Badger Creek, as determined during measurements obtained pursuant to Conservation Action GGS3.1.
Objective WPT1. During assembly of the SSHCP Preserve System, ensure that modeled aquatic and upland habitat for western pond turtle (*Actinemys marmorata*) is preserved. Minimum preservation will total • 315.35 acres of aquatic habitat and • 10,971 acres of upland habitat. (See Objectives FWM1, OW1, RIP1, RIP3, VG1, BOW1, and SC1.)	WPT1.1. The Implementing Entity will select Preserve sites for aquatic habitat, including Freshwater Marsh, Open Water, and Stream/Creek considering the following criteria: • Contains slow-moving or quiet water with emergent aquatic vegetation and deep pools with undercut banks for refugia. • Contains basking sites such as rocks, logs, matted floating vegetation, terrestrial islands within the aquatic habitat, and human-made debris. • Will allow a minimum 300-foot setback on at least one side of stream reaches that are preserved for western pond turtle. • Where a stream reach is at least 600 feet in length.
	WPT1.2. The Implementing Entity will select Preserve sites for upland habitat, including Blue Oak Savanna, Blue Oak Woodland, Mixed Riparian Woodland, Mixed Riparian Scrub, and Valley Grassland considering the following criteria: • Allows for a 400-foot setback along both sides of stream reaches identified for western pond turtle outside of the UDA. • Allows for a 300-foot corridor along each side of North Laguna Creek to the maximum extent feasible, as measured from the Ordinary High Water Mark (OHWM) of the creek, with a minimum stream corridor width of 600 feet plus the width of the creek, with additional setbacks as defined by local government ordinances.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	• In segments of Laguna Creek where a 300-foot corridor on one side of the creek is not possible due to existing development and constraints, 300 feet may be used as an average for a defined length of the creek. However, the corridor on either side of Laguna Creek will be a minimum of the mapped Federal Emergency Management Agency (FEMA) 100-year floodplain of 2014.
Objective WPT2. During assembly of the SSHCP Preserve System, ensure that modeled aquatic habitat for western pond turtle is re-established and/or established. Minimum re-establishment and/or establishment will total 315 acres of aquatic habitat. (See Objectives RIP2, FWM2, and OW2.)	WPT2.1. The Implementing Entity will select re-establishment and/or establishment sites for foraging and breeding habitat that includes Freshwater Marsh, Open Water, and Stream/Creek considering the following criteria: • Contains slow-moving or quiet water with emergent aquatic vegetation and deep pools with undercut banks for refugia. • Contains or has high potential to create basking sites such as rocks, logs, matted floating vegetation, terrestrial islands within the aquatic habitat, and human-made debris. Western pond turtle aquatic habitat re-establishment or establishment will occur only where non-modeled habitat is converted to modeled habitat, defined by the following criteria: • Located in intervals along the stream channel that are no closer to one another than 300 feet. • Establishment or re-establishment site within modeled habitat area at least 600 feet in length. • At least 0.2 acre at any given location along the stream channel but will not exceed 1 acre. • Provides perennial aquatic habitat. • Provides emergent vegetation (i.e., tules and/or cattails). • Provides grassy banks and openings in the waterside vegetation (e.g., bulrush, cattails, waterweed, or other floating vegetation). • Supports soils and topography modeled for restoring target habitat. • Designed and constructed to avoid or minimize direct or indirect impacts on existing functioning habitat. • Provides a minimum 300-foot setback on at least one side of restored stream reaches. • Surveys will be conducted after the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the restored habitat is not meeting re-establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed re-establishment/establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Terrestrial Invertebrate Covered Species	
Objective VELB1. Relocate or replace each impacted elderberry shrub (*Sambucus* spp.) according to USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b). Mitigation will occur in locations that are not inundated for 2 continuous weeks, as	VELB1.1. Implement the following measures to avoid or minimize impacts to occupied valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) habitat: • Conduct protocol-level surveys for valley elderberry longhorn beetle if elderberry shrubs are located within 100 feet of construction activities. • Avoid direct impacts to occupied elderberry shrubs, defined as shrubs within 20 feet of construction. • Avoid indirect impacts of occupied elderberry shrubs, defined as shrubs between 20 and 100 feet of construction.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
determined by the TAC.	• Compensate for direct loss of elderberry shrubs according to USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b). • Conduct surveys after the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the restored habitat is not meeting re-establishment criteria standards of 60% survivorship of occupied shrubs, the effort will be deemed to have failed. Remediation of failed re-establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Objective VELB2. During implementation of Riparian habitat re-establishment and/or establishment, strategically include elderberry shrub in the planting palette (see Objectives RIP2 and RIP4).	VELB2.1. In Riparian habitat re-establishment and establishment sites that include modeled habitat for valley elderberry longhorn beetle (i.e., Mixed Riparian Woodland and Mixed Riparian Scrub or Valley Grassland with elderberry shrubs along a riparian corridor), include in plantings elderberry shrubs to create habitat characteristics associated with valley elderberry longhorn beetle occupancy. These characteristics include density of elderberry shrubs, shrub size, number of stems, and range of branch sizes (Talley et al. 2007).
Bird Covered Species	
Objective CH1. During assembly of the SSHCP Preserve System, ensure that a minimum of 974 acres of modeled foraging and nesting habitat for Cooper's hawk (*Accipiter cooperii*) is preserved in accordance with the Conservation Actions described in this table (see Objectives RIP1, RIP3, and BOW1).	CH1.1. The Implementing Entity will select Preserve sites for nesting and foraging habitat considering certain criteria, including the following: • Blue oak woodland characterized by dense canopy closure (typically stands consisting of at least six trees with sparse ground cover). • Stands with trees approximately 26 to 49 feet high and 8 to 20 inches in diameter at breast height. • Proximity to foraging habitat with dense prey populations. • Located outside of the UDA.
Objective CH2. During assembly of the SSHCP Preserve System, ensure that a minimum of 601 acres of modeled foraging and nesting habitat for Cooper's hawk is re-established and/or established (see Objectives RIP2 and RIP4).	CH2.1. Refer to Conservation Action RIP2.1. The Implementing Entity will select re-establishment or establishment sites for modeled foraging and nesting habitat considering certain criteria, including the following: • Near known nesting territories. • Connect disjunct segments of riparian habitats. • Proximity to modeled foraging areas with abundant prey populations. • Cooper's hawk Mixed Riparian Woodland and Mixed Riparian Scrub habitat establishment and re-establishment will occur only where a non-modeled land cover is converted to Mixed Riparian Woodland and Mixed Riparian Scrub. Establishment or re-establishment criteria for modeled Cooper's hawk habitat will also include the following: • Trees will be planted to encourage dense canopy closure of the mature stand. • Planting of 10 acorns for each tree to establish oak trees. • Survivorship of at least six trees pursuant to stand.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	Surveys will be conducted after the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the established or re-established habitat is not meeting establishment or re-establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed establishment or re-establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Objective CH3. During assembly of the SSHCP Preserve System, ensure that a minimum of 38 acres of modeled foraging habitat for Cooper's hawk is preserved, in accordance with the Conservation Actions described in this table (see Objectives RIP1, RIP3, and BOW1).	CH3.1. The Implementing Entity will select Preserve sites for foraging habitat aquatic modeled habitat considering certain criteria, including the following: • Blue Oak Savannah containing trees approximately 26 to 49 feet high and 8 to 20 inches in diameter at breast height. • Presence of dense prey populations. • Located outside of the UDA.
Objective FH1. During assembly of the SSHCP Preserve System, ensure that a minimum of 25,881 acres of modeled foraging habitat for ferruginous hawk is preserved, including 19,625 acres in PPUs 5 and/or 7 (see Objectives AG1, VG1, VP1, VP3, and SW1).	FH1.1. The Implementing Entity will select Preserve sites for foraging habitat considering certain criteria, including the following: • Known to already support populations of prey species, including rabbits, ground squirrels, and pocket gophers. • Moderate to dense vegetative cover (particularly grasses). • Topographic variation with shorter vegetation.
Objective FH2. During assembly of the SSHCP Preserve System, ensure that a minimum of 729 acres of modeled foraging habitat for ferruginous hawk is re-established and/or established (see Objectives VP2 and SW2).	FH2.1. The Implementing Entity will select re-establishment/establishment sites for foraging habitat considering certain criteria, including the following: • Moderate to dense vegetative cover (particularly grasses). • Topographic variation with shorter vegetation.
Objective SH1. During assembly of the SSHCP Preserve System, ensure that a minimum of 31,033 acres of modeled foraging habitat for Swainson's hawk is preserved (see Objectives AG1, AG2, SW1, VP1, VP3, and VG1). Ensure that mitigation for high-value modeled habitat impacted within PPUs 4, 6, or 8 occurs within PPUs 4,	SH1.1. The Implementing Entity will select Preserve sites that include foraging habitat considering certain criteria, including the following: • Presence of irrigation systems that are engineered to provide for alfalfa production. • Agricultural lands that have existing trees or could support plantings of additional trees for future use as Swainson's hawk nest trees. • Within 3 miles of active nest sites, where the record of the nest site is not older than 5 years, unless confirmed to be currently active by new surveys. • Proximity to large, contiguous area of open space that provides foraging habitat.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
6, or 8.	• Proximity to stream riparian corridors containing large trees that potentially provide nesting habitat. • Preserves can include sites supporting vineyard and orchard as long as vines and trees are removed within 2 years of acquisition.
Objective SH2. At least 2,000 acres of cropland habitat within high-value habitat within PPUs 4, 6, and 8 will be preserved in fee title to ensure that intensive management actions can be taken. Land held in fee title will be restricted to growing field or row crops. Fee title lands must maintain, at a minimum, an average of 50% of their crop cover-type in alfalfa. Other crop types or land covers may be substituted for alfalfa if the TAC determines that such other crop types or land cover types are of the same or better quality foraging habitat as alfalfa.	SH2.1. Preserve 2,000 acres (1:1 ratio) of cropland habitat within 2 miles of at least two active nesting sites in fee title to ensure that intensive management actions can be taken that may be infeasible on Preserve easement lands. Land held in fee title will be restricted to growing fields or row crops. Fee title lands must maintain, at a minimum, an average of 50% of their crop cover-type in alfalfa over a period of 5 years. Other crop types or land covers may be substituted for alfalfa if a Swainson's hawk expert determines that such other crop types or land cover types are of the same or better quality foraging habitat as alfalfa.
Objective SH3. During assembly of the SSHCP Preserve System, ensure a minimum of 746 acres of modeled nesting habitat for Swainson's hawk is preserved (see Objectives RIP1 and RIP3).	SH3.1. The Implementing Entity will select Preserve sites that contain modeled nesting habitat considering certain criteria, including the following: • Presently supports nesting activity. • Located within or near (preferably within 4.2 miles) productive foraging habitat such as Prime Farmland, Statewide Farmland (most productive), and current agriculture land cover types (i.e., alfalfa; other crop types or land covers may be substituted for alfalfa if the TAC determines that such other crop types or land cover types are of the same or better quality foraging habitat as alfalfa). • Support large mature trees (e.g., taller than 50 feet) that are preferred nesting sites. • Located in rural areas unlikely to be affected by high levels of human activities.
Objective SH4. During assembly of the SSHCP Preserve System, ensure that a minimum of 373 acres of modeled riparian nesting habitat for Swainson's hawk is re-established and/or established. Ensure that mitigation for modeled nesting habitat	SH4.1. Re-establish or establish riparian habitat along stream or river channels near known nesting territories. Establishment and re-establishment will target areas that connect disjunct segments of riparian habitat to the maximum extent feasible. Surveys will be conducted periodically for 10 years to monitor success, including habitat quality and use by nesting Swainson's hawk. During the first year, established or re-established habitat will be monitored monthly, with more frequent monitoring during summer months or periods of drought to ensure that new plantings are kept moist. During the second and third years, habitat will be monitored quarterly. For the remainder of the monitoring period, restoration habitat will be monitored every 6 months. If there are

Table 7-1
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Measurable Objectives	Conservation Actions
impacted within PPUs 4, 6, or 8 occurs within PPUs 4, 6, or 8 (see Objectives RIP2 and RIP4).	extended periods of drought within the monitoring period, or if established or re-established habitat becomes flooded for an extended period during the monitoring period, the habitat will be monitored more frequently to assess the impacts of and remediate for these extreme weather conditions. If, after 10 years, the established or re-established habitat is not meeting establishment or re-establishment criteria standards in terms of modeled habitat quality, the efforts will be deemed to have failed. Absence of nesting Swainson's hawks over the 10-year period will not be a criterion for failure as long as the Riparian habitat has otherwise achieved the establishment or re-establishment standards. If, at any time during the monitoring period, restored habitat is declining beyond remediation, dying, or dead, efforts will be deemed to have failed. Remediation of failed re-establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Objective SH5. For each of the 36 known nesting trees within the UDA, plant 10 trees that are modeled for Swainson's hawk nesting within SSHCP Preserves. Plant nesting trees on properties protected by the SSHCP within PPUs 4, 6, and 8, and near protected foraging habitat. Tree species will be selected based on known suitability as nesting habitat for Swainson's hawk, and the planted trees must be maintained and/or replaced in perpetuity.	SH5.1. Plant nesting trees on properties protected by the SSHCP and within proximity to protected foraging habitat. Tree species will be selected based on known suitability as nesting habitat for Swainson's hawk. To minimize temporal loss, a mix of tree species will be planted at each site to include fast- and slow-growing species. Trees that are acceptable for planting include Fremont's cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), blue oak (*Q. douglasii*), interior live oak (*Q. wislizenii*), western sycamore (*Platanus racemosa*), red willow (*Salix laevigata*), and Northern California black walnut (*Juglans hindsii*). Clusters of five trees must be established and maintained for every 40 acres of agricultural cropland preserved, and must include at least two different species, one of which must be a fast-maturing tree such as Fremont's cottonwood or red willow. Trees will be placed at the edges of agricultural fields. To help ensure survivorship, acorns will be used to establish oak trees, and at least 10 acorns will be planted for each required tree (i.e., if a cluster is to be composed of two cottonwoods and three valley oaks, then 30 valley oak acorns must be planted).
Objective SH6. During assembly of the SSHCP Preserve System, ensure that a minimum of 729 acres of modeled foraging habitat for Swainson's hawk is re-established and/or established (see Objectives RIP2 and RIP4).	SH6.1. The Implementing Entity will select re-establishment/establishment sites for foraging habitat considering certain criteria, including the following: • Presence of irrigation systems that are engineered to provide for alfalfa production. • Agricultural lands that could support plantings of additional trees for future use as Swainson's hawk nest trees. • Within 3 miles of active nest sites where the record of the nest site is not older than 5 years, unless confirmed to be currently active by new surveys. • Proximity to large, contiguous area of open space that provides foraging habitat. • Proximity to stream riparian corridors containing large trees that potentially provide nesting habitat.
Objective WK1. During assembly of the SSHCP Preserve System, ensure that a minimum of 31,205 acres of modeled foraging habitat for white-tailed kite is preserved (see Objectives VG1, AG1, RIP1,	WK1.1. The Implementing Entity will select Preserve sites for foraging habitat considering certain criteria, including the following: • Agricultural lands that support perennial crops (e.g., alfalfa) rather than annual crops. • Known to be used by white-tailed kite for foraging. • On parcels 20 acres or greater and/or occurs in larger, open space areas.

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Measurable Objectives	Conservation Actions
RIP3, SW1, VP1, VP3, and BOW1).	• Linked or adjacent to currently preserved lands. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.
Objective WK2. During assembly of the SSHCP Preserve System, ensure that a minimum of 974 acres of modeled nesting or nesting/foraging habitat for white-tailed kite is preserved (see Objectives RIP1, RIP3, and BOW1).	WK2.1. The Implementing Entity will select Preserve sites for nesting habitat, including Blue Oak Woodland, Mixed Riparian Woodland, and Mixed Riparian Scrub, considering certain criteria, including the following: • Large, unfragmented patches connected to Grassland and agriculture areas known to support high prey densities. • Closed canopy consisting of multiple vegetation layers, including mature trees. • Known to support nesting white-tailed kite. • On parcels 20 acres or greater and/or occurs in larger, open space areas. • Linked or adjacent to currently preserved lands. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.
Objective WK3. During assembly of the SSHCP Preserve System, ensure a minimum of 767 acres of modeled foraging habitat for white-tailed kite is re-established and/or established (see Objectives VP2, RIP2, RIP4, and SW2).	WK3.1. Implement Conservation Actions VP2, RIP2, RIP4, and SW2. Foraging habitat re-establishment or establishment will involve establishing habitat, including vegetation structure modeled for voles (*Microtus californicus*) where it historically occurred but no longer exists due to loss of or changes in ecological factors. White-tailed kite foraging habitat re-establishment or establishment will occur only where non-modeled habitat is converted to modeled habitat.
	WK3.2. Re-establish or establish nesting habitat in areas that have a range of riparian plant assemblages that include large trees such as cottonwood and valley oak, as well as an understory of Mixed Riparian Scrub. The Implementing Entity will select re-establishment/establishment sites for nesting habitat considering certain criteria, including the following: • Located along existing riparian corridors where nesting habitat likely existed in the past, such as along the Cosumnes River and Deer Creek. • Located within a new or existing preserve or habitat corridor. Created Riparian Woodland areas must be able to support a wide variety of species. • Located in areas within at least 0.5 mile of modeled foraging habitat. • Supports soil and topography modeled for restoring target habitat. • Located at least 500 feet from urban land uses, including structures and roads. • Avoidance of locations that historically did not support Riparian Woodland. • Avoidance of locations within the existing Vernal Pool landscape. Surveys will be conducted after 1 year and every 5 years thereafter to monitor prey abundance. If, after the first year or any 5-year interval thereafter, the re-established habitat is not meeting re-establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed re-establishment efforts must occur within 1 year after efforts are deemed unsuccessful.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective WK4. During assembly of the SSHCP Preserve System, ensure that a minimum of 601 acres of modeled nesting or nesting/foraging habitat for white-tailed kite is re-established and/or established (see Objectives RIP2 and RIP4).	See Conservation Action WK2.1.
Objective NH1. During assembly of the SSHCP Preserve System, ensure that a minimum of 1,245 acres of modeled foraging habitat for northern harrier (*Circus cyaneus*) is preserved (see Objectives VG1, AG1, VP1, VP3, FWM1, and SW1).	NH1.1. The Implementing Entity will select Preserve sites for foraging habitat considering certain criteria, including the following: • Open habitats with dense, tall (12 to 38 inches) vegetation. • Known to support high prey densities (small mammals). • On parcels 20 acres or greater and/or occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Potentially support other Covered Species. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.
Objective NH2. During assembly of the SSHCP Preserve System, ensure that a minimum of 30,048 acres of modeled nesting/foraging habitat for northern harrier is preserved (see Objectives VG1 and AG1).	NH2.1. The Implementing Entity will select Preserve sites for nesting/foraging habitat considering the following criteria: • Open habitats with dense, tall (12 to 38 inches) vegetation. • Wet or moist sites for nesting. • Known to support high prey densities (small mammals). • On parcels 20 acres or greater and/or occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Potentially support other Covered Species. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.
Objective NH3. During assembly of the SSHCP Preserve System, ensure that a minimum of 856 acres of modeled foraging habitat for northern harrier is re-established and/or established (see Objectives VP2, FWM2, and SW2).	NH3.1. The Implementing Entity will select re-establishment/establishment sites for foraging habitat considering certain criteria, including the following: • Historically contained intact foraging habitat. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Could potentially support other Covered Species. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective BO1. Preserve seven occupied western burrowing owl (*Athene cunicularia*) sites (commensurate with 20% of the estimated number of sites within the UDA as of 2014), preserve at least 200 acres of land surrounding each occupied burrow site, and maintain modeled habitat for western burrowing owl within 0.4 mile of breeding sites.	BO1.1. The Implementing Entity will select Preserve sites that include nesting habitat land cover types considering certain criteria, including the following: • Known to support breeding burrowing owls. • Located within 3 miles of a known nesting site or modeled nesting habitat. • Known to support high rodent populations during the breeding season. • Expand upon or link already preserved lands and will not be bisected by new roadways or incur impacts from any other infrastructure developments. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Potentially support other Covered Species. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.
	BO1.2. Preserve modeled nesting habitat within PPUs 4, 6, and/or 8.

Objective BO2. For each burrowing owl or burrowing owl pair passively excluded, protect 200 acres of modeled habitat for western burrowing owl and establish a ground squirrel (*Spermophilus (Otospermophilus) beecheyi*) colony and augment with artificial burrows as appropriate (determined by TAC). Artificial burrows will be established at appropriate locations throughout the Preserve System pursuant to CDFW (CDFG 2012 guidelines) or as otherwise determined by the TAC.	BO2.1. Select Preserve sites in areas with known species occurrences and that contain modeled habitat. Manage these locations to maintain the following:
	• Open, well-drained terrain with low risk of flooding.
	• Short, sparse vegetation.
	• Underground burrows or burrow facsimiles.
	• Modeled foraging habitat within 0.4 mile of breeding sites.
	• Enhanced foraging habitat quality through
	  ○ promoting fossorial mammal populations in areas that are modeled foraging habitat and
	  ○ providing sentinel posts or mounds near burrows.

Objective LS1. During assembly of the SSHCP Preserve System, ensure that a minimum of 9,152 acres of modeled foraging habitat for loggerhead shrike (*Lanius ludovicianus*) is preserved (see Objectives VG1, AG1, SW1, VP1, and VP3).	LS1.1. The Implementing Entity will select Preserve sites for foraging habitat considering certain criteria, including the following: • Lands that are open with sparse vegetation for foraging. • Available hunting perches with an open view. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Known to support loggerhead shrike and other Covered Species. • Linked or adjacent to currently preserved lands. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective LS2. During assembly of the SSHCP Preserve System, ensure that a minimum of 22,014 acres of modeled nesting/foraging habitat for loggerhead shrike is preserved (see Objectives VG1, RIP1, and RIP3).	LS2.1. The Implementing Entity will select Preserve sites for nesting/foraging habitat considering certain criteria, including the following: • Lands that are open with sparse vegetation for foraging interspersed with scattered or isolated low trees or large shrubs for nest sites. • Available hunting perches with an open view. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Known to support loggerhead shrike and other Covered Species. • Linked or adjacent to currently preserved lands. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species.
Objective LS3. During assembly of the SSHCP Preserve System, ensure that a minimum of 592 acres of modeled nesting habitat for loggerhead shrike is re-established and/or established (see Objectives RIP2 and RIP4).	LS3.1. The Implementing Entity will select re-establishment/establishment sites for nesting habitat considering certain criteria, including the following: • Lands that possess or can be planted with scattered or isolated low trees or large shrubs for nest sites. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Potential to support loggerhead shrike and other Covered Species after re-establishment and/or establishment. • Linked or adjacent to currently preserved lands. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species. Loggerhead shrike habitat re-establishment will only occur where habitat historically occurred but no longer exists due to loss of or changes in ecological factors.
Objective LS4. During assembly of the SSHCP Preserve System, ensure that a minimum of 965 acres of modeled nesting habitat for loggerhead shrike is preserved (see Objectives RIP2 and RIP4).	See Conservation Action LS2.1.
Objective LS5. During assembly of the SSHCP Preserve System, ensure that a minimum of 729 acres of modeled foraging habitat for loggerhead shrike is re-established and/or established (see Objective SW2).	LS5.1. The Implementing Entity will select re-establishment/establishment sites for foraging habitat considering certain criteria, including the following: • On parcels 20 acres or greater and/or occur in larger, open space areas. • Potential to support loggerhead shrike and other Covered Species after re-establishment and/or establishment. • Linked or adjacent to currently preserved lands. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species. Loggerhead shrike habitat re-establishment will only occur where habitat historically occurred but no longer exists due to loss of or changes in ecological factors.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective GS1. During assembly of the SSHCP Preserve System, ensure that a minimum of 257 acres of modeled roosting or roosting/foraging habitat for greater sandhill crane is preserved. Roosting habitat will be preserved and maintained within PPUs 4, 6, and 8, with a minimum of 75% within PPU 6 (see Objectives VP1, SW1, and FWM1).	GS1.1. The Implementing Entity will select Preserve sites for roosting habitat considering certain criteria, including the following: • Known roost sites. • Located within 2 miles of modeled foraging habitat outside the UDA. • 20 acres or greater and/or occurs in larger, open space areas. • Linked or adjacent to currently preserved lands. • Potentially support other Covered Species or where management can be used to enhance or re-establish natural ecosystem processes and attract other Covered Species. • At least 1,000 feet from disturbances such as roads or other operations that may disturb roosting. • Free of fences and power lines. • Seasonal wetland present from September to mid-March. • Supports natural drainage inflows, or water delivery mimics natural hydrologic cycles.
Objective GS2. During assembly of the SSHCP Preserve System, ensure that a minimum of 7,751 acres of modeled foraging habitat for greater sandhill crane is preserved (see Objectives AG1, AG2, and VG1).	GS2.1. The Implementing Entity will select Preserve sites for foraging habitat considering certain criteria, including the following: • Modeled foraging habitat located within 2 miles of known roost sites or modeled roosting habitat outside the UDA. • On parcels 20 acres or greater and/or that occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Potentially support other Covered Species or where management can be used to enhance or re-establish natural ecosystem processes and attract other Covered Species. • Free of fences and power lines. • Contain available sources of "grit," including gravel and dirt roads or rocky uplands.
Objective GS3. During assembly of the SSHCP Preserve System, ensure that a minimum of 184 acres of modeled roosting habitat or roosting/foraging habitat for greater sandhill crane is established and/or re-established. Re-establish two new roost sites (minimum of 90 acres of Freshwater Marsh/Seasonal Wetland complex each) every 2 miles in the gap between the Cosumnes population and the Stone Lakes' population or other strategic locations if that	GS3.1. Implement Conservation Actions for Objectives SW2 and FWM2. Select re-establishment or establishment sites outside the UDA based on the same criteria used for preservation sites in GS1.1 and GS2.1. Habitat re-establishment and establishment will only occur where it replaces low-quality foraging or roosting habitat, including the following features: • Replacement of unmodeled agriculture uses such as orchards and vineyards with habitats supporting high prey abundance (e.g., vole), including Grassland, suitable Croplands, Irrigated Pasture, and Wet Meadow. • Removal of physical structures that can cause collisions during takeoff and flying, including fences, distribution lines, and other built structures. • Removal of human disturbances from otherwise modeled foraging and roosting habitat. • Establishment of suitable hydrologic regimes at roosting sites. • Grit sources near foraging areas.

Table 7-1
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Measurable Objectives	Conservation Actions
gap is closed by another HCP or conservation project (see Objectives VP2, SW2, and FWM2).	
Objective GS4. Create a visual screen of woody vegetation near human disturbances such as buildings, bridges, and paved roads from permanent roosting habitat within PPU 6. Screens should be located as appropriate to not interfere with habitat usage by greater sandhill crane.	GS4.1. Plant visual screens of woody vegetation in known and potential roosting sites within PPU 6 where there are nearby human disturbances, including roads, bridges, and dwellings.
Objective GS5. As part of the 2,000 acres preserved under Objective AG2, establish and maintain 10 food plots in strategic locations totaling a minimum of 200 acres within an agricultural setting for greater sandhill crane foraging habitat within PPU 6. Maintain the 200 acres among the 10 food plots as irrigated pasture or planted with crops preferred by greater sandhill crane as foraging habitat. Crops may include alfalfa, corn, wheat, or rice. Strategic placement of food plots will include locations for food plots in upland areas above the floodplain.	GS5.1. Maintain the 200 acres among the 10 food plots as irrigated pasture or planted with crops preferred by greater sandhill crane as foraging habitat. Crops may include alfalfa, corn, wheat, or rice. The 10 food plots will be distributed throughout PPU 6 at a minimum of five locations, each at least 20 acres. Food plots must be within 1.5 miles of irrigated pasture-grassland or other pasture, and within 2 miles of known roosting sites. Crops must not be harvested or removed until March.
Objective GS6. During assembly of the SSHCP Preserve System, ensure that a minimum of 1,000 acres of high-value modeled foraging habitat for greater sandhill crane outside the 100-year floodplain is preserved (see Objectives VP1, SW1, and FWM1).	GS6.1. The Implementing Entity will select Preserve sites for high-value foraging habitat outside the 100-year floodplain considering certain criteria, including the following: • Modeled high-value foraging habitat that is located outside the 100-year floodplain. • Located within 2 miles of known roost sites or modeled roosting habitat outside the UDA. • On parcels 20 acres or greater and/or that occur in larger, open space areas. • Is recorded as supporting greater sandhill crane foraging during previous flood events. • Linked or adjacent to currently preserved lands. • Potentially support other Covered Species or where management can be used to enhance or re-establish natural ecosystem

Table 7-1
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Measurable Objectives	Conservation Actions
	processes and attract other Covered Species. • Free of fences and power lines. • Contain available sources of "grit," including gravel and dirt roads or rocky uplands.
Objective TB1. During assembly of the SSHCP Preserve System, ensure that a minimum of 4,149 acres of modeled foraging habitat for tricolored blackbird is preserved (see Objectives AG1, AG2, FWM1, VG1, VP1, VP3, FWM1, OW1, and SW1).	TB1.1. The Implementing Entity will select Preserve sites for foraging habitat considering certain criteria, including the following: • Expand on or link already preserved lands and not bisected by new roadways or incur impacts from any other infrastructure developments. • Located within 1 mile of a known nesting site or modeled nesting habitat (note: intensive row crops, vineyards, and orchards generally do not provide modeled foraging habitat). • Contains vegetation with a potential for high insect populations during the breeding season (April through July). • On parcels 20 acres or greater and/or occur in larger, open space areas. • Where management can be used to enhance or re-establish natural ecosystem processes and attract tricolored blackbird.
Objective TB2. During assembly of the SSHCP Preserve System, ensure that a minimum of 27,532 acres of modeled nesting/foraging habitat for tricolored blackbird is preserved, including a minimum of 402 acres of Freshwater Marsh and Seasonal Wetland (see Objectives AG1, AG2, VG1, VG1, FWM1, and SW1).	TB2.1. The Implementing Entity will select Preserve sites for aquatic nesting/foraging habitat, including Seasonal Wetland and Freshwater Marsh land cover types considering certain criteria, including the following: • Has nesting substrate (e.g., tules, cattails) in an extensive area (minimum 2 acres) to accommodate large tricolored blackbird colonies. • Known to currently or historically support a tricolored blackbird colony. • Located within 3 miles of a known foraging site or modeled foraging habitat (note: intensive row crops, vineyards, and orchards generally do not provide modeled foraging habitat). • Open water (e.g., canal, lakeshore, or farm pond) within 1,640 feet of nesting substrate to provide a water source for nestlings. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species. Management for tricolored blackbird will include maintaining young, lush growth of emergent wetland (cattails or tules).
	TB2.2. The Implementing Entity will select Preserve sites for upland nesting/foraging habitat, including Cropland, Valley Seasonal Wetland, and Freshwater Marsh land cover types considering certain criteria, including the following: • Has upland nesting substrate (e.g., Himalayan blackberry thickets) in an extensive area (minimum 2 acres) to accommodate large tricolored blackbird colonies. • Known to currently or historically support a tricolored blackbird colony. • Located within 3 miles of a known foraging site or modeled foraging habitat (note: intensive row crops, vineyards, and orchards generally do not provide modeled foraging habitat). • Open water (e.g., canal, lakeshore, or farm pond) within 1,640 feet of nesting substrate to provide a water source for nestlings.

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Measurable Objectives	Conservation Actions
	• On parcels 20 acres or greater and/or occur in larger, open space areas. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species. Management for tricolored blackbird will include maintaining young, lush growth of emergent wetland (cattails or tules).
Objective TB3. During assembly of the SSHCP Preserve System, ensure that a minimum of 917 acres of modeled foraging habitat for tricolored blackbird is re-established and/or established (see Objectives FWM2, SW2, OW2, and VP2).	TB3.1. Implement Conservation Actions FWM2.1, SW2.1, OW2.1, and VP2.1. The Implementing Entity will select re-establishment/establishment sites for aquatic modeled habitat considering certain criteria, including the following: • Occurs within 1,000 feet of a nesting colony, that is occupied at the time of re-establishment/establishment or that was recorded as an occupied nesting colony at any time since 2008. Sources for occupied nesting colonies are the California Natural Diversity Database (CNDDB), Tricolored Blackbird Portal, eBird, or other data sources approved by the Wildlife Agencies. • Includes all or a mix of Irrigated Pasture Grassland, Cropland, Vernal Pool, Seasonal Wetland, Swale, Freshwater Marsh, Open Water, and/or Valley Grassland, preferably situated within a mosaic of foraging habitat (as opposed to on the edge of foraging habitat) and providing adequate insect prey. • Tricolored blackbird habitat establishment/re-establishment will occur only where currently non-modeled habitat is converted to modeled habitat (e.g., conversion of a current non-wetland to a wetland). Modeled nesting substrate includes flooded, thorny, spiny, or "visually" but not actually spiny vegetation. Surveys will be conducted after the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the established or re-established habitat is not meeting establishment or re-establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed establishment or re-establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Objective TB4. During assembly of the SSHCP Preserve System, ensure that a minimum of 232 acres of modeled nesting/foraging habitat for tricolored blackbird is re-established and/or established (see Objectives FWM2 and SW2).	TB4.1. The Implementing Entity will select re-establishment/establishment sites for nesting/foraging habitat, including Valley Grassland, Seasonal Wetland, and Freshwater Marsh land cover types considering certain criteria, including the following: • Known to historically support a tricolored blackbird colony. • Located within 1 mile of a known foraging site or SSHCP land cover type that provides modeled nesting and foraging habitat (Valley Grassland, Freshwater Marsh, Seasonal Wetland (Section 3.4.5)). Intensive row crops, vineyards, and orchards generally do not provide modeled foraging habitat. • Open water (e.g., canal, lakeshore, or stock pond) to provide water for nestlings within 1,640 feet of area where upland nesting substrate can be re-established and/or established. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species. • Management for tricolored blackbird will include maintaining young, lush growth of emergent wetland (cattails or tules) or for upland sites, blackberry bushes or other suitable spiny bushes.

Table 7-1
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Measurable Objectives	Conservation Actions
Objective TB5. Provide mitigation for loss of any tricolored blackbird nesting colony site that is occupied at the time of Covered Activity implementation or was recorded as an occupied nesting colony at any time since 2008. Sources for occupied nesting colonies are the California Natural Diversity Database, Tricolored Blackbird Portal, eBird, or other data sources approved by the Wildlife Agencies. Minimum mitigation is to protect one extant unprotected occurrence of a nesting colony prior to take of one nesting colony of tricolored blackbird. Ensure that at least five extant tricolored blackbird colonies that were occupied in recent years are maintained and managed within the SSHCP Preserve System.	TB5.1. Protect at least one extant unprotected occurrence of a nesting colony prior to take of one nesting colony of tricolored blackbird. Each of the extant occurrences preserved will meet the following criteria: • Has supported a minimum of 200 individual tricolored blackbirds during one or both of the survey years preceding the project application. • A protected nesting substrate (including wetlands that are flooded March to July, and thorny, spiny, or "visually" but not actually spiny vegetation). • Open accessible water within 1,640 feet of the nesting substrate. • Located within 1 mile of at least 500 acres of a known foraging site or SSHCP land cover type that provides modeled nesting and foraging habitat (Valley Grassland, some Cropland, Freshwater Marsh, Seasonal Wetland (Section 3.4.5)). This requirement targets lands with adequate insect forage. Intensive row crops, vineyards, and orchards generally do not provide modeled foraging habitat. One or more of the three elements (nesting substrate, access to open water as a water source for nestlings, and modeled foraging habitat) may be provided through establishment or re-establishment through Conservation Action TB3.1. If re-establishment is included, surveys will be conducted the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the restored habitat is not meeting re-establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed re-establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Objective TB6. Conduct an experimental study to identify management actions to protect tricolored blackbird colonies (e.g., coarse netting to reduce nest predation or impact of pesticides).	TB6.1. Select one or more existing tricolored blackbird colonies as experimental populations. If a large colony is available, test several potential feasible management actions within that one colony. If results of experimental treatments indicate a measurable and biologically significant decrease in nest predation or increased fledgling success and that treatments are feasible, include these management actions within Preserve Management Plans for Preserves that include historic or current tricolored blackbird colonies.
Objective TB7. Ensure that at least one large tricolored blackbird colony (i.e., one that has historically (from 1950 onward) supported a minimum of 1,500 individuals) is protected.	TB7.1 Each of the large colonies preserved will meet the following criteria: • Has supported a minimum of 1,500 individual tricolored blackbirds during a survey year since 1950. • A protected nesting substrate (including flooded, thorny, spiny, or "visually" but not actually spiny vegetation). • Open accessible water to provide a water source for nestlings within 1,640 feet of the nesting substrate. • At least 500 acres of modeled foraging habitat (that may include any combination of Irrigated Pasture Alfalfa, Vernal Pool, Valley Grassland, Seasonal Wetland, Swale, and Freshwater Marsh) providing adequate insect prey within a 1-mile radius of the nesting colony. One or more of the three elements (nesting substrate, access to open water, and modeled foraging habitat) may be provided through establishment or re-establishment through Conservation Action TB3.1. If re-establishment is included, surveys will be conducted the first year and every 5 years thereafter to monitor success. If, after the first year or any 5-year interval thereafter, the

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	restored habitat is not meeting re-establishment criteria standards, the efforts will be deemed to have failed. Remediation of failed re-establishment efforts must occur within 1 year after efforts are deemed unsuccessful.
Objective TB8. For any tricolored blackbird nesting colony that is removed by a Covered Activity, re-establish and/or establish three new colonies within SSHCP Preserves. Re-established and/or established colonies can be in aquatic (freshwater marsh, seasonal wetland) or upland (annual grassland) habitat types, and must be within 0.5 mile of appropriate agricultural forage crops (especially alfalfa) or annual grasslands that provide adequate foraging opportunities.	TB8.1. When re-establishing and/or establishing aquatic nesting colony sites, the Implementing Entity will consider the following in their design: • Avoid management of properties for fall and winter waterfowl habitat. Maintain flooded marshes from spring into July through irrigation or impoundment (8–12 inches standing water through spring). As necessary, use graywater or recycled water sources for spring irrigation. • Plant mixture of cattails and tules (cattails more abundant) in seasonal wetlands and freshwater marshes if absent. Manage the wetlands for large patches of cattails (at least 100 feet in width), spaced away from the shoreline. Refresh cattails by mowing/discing or burning, not less than every 3 years in fall and winter. • Protect the colony site from encroachment by trees or high shrubs, to eliminate perching sites for avian nest predators. • Sites selected for re-establishment/establishment of aquatic nesting habitat must be within 0.5 mile of appropriate agricultural forage crops (especially alfalfa) or annual grasslands. Agricultural operations or grasslands should ideally be protected in SSHCP Preserves, but if not, must be free from pesticide use so that insect populations are not reduced. • Encourage cattle grazing near suitable breeding colony sites if possible. Grazing increases insect abundance and the short grass increases tricolored blackbird access to insects. As an alternative to cattle grazing, conduct prescribed burns every 5 years. The preferred grass height to maintain by grazing is less than 15 inches. • Near the aquatic nesting colony site, promote insect production in early spring through irrigation or other methods. Preferred insect prey include grasshoppers and caterpillars, but aquatic insect larvae can also provide food. • Tules or cattails will be cut down or removed after each season to allow for growth of new tules and cattails.
	TB8.2. When re-establishing and/or establishing upland nesting colony sites, the Implementing Entity will consider the following in their design: • Provide native spiny, thorny, thick substrate such as California blackberry (*Rubus ursinus*), prickly lettuce (*Lactuca serriola*), nettles (*Urtica dioica*), California rose (*Rosa californica*), sandbar willow (*Salix exigua*), and mugwort (*Artemisia douglasiana*). • Protect existing patches of non-native Himalayan blackberry (*Rubus armeniacus*) and milk thistle (*Silybum marianum*) patches and allow planting in select areas. These provide superior upland habitat compared to native species as they are more thick and spiny. • Protect the colony site from encroachment by trees or high shrubs to eliminate perching sites for avian nest predators. Patches should remain in the open to avoid predator access from trees and shrubs. • Target establishment of high-density patches with height of 4 to 10 feet in existing pastureland and rangeland. Irrigating in March–April can help increase the height and density of the plants if the winter has been dry.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
	• Do not prune or mow patches until after the nesting season. • Sites selected for re-establishment/establishment of upland nesting habitat must be within 0.5 mile of appropriate agricultural forage crops (especially alfalfa) or annual grasslands. Agricultural operations or grasslands should ideally be protected in SSHCP Preserves, but if not, must be free from pesticide use so that insect populations are not reduced. • Ensure a water source is available within 1,500 feet of a target upland colony site throughout the breeding season. Water sources can include ponds, marshes, canals, stock ponds, and streams.
Mammal Covered Species	
Objective AB1. During assembly of the SSHCP Preserve System, ensure that a minimum of 23,171 acres of modeled habitat for American badger (*Taxidea taxus*) is preserved (see Objectives BOW1, VG1, VP1, VP3, and SW1).	AB1.1. The Implementing Entity will select Preserve sites for modeled habitat considering certain criteria, including the following: • Large areas (e.g., relatively undisturbed by human activity). • Supporting friable soils. • Known to support high prey densities, particularly ground squirrels and pocket gophers. • Where management can be used to enhance or re-establish natural ecosystem processes.
Objective AB2. During Preserve Assembly, ensure that a minimum of 767 acres of modeled habitat for American badger is re-established and/or established (see Objectives VP2 and SW2).	AB2.1. The Implementing Entity will select re-establishment/establishment sites for modeled habitat considering certain criteria, including the following: • Large areas (e.g., relatively undisturbed by human activity). • Supporting friable soils. • Known to support high prey densities, particularly ground squirrels and pocket gophers. • Where management can be used to enhance or re-establish natural ecosystem processes.
Objective WR1. During Preserve Assembly, ensure that a minimum of 23,910 acres of modeled foraging habitat for western red bat (*Lasiurus blossevillii*) is preserved (see Objectives BOW1, RIP1, RIP3, AG1, VG1, VP1, VP3, SW1, OW1, FWM1, and SC1).	WR1.1. The Implementing Entity will select Preserve sites for foraging habitat considering certain criteria, including the following: • Foraging areas known to be used by western red bats. • Located within 2–3 miles of permanent water. • Areas known or having potential to support high insect prey densities. • Few or no human disturbances. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Absence of or few habitat-fragmenting features, including roads and other infrastructure. • Where management can be used to enhance or re-establish natural ecosystem processes and attract other Covered Species.

Table 7-1
Biological Goals, Measurable Objectives, and Conservation Actions

Measurable Objectives	Conservation Actions
Objective WR2. During assembly of the SSHCP Preserve System, ensure that a minimum of 841 acres of modeled roosting/foraging habitat for western red bat is preserved (see Objectives BOW1, RIP1, and RIP3).	WR2.1. The Implementing Entity will select Preserve sites for roosting/foraging habitat considering certain criteria, including the following: • Active roosting sites, especially maternity sites (note that buildings, bridges, and other built structures may be used for roosting). • Located within 2–3 miles of foraging habitat and permanent water. • Foraging areas known to be used by western red bat. • Areas known or having potential to support high insect prey densities. • Few or no human disturbances. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Absence of or few habitat-fragmenting features, including roads and other infrastructure. • Where management can be used to enhance or re-establish natural ecosystem processes and attract other Covered Species.
Objective WR3. During assembly of the SSHCP Preserve System, ensure that a minimum of 1,317 acres of modeled foraging habitat for western red bat is re-established and/or established (see Objectives VP2, SW2, OW2, FWM2, RIP2, and RIP4).	WR3.1. The Implementing Entity will select re-establishment/establishment sites for foraging habitat considering certain criteria, including the following: • Areas known or having potential to support high insect prey densities. • Located within 2–3 miles of permanent water. • Few or no human disturbances. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Absence of or few habitat-fragmenting features, including roads and other infrastructure. • Where management can be used to enhance or re-establish natural ecosystem processes and attract other Covered Species.
Objective WR4. During assembly of the SSHCP Preserve System, ensure that a minimum of 450 acres of modeled roosting/foraging habitat for western red bat is re-established and/or established (see Objectives RIP2 and RIP4).	WR4.1. The Implementing Entity will select re-establishment/establishment sites for roosting/foraging habitat considering certain criteria, including the following: • Areas known or having potential to support high insect prey densities. • Located within 2–3 miles of foraging habitat and permanent water. • Few or no human disturbances. • On parcels 20 acres or greater and/or occur in larger, open space areas. • Linked or adjacent to currently preserved lands. • Absence of or few habitat-fragmenting features, including roads and other infrastructure. • Where management can be used to enhance or re-establish natural ecosystem processes and attract other Covered Species.

7.4 Development of the SSHCP Preserve System

The Plan Permittees will use the key conservation biology principles described in Section 7.1 and the Biological Goals and Measurable Objectives (Section 7.3) to develop the SSHCP Preserve System.

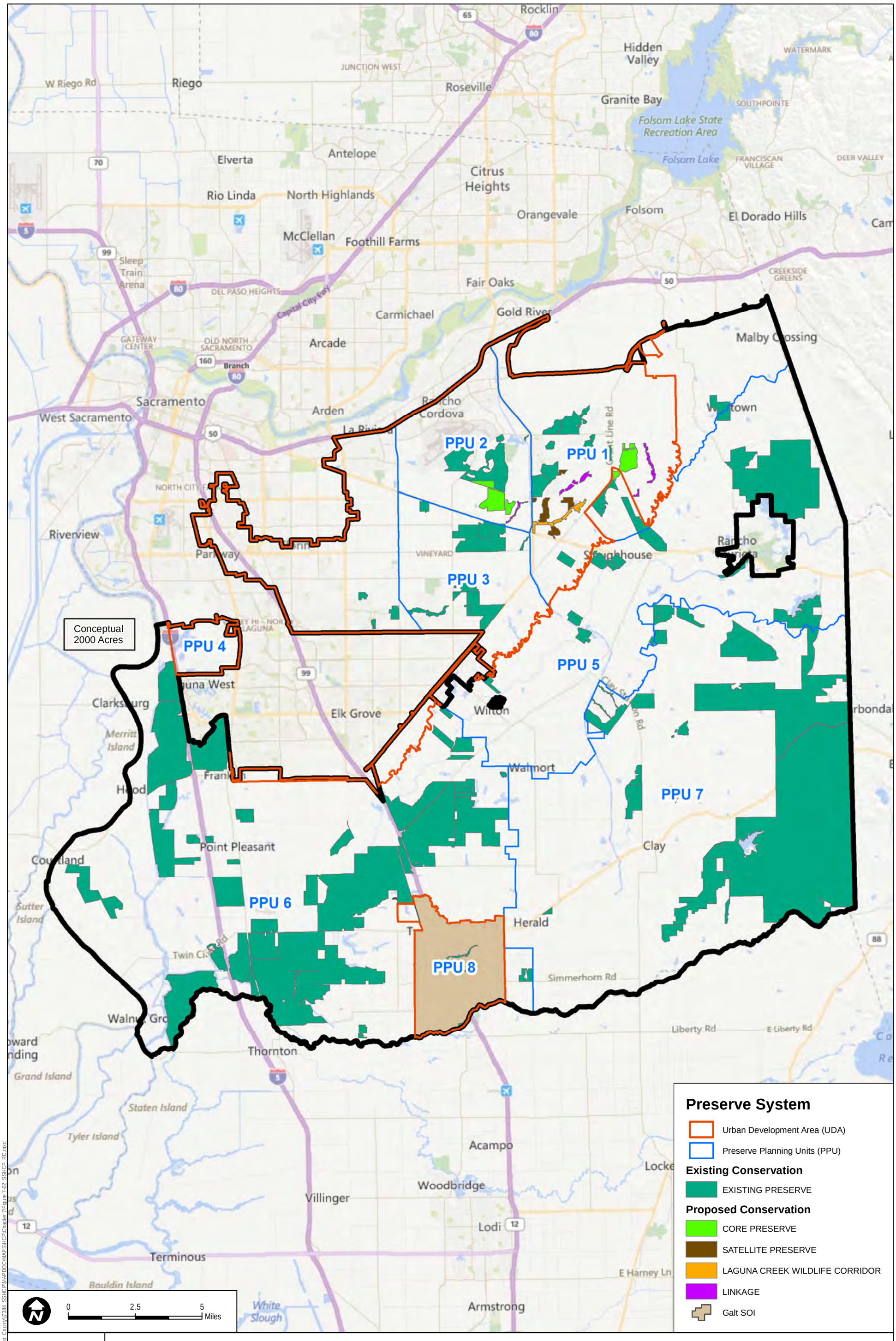
7.4.1 Preserve System Assembly Process

As described in Chapter 1, the Plan Area contains two regions: the UDA, where local jurisdictions anticipate urban growth, and lands outside the UDA, which are characterized by agricultural land uses and already include some large areas of conservation lands. Habitat preservation and management requirements in the UDA differ from those outside the UDA because these areas are subject to different land uses. Large SSHCP Preserves established outside of the UDA will occur in a matrix of open space and agricultural lands interspersed with agricultural residential communities; smaller SSHCP Preserves in the UDA will be surrounded by urban, suburban, industrial, and commercial land uses. Each Preserve in the SSHCP Preserve System will be established by one of two processes:

- **Hardline process**. This process is termed "hardline" because the exact locations and Preserve boundaries are known at the time of Plan preparation. Inside the UDA, some Preserves have already been proposed by willing landowners. These nine "hardline" Preserve locations are all within the UDA, and total approximately 1,800 acres (see Figures 7-2 through 7-5 and Section 7.5).
- **Criteria-based process.** These Preserves are "criteria-based," meaning the exact Preserve boundaries and locations are not known at the time of Plan preparation. Criteria-based Preserves will be located within the UDA and outside the UDA. The criteria-based Preserves will be located and established as described below (see Section 7.5).

The combined criteria-based and hardline preservation process will create an interconnected SSHCP Preserve System totaling 36,282 acres. All SSHCP Preserves will be preserved in perpetuity and would be acquired either as fee title or as conservation easements (see Chapter 9). As the SSHCP is implemented over the Permit Term, the new 36,282 acres SSHCP Preserve System will be established in a manner that supplements, complements, and links together many of the existing preserves[4] within the Plan Area (Section 3.5).

[4] Existing preserve acres are not included as part of the new 36,282 acre SSHCP Preserve System, and are not considered a part of the SSHCP Preserve System. Existing preserves do not count towards achieving any of the Biological Goals and Measurable Objectives described in this chapter or any other components of the SSHCP Conservation Strategy.



SOURCE: USGS 2012, County of Sacramento 2012

FIGURE 7-2

Existing Preserves and SSHCP Planned Hardline Preserves

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

Figure depicts existing preserves and hard-line planned conservation only. For a description of soft-line planned conservation see Sections 7.5.2 and 7.5.3.

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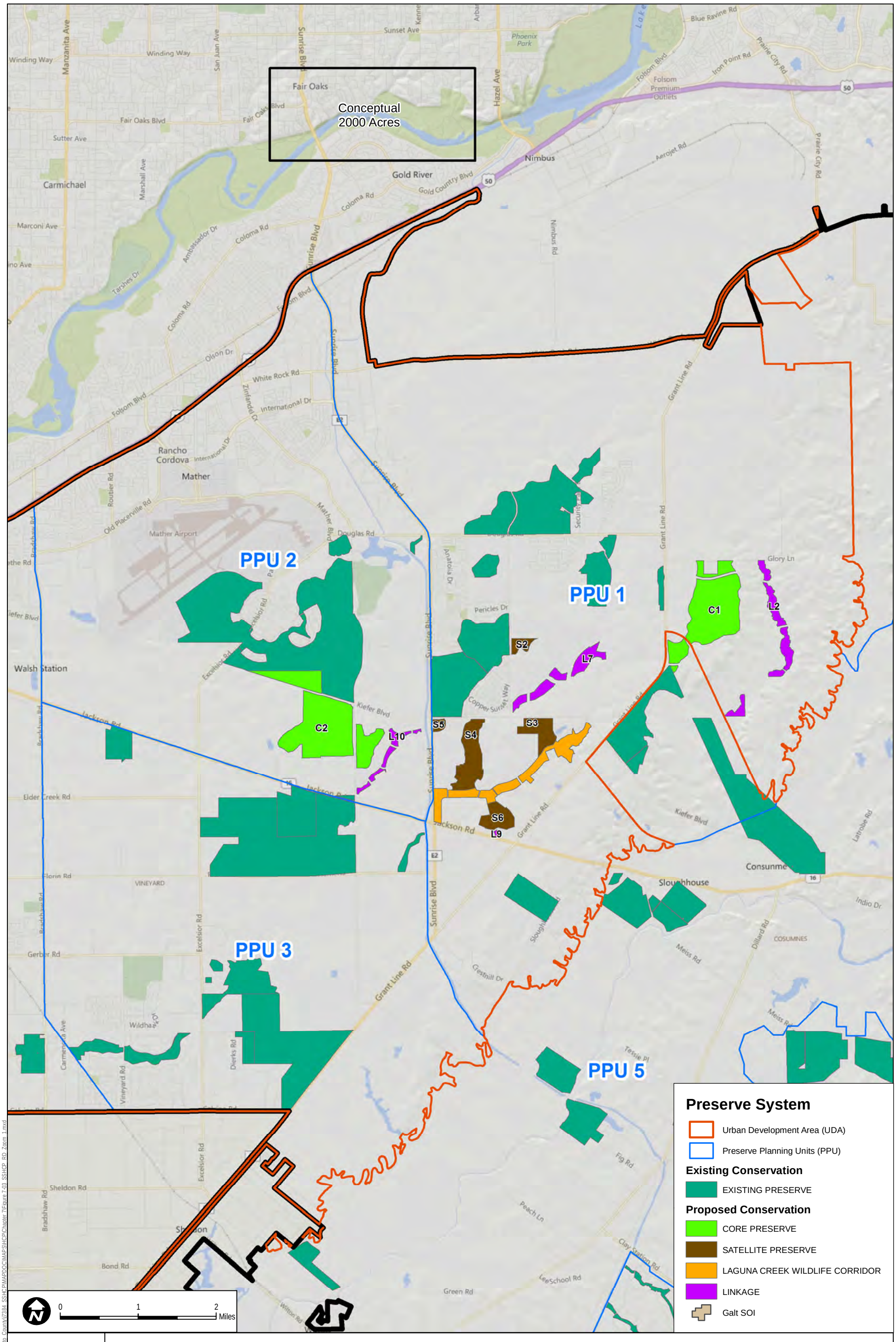

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 7-3

Existing Preserves and SSHCP Planned Hardline Preserves

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

Figure depicts existing preserves and hard-line planned conservation only. For a description of soft-line planned conservation see Sections 7.5.2 and 7.5.3.

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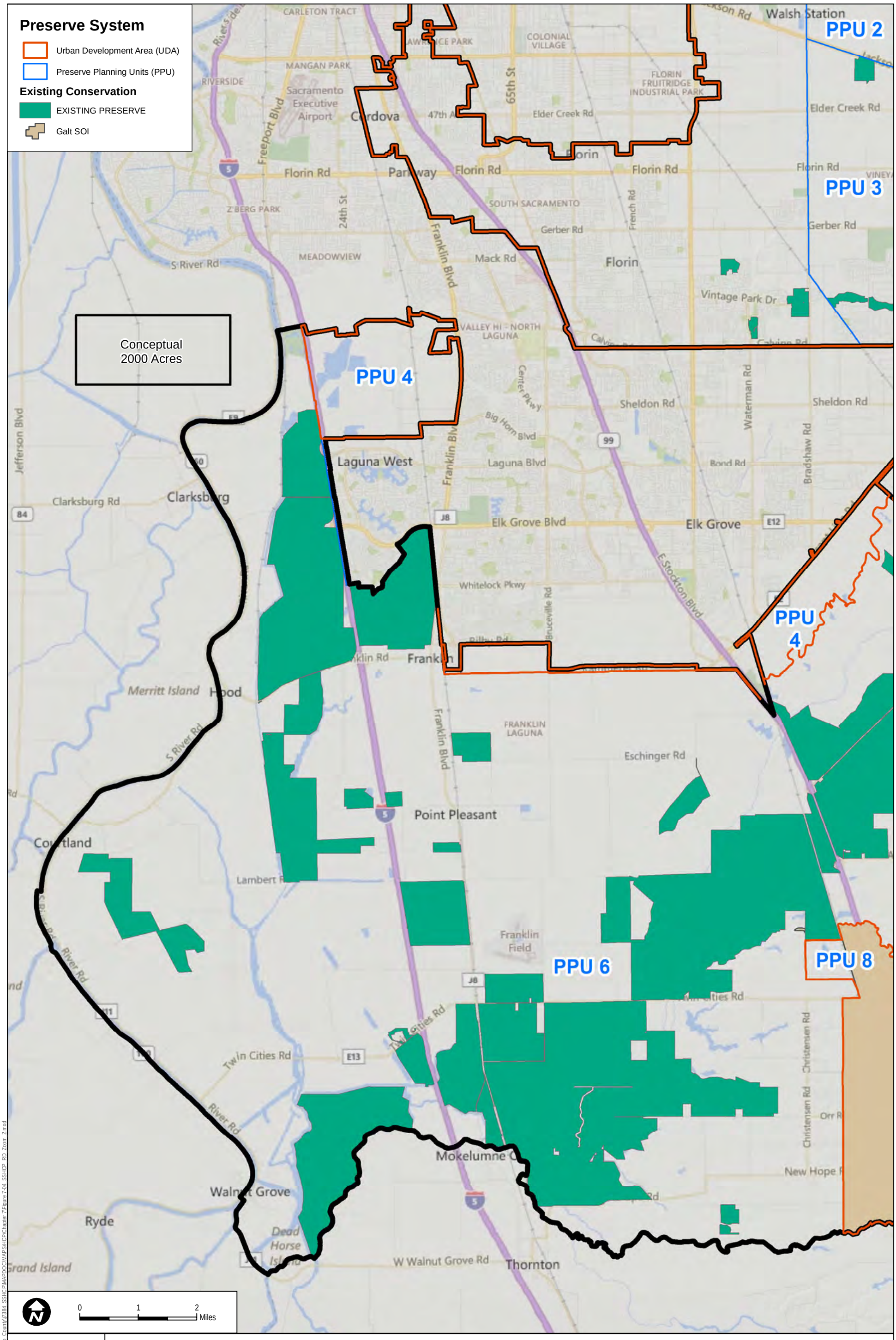

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 7-4

Existing Preserve and SSHCP Planned Hardline Preserves

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

Figure depicts existing preserves and hard-line planned conservation only. For a description of soft-line planned conservation see Sections 7.5.2 and 7.5.3.

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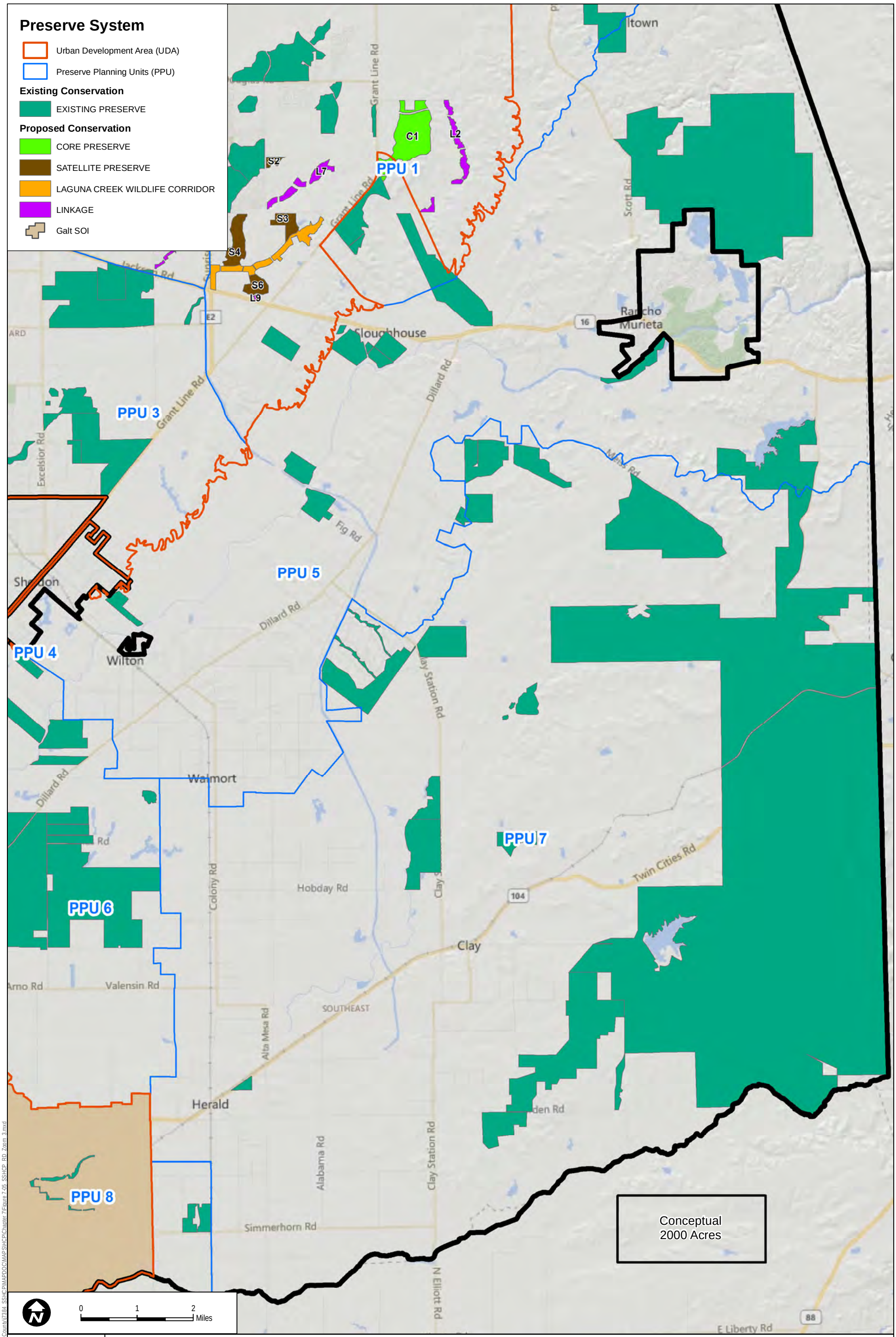

SOURCE: Bing 2015, County of Sacramento 2014

FIGURE 7-5

Existing Preserves and SSHCP Planned Hardline Preserves

SOUTH SACRAMENTO HABITAT CONSERVATION PLAN

Figure depicts existing preserves and hard-line planned conservation only. For a description of soft-line planned conservation see Sections 7.5.2 and 7.5.3.

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7.4.2 Benefits to Non-Covered Species

Although the SSHCP Preserve System is designed to provide benefits to Covered Species, establishing, managing, and monitoring the SSHCP Preserve System will also benefit non-covered native species within the Plan Area. For example, preserved Valley Grassland will provide foraging habitat for a range of bird species, and preserved Riparian Woodland will provide breeding habitat for many bird species. Establishment of large, well-linked Preserves and establishment of wildlife crossings as part of Urban Transportation and Rural Transportation Covered Activities will maintain habitat connectivity and provide movement corridors for mobile species such as deer (*Odocoileus hemionus* or *Odocoileus hemionus columbianus*), coyotes (*Canis latrans*), foxes (*Urocyon cinereoargenteus*), and others.

7.4.3 Existing Preserves in the Plan Area

The SSHCP Preserve System will be designed to link and to complement existing preserves, which are widely scattered within the Plan Area (see Section 3.5). The biological resources, aquatic resources, and Covered Species within the Plan Area will benefit from a network of new SSHCP Preserves that are interconnected to existing preserves (refer to Section 7.5.3 and Table 7-2). Existing preserve acres are not considered a part of the SSHCP Preserve System and do not count towards achieving any of the Biological Goals and Measurable Objectives described in this chapter or any other components of the SSHCP Conservation Strategy.

Table 7-2
Summary of SSHCP Preserve System and Existing Preserves by Preserve Planning Unit

Preserve Planning Unit (PPU)	Total PPU Area (acres)	SSHCP Preserve (acres)	Existing Preserve (acres)	Total Preservation (acres)
Inside UDA				
1	17,574	3,537	683	4,220
2	9,271	584	33	617
3	14,303	1,815	2,191	4,006
4	5,253	527	0	527
8	7,133	415	95	510
Outside PPU	14,085	63	169	232
Total	*67,619*	*6,941*	*3,171*	*10,112*
Outside Urban Development Area				
1	2,156	219	495	714
5	52,534	1,691	6,534	8,225
6	95,196	9,750	28,076	37.826
7	90,906	15,894	26,079	41,973
Outside PPU	9,245	0	180	180
Total	*250,037*	*27,554*	*61,364*	*88,918*
Grand Total	**317,656**	**34,495**	**64,535**	99,030

7.5 Description of the SSHCP Preserve System

This section describes the SSHCP Preserve System, including a description of preservation inside and outside of the UDA by PPU and by preserve category. As the Preserve System is assembled, the spatial configuration may be somewhat different than the Preserve System described in this section. The requirement to acquire a minimum 36,282-acre preserve system, to acquire 6,941 acres of preserve within the UDA, and to establish preserves by preserve category (e.g., Landscape Preserve, Core Preserve, Minor Preserve, etc.) within each PPU as described below are firm commitments. In addition, the SSHCP is committing to the preservation of at least 6,065 acres of Valley Grassland and 210 acres of vernal pool within the UDA. While it is the intent of the SSHCP to generally adhere to the amount of preservation by land cover type assumed within and outside of the UDA, some flexibility is needed to ensure that the SSHCP is acquiring the best habitat available. Therefore, up to 15% of proposed preserve acreage that is assumed to occur outside of the UDA can be shifted to locations within the UDA. All candidate Preserves will be reviewed as described in Section 9.4. Section 7.6 presents the conservation analysis of the operating Conservation Strategy.

The SSHCP Preserve System will include 36,282 acres of SSHCP Preserve, the majority of which would be preserved by conservation easements. Table 7-3 provides a breakdown of land cover types by acreage of existing habitat that will be preserved under the SSHCP Preserve System. Table 7-4 provides a breakdown of land covers by acreage of re-established/established habitat that will be preserved under the SSHCP Preserve System. The total amount of each land cover type presented in Tables 7-3 and 7-4 must be preserved within the SSHCP Plan Area. A minimum of 50 acres of vernal pool, a minimum of 30 acres of swales, and a minimum of 300 acres of Vernal Pool Ecosystem must be re-established or established within the Mather Core Recovery Area. A minimum of 50 acres of Freshwater Marsh must be re-established or established within the UDA. The conservation analysis for land covers is provided in Section 7.6.1.

Table 7-3
Summary of Preservation of Existing Habitat within the SSHCP Preserve System

Land Cover	SSHCP Preserve System (acres)		
	Inside UDA	*Outside UDA*	*Total*
Wetland Waters			
Freshwater Marsh	54	73	127
Seasonal Wetland	12	93	105
Swales	92	186	278
Vernal Pools	210	756	966
Non-Wetland Waters			
Open Water	71	84	155
Streams/Creeks (Intermittent and Perennial)	29	88	117

Table 7-3
Summary of Preservation of Existing Habitat within the SSHCP Preserve System

Land Cover	SSHCP Preserve System (acres)		
	Inside UDA	*Outside UDA*	*Total*
Streams/Creeks VPIH (Ephemeral)	26	0	26
Riparian			
Mixed Riparian Scrub/ Mixed Riparian Woodland*	72	892	964
Terrestrial			
Blue Oak Woodland/Blue Oak Savanna**	0	47	47
Cropland/Irrigated-Pasture Grassland***	310	9,386	9,696
Valley Grassland	6,065	15,949	22,014
Total Preserve Area	**6,941**	**27,554**	**34,495**

* Impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland will be mitigated by preserving any combination of Mixed Riparian Scrub and Mixed Riparian Woodland.

** Impacts to Blue Oak Woodland and Blue Oak Savanna will be mitigated by preserving any combination of Blue Oak Woodland and Blue Oak Savanna.

*** Impacts to Cropland, Irrigated Pasture-Grasslands, Vineyard and Orchard will be mitigated by preserving any combination of Cropland and Irrigated Pasture Grassland.

Table 7-4
Summary of Re-established/Established Habitat within the SSHCP Preserve System

Land Cover	SSHCP Preserve System (acres)		
	Inside UDA	*Outside UDA*	*Total*
Wetland Waters			
Freshwater Marsh	50	77	127
Seasonal Wetland	0	105	105
Swales*	30	226	256
Vernal Pools	50	339	389
Non-Wetland Waters			
Open Water**	0	155	155
Streams/Creeks	0	117	117
Riparian			
Mixed Riparian Scrub/ Mixed Riparian Woodland***	0	591	591
Terrestrial			
Blue Oak Woodland/Blue Oak Savanna****	0	47	47
Total Preserve Area	**130**	**1,657**	**1,787**

* The acreage necessary to provide compensatory mitigation for impacts to Stream/Creek (VPIH) (22 acres) is assumed in the Swale land cover type category. However, compensatory mitigation for Swale and Stream/Creek (VPIH) land cover types can be achieved by re-establishing/establishing vernal pool land cover types.

** Compensatory Mitigation for Open Water can be achieved by re-establishing/establishing Open Water or an aquatic land cover type that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC).

*** Compensatory Mitigation for Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland will be achieved by re-establishing/establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

**** Compensatory Mitigation for Blue Oak Woodland and Blue Oak Savanna will be achieved by re-establishing/establishing any combination of Blue Oak Woodland and Blue Oak Savanna.

7.5.1 Preserve System Inside the UDA by PPU

The following section summarizes the Preserve System inside the UDA in three ways:

- By PPU, broken out by SSHCP land cover types
- With regard to SSHCP Preserve categories (Landscape, Core, Minor, Satellite, Linkage, etc.)
- In relation to existing preserves

Subsections that follow provide more detailed commitments for SSHCP Preserves in each of the PPUs inside the UDA, as well as the portion of the Laguna Creek Wildlife Movement Corridor that is located outside the PPUs. Table 7-5 provides a summary of the acreage by SSHCP Land Cover Type in each PPU that is inside the UDA. SSHCP Preserves inside the UDA will account for approximately 20% of the Preserve System, most of which will be in PPUs 1, 3, and 4.

The following subsections also provide a general description for where criteria-based Preserves will be sited to meet Biological Goals and Measurable Objectives (Table 7-1). As described above, the final spatial configuration of the SSHCP Preserve System inside the UDA may differ somewhat from the details provided for each PPU below, but the assembled SSHCP Preserve System must meet the SSHCP Biological Goals and Measurable Objectives. While the exact preserve configuration may differ somewhat from the descriptions provided below, the preservation acreages to be acquired within each PPU (as illustrated in Table 7-5) and by preserve category (e.g., Landscape Preserve, Core Preserve, Minor Preserve, etc.) must be achieved. The following subsections also provide qualitative discussions of Covered Species preservation in each of the PPUs. The full conservation analysis for Covered Species is provided in Section 7.6.2.

Table 7-5
Preservation of Natural Land Cover Types in the Preserve System by PPU Inside the UDA

Land Cover Type	SSHCP Preserves (acres)						
	PPU 1	*PPU 2*	*PPU 3*	*PPU 4*	*PPU 8*	*Outside PPUs*	*Total*
Wetland Waters							
Freshwater Marsh	10	0	24	20	0	0	54
Seasonal Wetland	0	1	0	4	6	1	12
Swale	49	7	32	2	2	0	92
Vernal Pool	133	17	49	8	1	2	210
Non-Wetland Waters							
Open Water	51	2	14	4	0	0	71
Stream/Creek	10	2	10	2	0	5	29
Stream/Creek (VPIH)	17	6	3	0	0	0	26

Table 7-5
Preservation of Natural Land Cover Types in the Preserve System by PPU Inside the UDA

Land Cover Type	SSHCP Preserves (acres)						
	PPU 1	*PPU 2*	*PPU 3*	*PPU 4*	*PPU 8*	*Outside PPUs*	*Total*
Riparian							
Mixed Riparian Woodland/Mixed Riparian Scrub	0	0	24	42	0	6	72
Terrestrial							
Blue Oak Woodland/Blue Oak Savanna	0	0	0	0	0	0	0
Cropland/ Irrigated Pasture-Grassland	0	0	0	0	310	0	310
Valley Grassland	3,267	549	1,659	445	96	49	6,065
Total	**3,537**	**584**	**1,815**	**527**	**415**	**63**	**6,941**

7.5.1.1 PPU 1

That portion of PPU 1 that is inside the UDA[5] encompasses 17,574 acres and is bordered by U.S. Highway 50 to the north, Prairie City Road to the northeast, the Deer Creek floodplain boundary to the southeast, Sloughhouse to the south, and Sunrise Boulevard to the west. Land cover types in PPU 1 are summarized in Table 3-1. The dominant land cover in PPU 1 is Valley Grassland (within the Vernal Pool Ecosystem), which comprises 13,260 acres of the PPU. PPU 1 in the UDA also contains substantial amounts of Cropland (359 acres) and Mine Tailing Riparian Woodland (220 acres). PPU 1 also includes 389 acres of Vernal Pool that supports high-value vernal pool complexes, and 193 acres of Swale. Some urbanization has already occurred south of U.S. Highway 50 and east of Sunrise Boulevard, with High-Density Development comprising 1,158 acres of PPU 1 in the UDA. PPU 1 encompasses the City of Rancho Cordova in the Plan Area, and lands east of Rancho Cordova in unincorporated areas of the County. Because much of PPU 1 is located in Rancho Cordova's city limit and within the County's Urban Services Boundary, it is anticipated that much of PPU 1 within the UDA will eventually be urbanized.

PPU 1 contains documented occurrences for many SSHCP Covered Species (Figures 3-3 through 3-30), including 28 occurrences of Boggs Lake hedge-hyssop (*Gratiola heterosepala*) (89% of the total number of occurrences in the Plan Area) , 39 occurrences of Sacramento

[5] Note that a small portion of PPU 1 is also located outside of the UDA. The portion of PPU 1 that is located outside of the UDA is discussed in Section 7.5.2.

Orcutt grass (92% of the total number of occurrences in the Plan Area),53 occurrences of legenere (*Legenere limosa*) (30% of the total number of occurrences in the Plan Area), one of the four slender Orcutt grass occurrences that occur in the Plan Area, and 703 occurrences of vernal pool tadpole shrimp (34% of the total number of occurrences in the Plan Area). There are 53 occurrences of vernal pool fairy shrimp within PPU 1 out of a total of 533 occurrences Plan Area-wide, one occurrence of valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (on the northern boundary of the PPU), six occurrences for western spadefoot (*Spea hammondii*), and scattered occurrences for all of the bird Covered Species except ferruginous hawk. PPU 1 also includes the eastern segment of the County's designated Laguna Creek Wildlife Movement Corridor, which generally provides riparian, wetland, and aquatic habitats for several Covered Species, including western pond turtle, Sanford's arrowhead (*Sagittaria sanfordii*), and dwarf Downingia (*Downingia pusilla*). The riparian habitat in PPU 1 also provides potential roosting and/or foraging habitat for western red bat (*Lasiurus blossevillii*), although there are no documented occurrences of this species.

Overview of Conservation Strategy for PPU 1

In PPU 1 inside the UDA, approximately 3,537 acres will be preserved by the SSHCP. The Preserve design focus in PPU 1 includes establishing a Core Preserve, several smaller minor and Satellite Preserves, and providing Linkage Preserves between both existing preserves and SSHCP Preserves.

Core Preserve

A new Core Preserve (Core Preserve C-1) will total 839 acres, of which, 350 acres will be hardline Preserve (see Figure 7-3) and the remaining 489 acres will be criteria-based Preserve. The following provides a general description of Core Preserve C-1.

The northern boundary of Core Preserve C-1 will generally be defined by existing mining operations, mine tailings, and agricultural uses. Most of the land cover north of Core Preserve C-1 lacks wetland resources as a result of mining and agricultural uses, and it is expected that this area will continue to operate as a processing plant for aggregate material in the foreseeable future.

The eastern boundary of Core Preserve C-1 will generally be defined by a ridgeline that defines the eastern watershed boundary of the Preserve and where the terrain drops precipitously to the east. There are some vernal pool resources east of the ridgeline, but these are in low-density complexes spread across a large area and, thus, probably could not be efficiently aggregated into a Preserve. At full buildout of the UDA (see Chapter 5, Covered Activities), it is expected that the area east of Core Preserve C-1 will ultimately be residential and commercial development.

Similar to the eastern boundary, the southern boundary of Core Preserve C-1 will generally be defined by a ridgeline. The area south of this general boundary contains few wetland

resources and does not provide hydrological connection to Core Preserve C-1. Future land uses south of Core Preserve C-1 will likely be residential, public, or quasi-public.

The western boundary of the southern portion of Core Preserve C-1, generally south of Glory Lane (a maintained gravel road), will generally be defined by an unnamed tributary drainage to Laguna Creek. This drainage is at the lowest elevation in the basin and is important for maintaining the integrity of the Core Preserve C-1 watershed to the east of Grant Line Road and ensuring that the sub-watersheds surrounding vernal pool complexes in Core Preserve C-1 remain intact. Water entering the basin flows from the northeast to the southwest, or from the ridgeline that generally defines the eastern boundary of Core Preserve C-1.

The western boundary of the northern portion of Core Preserve C-1, generally north of Glory Lane, will generally follow a ridgeline that defines the western watershed boundary for Core Preserve C-1 and its wetland features. The area west of this ridgeline will likely consist of commercial and residential development at full buildout of the UDA.

It is estimated that Core Preserve C-1 will comprise approximately 752 acres of Valley Grassland and approximately 54 acres of Vernal Pool that are located on the Laguna land formation.

Based on documented occurrences, several known Covered Species will be protected in Core Preserve C-1, including vernal pool tadpole shrimp, vernal pool fairy shrimp, legenere, pincushion Navarretia (*Navarretia myersii* ssp. *myersii*), and Sacramento Orcutt grass. Valley Grassland and Vernal Pool will also provide modeled habitat for several other Covered Species. The conservation analysis for Covered Species is provided in Section 7.6.2.

Minor Preserves

At least three Minor Preserves will be established in the UDA in PPU 1, totaling 785 acres within the UDA and ranging from approximately 247 to 271 acres each. They will be provisionally called Minor Preserves M-1, M-2, and M-3 (the name and number of Minor Preserves could change as the Preserve System is assembled, pursuant to review and approval by the Permitting Agencies). These three Minor Preserves will be entirely criteria-based.

Preserve M-1 will be approximately 271 acres. The eastern boundary of Preserve M-1 will generally be adjacent to Grant Line Road. Most of the land east of Preserve M-1 is in existing preserves or is in the Preserve System as the Laguna Creek Wildlife Movement Corridor (see Figure 7-3). It is anticipated that lands east and north of Preserve M-1 will be urbanized at full buildout of the UDA.

The southern boundary of Preserve M-1 will be adjacent to existing preserve outside the UDA. The boundary will be established to provide an adequate setback to a swale that drains Preserve

M-1, and an adjacent existing preserve into Laguna Creek. Protecting this drainage will maintain the subwatersheds located inside Preserve M-1 and the hydrological connectivity between Preserve M-1 and the existing preserve to the south.

Preserve M-1 will be dominated by Valley Grassland, but will also contain Vernal Pool. Although focused species surveys have not been conducted in this area, it is likely that Preserve M-1 will contain vernal pool tadpole shrimp and vernal pool fairy shrimp, and it may also contain Sacramento Orcutt grass based on documented occurrences in the adjacent existing preserve. There is also a documented occurrence of western spadefoot in the area. Several other Covered Species have potential to occur on Preserve M-1 based on the presence of modeled habitat and proximity to Laguna Creek.

Preserve M-2 will be approximately 247 acres and will generally be bordered on the north by Grant Line Road and the UDA boundary. Preserve M-2 is intended to be linked directly to an existing preserve. The eastern boundary of Preserve M-2 will be established to ensure that wetlands within Preserve M-2 are provided an adequate setback and that the slopes of Preserve M-2's principle drainage are protected. It is anticipated that areas east of Preserve M-2 will be developed for industrial and possibly some recreational uses with full buildout of the UDA. The southern boundary of Preserve M-2 will generally be defined by the existing agricultural and residential lots to the south, which have relatively little resource value. It is anticipated that the area south of Preserve M-2 will remain in agricultural and residential land use for the foreseeable future. The western boundary of Preserve M-2 will be established to ensure that wetlands in the Preserve are at a higher elevation than areas to the west that are anticipated to be developed for commercial, residential, and possibly industrial uses at full buildout of the UDA. Having the Preserve M-2 boundary at a lower elevation than wetland resources within Preserve M-2 will ensure that the sub-watersheds surrounding protected wetland resources remain intact. A majority of the rainfall that enters Preserve M-2 will exit via small drainages and swales that flow to the east or west.

Preserve M-2 will largely consist of Valley Grassland, Vernal Pools, and Swales. An additional 98 acres of Preserve M-2 will extend outside the UDA. The vernal pools are on the Laguna land formation. Although focused species surveys have not been conducted in this area, it is likely that Preserve M-2 will contain vernal pool tadpole shrimp and vernal pool fairy shrimp, and possibly Sacramento Orcutt grass based on several documented occurrences on nearby existing preserves. Several other Covered Species have potential to occur on Preserve M-2 based on the presence of modeled habitat and proximity to Laguna Creek.

Preserve M-3 will be approximately 267 acres and will be bordered on the north by Jackson Highway. At full buildout of the UDA, lands north of Preserve M-3 will likely be developed for residential or commercial uses. The southeastern boundary of Preserve M-3 will generally

be adjacent to Grant Line Road. At full buildout of the UDA, property southeast of Preserve M-3 will likely be developed for residential or commercial uses, or could become agricultural-residential. The western boundary of Preserve M-3 will generally be adjacent to Sunrise Boulevard. At full buildout of the UDA, property west of Preserve M-3 will likely be developed for commercial uses.

Preserve M-3 will consist largely of Valley Grassland, Vernal Pools, and Swales. The vernal pools in Preserve M-3 occur on the Laguna, Riverbank Undivided, and Surficial Alluvial Undifferentiated Deposits land formations. Although focused species surveys have not been conducted in this area, Preserve M-3 is likely to contain vernal pool tadpole shrimp and vernal pool fairy shrimp. Several other Covered Species have potential to occur in Preserve M-3 based on the presence of species modeled habitat and proximity to Laguna Creek.

Satellite Preserves

The Preserve System includes seven Satellite Preserves in PPU 1, totaling approximately 596 acres and ranging from approximately 11 to 160 acres each. These are provisionally called Satellite Preserves S-1 through S-6 and S-8 (Satellite Preserve S-7 in PPU 1 is outside the UDA and is discussed in Section 7.5.2.1).

Satellite Preserve S-1 will be a criteria-based Preserve and will generally be located west of Grant Line Road northeast of existing preserve and northwest of the new Core Preserve C-1 described above. Satellite Preserve S-1 will be connected to existing preserve and Core Preserve C-1 via Linkage Preserves, discussed below. It is anticipated that Satellite Preserve S-1 will eventually be surrounded by residential or commercial development at full buildout of the UDA.

Satellite Preserve S-1 will be approximately 118 acres in size and consist of Valley Grassland, Vernal Pools, and Swales. Satellite Preserve S-1 was primarily identified to protect an occurrence of slender Orcutt grass (for which all known and future occurrences subject to a Covered Activity will be protected pursuant to Objective VPP7), but also to protect vernal pools and the upper reaches of Morrison Creek. The vernal pools that support slender Orcutt grass are located above the upper reaches of Morrison Creek. These pools will be provided an adequate setback from the Preserve edge. Adjacent lands outside of Satellite Preserve S-1 slope and drain away from Satellite Preserve S-1, ensuring that the sub-watershed for the vernal pools in Satellite Preserve S-1 will remain intact. The vernal pools north of Morrison Creek drain south and southeast into Morrison Creek. A setback south of Morrison Creek that is adequate to protect the integrity of the creek will be established and will incorporate wetland features that border the creek. In addition to slender Orcutt grass, several other Covered Species have potential to occur on Satellite Preserve S-1 based on the presence of species modeled habitat.

Satellite Preserve S-2 will be a hardline Preserve that will add acreage to an existing preserve to the west (Anatolia Preserve). It will also be adjacent to an existing preserve on the north. The eastern and southern boundaries of Satellite Preserve S-2 will likely be adjacent to residential or commercial development at full buildout of the UDA. Satellite Preserve S-2 will be approximately 22 acres and consist largely of Valley Grassland, Vernal Pools, and Swales. Satellite Preserve S-2 will preserve several vernal pools and drainages from the two adjacent existing preserves, including vernal pools known to contain vernal pool tadpole shrimp and Boggs Lake hedge-hyssop. Several other Covered Species have potential to occur in Preserve S-2 based on the presence of modeled habitat.

Satellite Preserve S-3 will be a hardline Preserve generally bordered on the north by Kiefer Boulevard (see Figure 7-3). Except where Satellite Preserve S-3 will connect directly to the existing Laguna Creek Wildlife Movement Corridor directly to the south, it is anticipated that Satellite Preserve S-3 will be bordered by residential or commercial development at full buildout of the UDA. Satellite Preserve S-3 will be approximately 79 acres largely consisting of Valley Grassland, Vernal Pools, and Swales. Satellite Preserve S-3 was identified primarily to protect an area of high-density vernal pools on a plateau that flows into Laguna Creek. Several Covered Species have potential to occur in Satellite Preserve S-3 based on the presence of modeled habitat and proximity to Laguna Creek.

Satellite Preserve S-4 will be a hardline Preserve generally bordered on the north by Kiefer Boulevard and will be located east of Sunrise Boulevard (Figure 7-3). Except where Satellite Preserve S-4 will connect directly to the Laguna Creek Wildlife Movement Corridor, it is anticipated that Satellite Preserve S-4 will be bordered by residential or commercial development at full buildout of the UDA. Satellite Preserve S-4 will be approximately 135 acres and largely consist of Valley Grassland, Vernal Pools, and Swales. Satellite Preserve S-4 was identified primarily to protect vernal pools. In addition, Sun Creek, which drains into Laguna Creek, runs north–south through the central portion of Satellite Preserve S-4 and is situated between shallow slopes on both sides. Satellite Preserve S-4 will encompass the relatively flat terrace adjacent to Sun Creek and will be large enough to provide adequate setbacks for the vernal pools located on the terrace. Satellite Preserve S-4 is expected to support vernal pool tadpole shrimp and vernal pool fairy shrimp based on documented occurrences on nearby existing preserves. Several other Covered Species have potential to occur on Satellite Preserve S-4 based on the presence of modeled habitat and proximity to Laguna Creek.

Satellite Preserve S-5 will be a hardline Preserve adjacent to an existing preserve (Anatolia Preserve) to the north and bordered by Sunrise Boulevard on the west (Figure 7-3). It is anticipated that lands east and south of Satellite Preserve S-5 will be residential or commercial development at full buildout of the UDA. Satellite Preserve S-5 will be approximately 11 acres consisting mostly of Valley Grassland, Vernal Pools, and Swales. Satellite Preserve S-5 will protect the on-site vernal pools and the hydrology of the existing preserve to the north, which

supports vernal pools known to contain vernal pool tadpole shrimp and Boggs Lake hedge-hyssop. It is expected that the vernal pools in Satellite Preserve S-5 contain vernal pool tadpole shrimp and Ahart's dwarf rush (*Juncus leiospermus*). Several other Covered Species have potential to occur on Satellite Preserve S-5 based on the presence of modeled habitat and proximity to Laguna Creek.

Satellite Preserve S-6 will be a hardline Preserve generally located north of Jackson Highway, east of Sunrise Boulevard, and west of Grant Line Road (Figure 7-3). Except where Satellite Preserve S-6 connects to Laguna Creek to the north, it is anticipated that Satellite Preserve S-6 will be bordered by residential or commercial development at full buildout of the UDA. Satellite Preserve S-6 will be approximately 71 acres and consist largely of Valley Grassland, Vernal Pools, and Swales. Satellite Preserve S-6 was identified primarily to protect vernal pools and is located on a plateau that drains north into Laguna Creek. Several Covered Species have potential to occur in Satellite Preserve S-6 based on the presence of modeled habitat and proximity to Laguna Creek.

Satellite Preserve S-8 will be a criteria-based Preserve located southeast of the intersection of Jackson Highway and Grant Line Road, and will be bordered on the south by existing preserve. Satellite Preserve S-8 will be approximately 160 acres and consist largely of Valley Grassland, Vernal Pools, Swales, and Open Water. Satellite Preserve S-8 was identified primarily to protect vernal pools and to connect with an existing preserve. Several Covered Species have potential to occur on Satellite Preserve S-8 based on the presence of modeled habitat.

Linkage Preserves

Seven Linkage Preserves totaling approximately 924 acres will be established in the UDA in PPU 1, not including the area in the Laguna Creek Wildlife Movement Corridor or the Cosumnes/Deer Creek Wildlife Movement Corridor, which are discussed separately below. Approximately 721 acres of the Linkage Preserves will be criteria-based, so their final design has not been established. The Linkage Preserves will be designed to maintain connectivity between existing preserves and SSHCP Preserves, providing for wildlife movement and, in many cases, hydrological connections between Preserves. Their ultimate size and dimensions (i.e., width and length of the linkage) will depend on several factors, including habitat types in the linkage, the ecological function(s) the linkage is designed to serve (e.g., overland wildlife movement, drainage), and adjacent land uses. The Linkage Preserves will need to be wide enough to support the suite of species expected to use the linkage, including movement habitat for more mobile species and "live-in" habitat for more sedentary species, and to provide adequate setbacks from adjacent land uses and potential edge effects, including invasive species, runoff, pollutants, lighting, and noise (see discussion of permanent indirect effects in Chapter 6). Pursuant to Objective L2, the Linkage Preserves inside the UDA will have minimum widths of approximately 600 feet, except where this minimum width is not possible due existing physical

constraints such as adjacent existing land uses or ownership constraints. See Chapter 5 for more details on linkage design criteria (e.g., setbacks) and Avoidance and Minimization Measures.

Seven Linkage Preserves have been identified for PPU 1, provisionally referred to as Linkage Preserves L-1 through L-4, L-7, L-8, and L-9.

Linkage Preserve L-1 (Carson Creek Linkage) will be a criteria-based linkage approximately 2 miles long and will connect Preserve C-1 to undeveloped lands east of the UDA. It is anticipated that Preserve L-1 will be bordered by urban development with full buildout of the UDA. Preserve L-1 will be approximately 231 acres and largely consist of Valley Grassland, Vernal Pools, and Swales. The primary purpose of Linkage Preserve L-1 will be to facilitate wildlife movement in the northeastern portion of the Plan Area and to maintain a hydrological connection of an unnamed stream between Core Preserve C-1 and undeveloped lands located east of the UDA. Although focused species surveys have not been conducted in Linkage Preserve L-1, it is likely to support vernal pool fairy shrimp and possibly vernal pool tadpole shrimp. Linkage Preserve L-1 will also be designed to support a vernal pool with a known occurrence of Sacramento Orcutt grass, and this vernal pool will be protected from adjacent future development by an adequate setback (see discussion in Chapter 5). Linkage Preserve L-1 will also be designed to maintain the hydrology of wetlands contained within Linkage Preserve L-1 by incorporating the Avoidance and Minimization Measures described in Chapter 5. Because Linkage Preserve L-1 will be crossed by roads, additional design features and Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained.

Linkage Preserve L-2 (Deer Creek Linkage) will be approximately 2.5 miles long and designed to connect to Core Preserve C-1 via Linkage Preserve L-1 to criteria-based Preserve to the south outside the UDA. In the north, Linkage Preserve L-2 will connect directly to Linkage Preserve L-1 just north of Glory Lane and just south of where Linkage Preserve L-1 will connect to Core Preserve C-1. It is anticipated that Linkage Preserve L-2 will be bordered by urban development with full buildout of the UDA. Linkage Preserve L-2 will be approximately 158 acres and will mostly consist of Valley Grassland, Stream/Creek VPIH, Vernal Pools, and Swales. The primary purpose of Linkage Preserve L-2 will be to facilitate wildlife movement in the northeastern portion of the Plan Area and to maintain a hydrological connection of an unnamed stream between Core Preserve C-1 and existing preserves and SSHCP Preserves located south of the UDA. Although focused species surveys have not been conducted in Linkage Preserve L-2, it is likely to support vernal pool fairy shrimp and possibly vernal pool tadpole shrimp. Linkage Preserve L-2 will also be designed to maintain the hydrology of wetlands contained within Linkage Preserve L-2 by incorporating the Avoidance and Minimization Measures described in Chapter 5. Because Linkage Preserve L-2 is expected to be crossed by roads, additional design features and Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained.

Linkage Preserve L-3 (Heritage Falls Linkage) will be a criteria-based linkage approximately 2 miles long, designed to connect the northern end of Core Preserve C-1 to the eastern portion of Satellite Preserve S-1. Linkage Preserve L-3 will run east approximately 1 mile from Satellite Preserve S-1, north of a mining operation, then trend south approximately 1 mile to Core Preserve C-1. It is anticipated that Linkage Preserve L-3 will be bordered by urban development at full buildout of the UDA. Linkage Preserve L-3 will be approximately 272 acres mostly consisting of Valley Grassland, Vernal Pools, and smaller areas of Swale. The primary purpose of Linkage Preserve L-3 is to facilitate wildlife movement between Core Preserve C-1 and Satellite Preserve S-1. Although focused surveys have not been conducted in Linkage Preserve L-3, it is likely to support vernal pool fairy shrimp and possibly vernal pool tadpole shrimp. At a minimum, Linkage Preserve L-3 will need to cross Grant Line Road, so Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained (see Chapter 5).

Linkage Preserve L-4 (Sunrise Douglas Linkage) will be a criteria-based linkage approximately 1 mile long designed to connect Core Preserve C-1 with an existing preserve located just south of Douglas Road. Linkage Preserve L-4 will generally be bordered on the west by existing development, and it is anticipated that Linkage Preserve L-4 will be bordered by additional urban development with full buildout of the UDA. Linkage Preserve L-4 will be approximately 102 acres largely consist of Valley Grassland, Vernal Pools, Swales, and Stream/Creek (VPIH). The primary purpose of Linkage Preserve L-4 is to facilitate wildlife movement and maintain the hydrological connection of an unnamed stream that runs between Core Preserve C-1 and an existing preserve south of Douglas Road. Linkage Preserve L-4 contains documented occurrences of vernal pool tadpole shrimp and possibly also supports vernal pool fairy shrimp. Because Linkage Preserve L-4 will connect to Core Preserve C-1 at Grant Line Road on the east and to an existing preserve at Douglas Road on the south, Avoidance and Minimization Measures will be employed at the unnamed stream to ensure that habitat linkage functions are maintained (see Chapter 5).

Linkage Preserve L-7 (Sun Creek Linkage) will be approximately 1.3 miles long and designed to connect Minor Preserve M-1 to Satellite Preserve S-4. Linkage Preserve L-7 will be bordered by urban development with full buildout of the UDA. Linkage Preserve L-7 will be approximately 92 acres mostly consisting of Valley Grassland, Vernal Pools, Swales, and Stream/Creek (VPIH). The primary purpose of Linkage Preserve L-7 is to facilitate wildlife movement and maintain a hydrological connection of an unnamed stream between Minor Preserve M-1 and Satellite Preserve S-4. Although focused surveys have not been conducted in this linkage area, it is likely to support vernal pool fairy shrimp, western spadefoot, and possibly vernal pool tadpole shrimp. Linkage Preserve L-7 will be crossed by several roads. Therefore, additional design features and Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained (see Chapter 5).

Linkage Preserve L-8 (Rio Del Oro Linkage) will be a criteria-based linkage approximately 0.4 mile long designed to connect Satellite Preserve S-1 to an existing preserve to the west. Linkage Preserve L-8 will be adjacent to existing development on the south and it is anticipated that Linkage Preserve L-8 will be bordered by additional urban development with full buildout of the UDA. Linkage Preserve L-8 will be approximately 27 acres largely consisting of Valley Grassland, Vernal Pools, Swales, Stream/Creek (VPIH), and Open Water. The primary purpose of Linkage Preserve L-8 is to facilitate wildlife movement and maintain a hydrological connection of an unnamed stream between Satellite Preserve S-1 and an existing preserve. Although focused surveys have not been conducted in the Linkage Preserve L-8 area, it is expected to support vernal pool fairy shrimp and possibly vernal pool tadpole shrimp. Linkage Preserve L-8 will likely be crossed by roadways. Therefore, additional design features and Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained (see Chapter 5).

Linkage Preserve L-9 will be approximately 1.5 miles long designed to connect Minor Preserve M-2 and Minor Preserve M-3. Linkage L-9 will be approximately 42 acres mostly consisting of Valley Grassland, Vernal Pools, Swales, and Stream/Creek (VPIH). Linkage Preserve L-9 will consist primarily of criteria-based Preserve, but will also include a small amount of Hardline Preserve. Linkage L-9 generally will be located in the west, north, and east corners of Jackson Road and Grant Line Road. The primary purpose of Linkage Preserve L-9 is to facilitate wildlife movement and maintain the hydrological connection of an unnamed stream between Minor Preserve M-2 and Minor Preserve M-3. Although focused surveys have not been conducted in the Linkage Preserve L-9 area, it is expected to support vernal pool fairy shrimp and possibly vernal pool tadpole shrimp. Linkage Preserve L-9 will be crossed by Grant Line Road and Jackson Road. Therefore, additional design features and Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained (see Chapter 5).

Laguna Creek Wildlife Movement Corridor

The Laguna Creek Wildlife Movement Corridor in PPU 1 will be designed to connect Minor Preserve M-1 in the east to Minor Preserve M-3 and existing preserve in PPU 3 to the west. The Laguna Creek Wildlife Movement Corridor extends approximately 3 miles through PPU 1 between the western boundary of PPU 1 to Minor Preserve M-1. The westernmost segment of the Laguna Creek Wildlife Movement Corridor will be located between the PPU 1 western boundary and Sunrise Boulevard, where it will connect to the northwest corner of Minor Preserve M-3. It will extend north of Jackson Road east of and parallel to Sunrise Boulevard approximately 0.4 mile, where it will then trend east and northeast for approximately 2.2 miles to connect with Minor Preserve M-1. Along the east-northeast segment, it will connect Satellite Preserves S-3, S-4, and S-5. The Laguna Creek Wildlife Movement Corridor in PPU 1 will comprise mostly Valley Grassland, Open Water, and Cropland, but will also include smaller areas of Stream/Creek, Freshwater Marsh, Vernal Pool, and Swale. The Laguna Creek Wildlife

Movement Corridor in PPU 1 supports documented occurrences of vernal pool tadpole shrimp and legenere, and provides modeled habitat for Covered Species such as vernal pool fairy shrimp and western pond turtle.

The Laguna Creek Wildlife Movement Corridor within PPU 1 is approximately 192 acres.

Cosumnes River/Deer Creek Wildlife Movement Corridor

Approximately 69 acres of the Cosumnes River/Deer Creek Wildlife Movement Corridor crosses through PPU 1 in the UDA. This is part of the broad 1-mile long Corridor in PPU 5 that borders the UDA. This part of the Corridor is composed of almost all Valley Grassland in the Vernal Pool Ecosystem.

7.5.1.2 PPU 2

PPU 2 encompasses approximately 9,271 acres located in the northern portion of the Plan Area (see Figure 7-3). PPU 2 is bordered on the north by U.S. Highway 50, on the east by Sunrise Boulevard, on the south by Jackson Highway, and on the west by Bradshaw Road. A substantial portion of PPU 2 is already developed, including Mather Field and urban development directly north and southeast of Mather Field Airport. PPU 2 supports 3,180 acres of High-Density Development, 239 acres of Low-Density Development, 181 acres of Major Roads, and 1,426 acres of Disturbed land covers, which together account for 54% of the total land cover in PPU 2. The co-dominant land cover in PPU 2 is Valley Grassland, comprising 3,589 acres of PPU 2. PPU 2 also contains 36 acres of Open Water, Stream/Creek, and Freshwater Marsh (combined), and 70 acres of Vernal Pool. It is anticipated that a majority of PPU 2 will eventually be urbanized.

PPU 2 contains documented occurrences for many of the Covered Species, notably the only Ahart's dwarf rush documented occurrence in the Plan Area (Figure 3-3) and occurrences for vernal pool invertebrates such as vernal pool fairy shrimp (34 occurrences) and vernal pool tadpole shrimp (97 occurrences), but the occurrence numbers are smaller than in PPUs 1 and 3. All of the bird Covered Species have been documented in PPU 2 except greater sandhill crane.

Overview of Conservation Strategy for PPU 2

Approximately 584 total acres in PPU 2 will be preserved in the SSHCP Preserve System (Table 7-5). All of the SSHCP Preserves in PPU 2 will be connected. Core Preserve C-2 will connect to the existing Mather Field Preserve to enhance Preserve value. SSHCP Preserves in PPU 2 will also be directly connected to existing preserves within PPU 2, and in PPU 3 (Vernal Pool Prairie Preserve) to the south by Linkage Preserve L-5 (Jackson Linkage). This Preserve System connectivity in PPU 2 will, therefore, contribute to achieving Objective L2 (Table 7-1).

Core Preserve

The Preserve System in PPU 2 includes a new Core Preserve (Core Preserve C-2) of approximately 522 acres (Figure 7-3). Although this Preserve is not large enough to be considered a Core Preserve by itself, the Conservation Strategy treats Core Preserve C-2 as a Core Preserve because it will connect with the existing 1,270-acre Mather Field Preserve along its southern boundary to form a single large Core Preserve.

The eastern boundary of Core Preserve C-2 will generally be at Eagles Nest Road, an existing obstacle to species movement and dispersal and that eliminates hydrological connections via overland surface flow from wetland resources to the east. Further, most of the wetland resources east of Eagles Nest Road are largely degraded by overburden that was deposited during construction of Folsom South Canal or from agricultural and urban land uses; therefore, they are not targeted for preservation in this Plan. However, one area east of Eagles Nest Road supports high-quality vernal pool resources that warrant protection. This area contains high-density vernal pool complexes and is considered likely to contain covered vernal pool species. The southeastern portion of Core Preserve C-2 will preserve these resources. At full buildout of the UDA, a majority of the land east of Core Preserve C-2 will likely be residential, commercial, and/or quasi-public land use.

The southern boundary of Core Preserve C-2 will be approximately 0.5 mile north of Jackson Highway. The area between the southern boundary of Core Preserve C-2 and Jackson Highway supports vernal pools, but these are disturbed, not abundant, and fragmented by existing small-lot agricultural-residential land uses. Although Core Preserve C-2 will protect the hydrology of vernal pool complexes within the Preserve, achieving a functional hydrological connection to the existing preserve south of Jackson Road via the agricultural-residential parcels will be difficult. Many of the drainages have been bermed, redirected, or developed, or simply do not drain to the existing preserve to the south. Such land uses typically have lower preservation value as core habitat and lower potential for cost-effective remediation because the landscape is disturbed and fragmented. Future land uses south of Core Preserve C-2 may remain agricultural-residential or could become residential or commercial development at full buildout of the UDA. However, as described below, a habitat linkage (Linkage 5) will be established to connect Core Preserve C-2 with the existing preserve south of Jackson Highway.

The western boundary of Core Preserve C-2 is generally bordered by currently undeveloped land and small-lot agricultural-residential land uses, but it is anticipated that land uses west of Core Preserve C-2 will eventually be residential and commercial development at full buildout of the UDA. Areas west of Core Preserve C-2 are at a lower elevation than the interior of Core Preserve C-2 where the vernal pools are located. This will ensure that the sub-watersheds and

hydrology of protected vernal pool complexes within Core Preserve C-2 remain undisturbed by any development-related changes in hydrology and drainage that may occur west of the Preserve edge (e.g., runoff from developed areas will naturally drain away from the wetland resources in Core Preserve C-2).

Core Preserve C-2 largely consists of vernal pool invertebrate habitat (Vernal Pool, Swale, Stream/Creek (VPIH), and Valley Grassland). Protected vernal pools occur on the Laguna landform, Modesto Upper Unit Formation, Riverbank Middle Unit Formation, and South Fork Gravel Formation (Chapter 4).

Documented occurrences of Covered Species at the existing Mather Field Preserve include vernal pool tadpole shrimp, vernal pool fairy shrimp, mid-valley fairy shrimp, legenere, and burrowing owl (*Athene cunicularia*). These and several other Covered Species also have potential to occur in the Core Preserve C-2, based on the presence of modeled habitat.

Kiefer Boulevard currently separates the existing Mather Field Preserve from Core Preserve C-2 to the south. To minimize fragmentation and maintain connectivity of Core Preserve C-2 with Mather Field Preserve, and to reduce the chance of road kill in the area, a grade separation and road crossing at Morrison Creek will be constructed to the specifications outlined in the Avoidance and Minimization Measures discussed in Chapter 5. These Avoidance and Minimization Measures will facilitate movement of wildlife and maintain hydrological connectivity between Mather Field Preserve and Core Preserve C-2.

Linkage Preserves

Two hardline Linkage Preserves totaling approximately 62 acres will be established in PPU 2. Linkage Preserve L-5 will consist of approximately 23.4 acres in a north–south linkage between Core Preserve C-2 and the existing Vernal Pool Prairie Preserve south of Jackson Road in PPU 3. Linkage Preserve L-10 will consist of approximately 38.6 acres connecting existing preserves in PPUs 1 and 3.

Linkage Preserve L-5 (Jackson Linkage) will be approximately 0.5 mile long and designed to connect Core Preserve C-2 in the north to the existing preserve in the south. It is anticipated that Linkage Preserve L-5 will be bordered by urban development on the east and west, but it is possible that the area could remain agricultural-residential. Linkage Preserve L-5 will be approximately 23 acres consisting of Valley Grassland, Vernal Pools, and smaller areas of Swale and Stream/Creek (VPIH). The primary purpose of Linkage Preserve L-5 is to facilitate wildlife movement between Core Preserve C-2 and the existing preserve in the north and the existing preserve in the south. Although focused surveys have not been conducted, Linkage Preserve L-5 is likely to support vernal pool fairy shrimp and possibly vernal pool tadpole shrimp. Linkage

Preserve L-5 will be designed to maintain the hydrology of wetlands contained within the linkage by incorporating the Avoidance and Minimization Measures described in Chapter 5. Linkage Preserve L-5 will be crossed by Jackson Highway where it connects to the existing preserve in PPU 3 and possibly crossed by other new roads. Because Linkage Preserve L-5 will be crossed by roads, additional design features and Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained.

Linkage Preserve L-10 will be an approximately 39-acre Linkage Preserve that will generally run along the Frye Creek tributary to Laguna Creek approximately 1.5 miles southwest from Sunrise Boulevard, where it will connect to Satellite Preserve S-5 and existing preserve at Eagles Nest Road at the extreme northeast corner of an existing preserve in PPU 2/PPU 3. Linkage Preserve L-10 will consist of Valley Grassland, Cropland, and small areas of Open Water, Stream/Creek (VPIH), Seasonal Wetland, and Swale.

7.5.1.3 PPU 3

PPU 3 encompasses 14,303 acres located in the northwestern portion of the Plan Area (see Figure 7-3). PPU 3 is bordered by Jackson Highway on the north, Sunrise Boulevard on the east, Deer Creek and the Cosumnes River floodplain boundary on the south, the Central California Traction railroad line on the southwest, and Bradshaw Road on the west. The dominant land cover in PPU 3 is Valley Grassland, which comprises 7,072 acres (49%). PPU 3 supports substantial urban development in the southwestern portion; High- and Low-Density Development together totals 2,168 acres, or 15% of PPU 3. PPU 3 also contains substantial agriculture (Cropland, Irrigated Pasture-Grassland, Orchard, and Vineyard) totaling 3,410 acres, or 24% of PPU 3. Other natural land covers with substantial acreage in PPU 3 are Open Water, Stream/Creek (VPIH), and Freshwater Marsh, which together total 246 acres, and Vernal Pool and Swale, which together total 508 acres.

PPU 3 contains documented occurrences for many of the Covered Species, notably three of the slender Orcutt grass documented occurrences in the Plan Area, a substantial number of occurrences for vernal pool tadpole shrimp and vernal pool fairy shrimp, and all of the bird Covered Species except ferruginous hawk and greater sandhill crane (Figures 3-20 through 3-28). Occurrences of tricolored blackbird (*Agelaius tricolor*) are especially numerous in PPU 3, with 49 occurrences (19% of the total occurrences in the Plan Area).

Overview of Conservation Strategy for PPU 3

Approximately 1,815 acres in PPU 3 will be preserved under the SSHCP (Table 7-5). The Preserve design focus for PPU 3 is to connect two large existing preserves: the 1,160 acres of existing preserve in the north portion of PPU 3 and the 560 acres of existing preserve in the

central portion. This is accomplished by establishing a new Core Preserve (Core Preserve C-3), which will total approximately 1,046 acres. By linking preserves within PPU 3 and linking to other preserves in PPUs 2 and 4, the Preserve System in PPU 3 is consistent with the principle of establishing habitat linkages among Preserves and will contribute to achieving Objective L2 (Table 7-1).

Core Preserve

In PPU 3, a new Core Preserve (Core Preserve C-3) will total approximately 1,046 acres, all which will be criteria-based Preserve. Core Preserve C-3 will consist of five discrete areas located adjacent to existing preserves in a spatial configuration to fill in gaps between existing preserves. An approximately 770-acre area of Core Preserve C-3 will connect two large existing preserves and will be located between Florin Road on the north, Gerber Road on the south, and between Excelsior Road on the west and Eagles Nest Road on the east. The southwestern portion of this 770-acre Core Preserve C-3 area will include Laguna Creek.

The eastern and southern boundaries of Core Preserve C-3 generally connect to an existing preserve. The boundaries of Core Preserve C-3 will generally follow property lines that capture whole parcels supporting high-density wetland resources. Most of the areas immediately east of the Core Preserve C-3 boundary support agricultural uses and completely lack wetland resources. At full buildout of the UDA, the entire eastern border of Core Preserve C-3 may be adjacent to residential and commercial development, but could also remain in agriculture or be restored, as noted below.

The western boundary of Core Preserve C-3 in PPU 3 is generally defined by Excelsior Road. Wetland resources west of Excelsior Road tend to be scattered on small agricultural-residential parcels ranging in size from several acres to 30 acres. The value of remaining wetlands west of Excelsior Road is compromised by patches of existing development, which usually results in altered wetland hydrology and fragmented habitats. The western boundary of Core Preserve C-3 will likely be bordered by commercial and residential development at full buildout of the UDA, except for the Laguna Creek Wildlife Movement Corridor that trends to the southwest from Core Preserve C-3.

The approximately 1,046 acres of Core Preserve C-3 will mostly consist of Valley Grassland, Vernal Pool, and Swales. Vernal Pools occur on the Laguna and Riverbank Undivided land formations. Smaller acreages (i.e., less than 20 acres each) of other land covers in Core Preserve C-3 will include Blue Oak Savanna, Freshwater Marsh, Riparian, Open Water, and Stream/Creek. Core Preserve C-3 supports documented occurrences and modeled habitat for a number of Covered Species, including documented occurrences for vernal pool fairy shrimp,

burrowing owl, loggerhead shrike (*Lanius ludovicianus*), northern harrier (*Circus cyaneus*), legenere, and slender Orcutt grass.

The hydrological flow across Core Preserve C-3 is generally from the northeast to the southwest. The area to the north of Core Preserve C-3 is hydrologically disconnected from the area to the south of Core Preserve C-3, except where Frye Creek and an unnamed drainage currently convey water from north to south via small pipe culverts. However, the wetland complexes within Core Preserve C-3 are largely intact and connected where pools at lower elevations receive water from pools at higher elevations. The Core Preserve C-3 boundaries will be established to ensure that sub-watersheds for preserved wetland resources are left intact and are capable of maintaining the natural hydrologic regime for those protected resources.

Water that enters Core Preserve C-3 from off-site areas primarily is collected via several drainages and swales that drain into Laguna Creek, which conveys water through the southern portion of Core Preserve C-3 from the northeast to the southwest.

Several properties adjacent to Core Preserve C-3 have habitat restoration potential. These properties are currently in agricultural production but, according to the property owners, have never been deep ripped (which will prevent vernal pool restoration because deep ripping disrupts the clay hardpan soil required to form vernal pools). Historical and current aerial photography reveal faint outlines of past vernal pool wetland signatures that could potentially be restored on these properties. If the vernal pool complexes on these properties are restored and added to Core Preserve C-3, they could add substantial suitable habitat for Covered Species and common species to the Preserve System.

Core Preserve C-3 will be bisected by Florin Road. A grade separation and road crossing where Frye Creek crosses Florin Road will be established to reduce habitat fragmentation, maintain connectivity within Core Preserve C-3, and minimize road kill (see Figure 5-10).

Satellite Preserves

Two Satellite Preserves will be established in PPU 3: Satellite Preserves S-7 and S-9.

Satellite Preserve S-7 will be a criteria-based Preserve adjacent to an existing preserve and generally located south of Florin Road and east of Eagles Nest Road. Satellite Preserve S-7 will be approximately 91 acres consisting mostly of Valley Grassland and Vernal Pool habitat. Satellite Preserve S-7 is primarily designed to protect a documented occurrence of tricolored blackbird and wetland resources. The site's hydrology currently is artificially impounded on the south by berms, creating large marsh areas that are suitable for tricolored blackbird nesting colonies. The eastern portion of Satellite Preserve S-7 connects directly to Laguna Creek, which

runs north–south in this area. Satellite Preserve S-7 is also adjacent to a potential vernal pool re-establishment/establishment site. If the re-establishment/establishment site is acceptable and the landowner agrees to protect the property as a vernal pool re-establishment/establishment site, that site will connect Satellite Preserve S-7 directly to Core Preserve C-3.

Satellite Preserve S-9 will be a criteria-based Preserve located southeast of the Laguna Creek Wildlife Movement Corridor and west of Excelsior Road. Satellite Preserve S-9 will be approximately 31 acres consisting mostly of Valley Grassland, Swale and Vernal Pool. The northwestern portion of Satellite Preserve S-9 will connect directly to Laguna Creek, which runs northeast–southwest in this area. The northeastern portion of Satellite Preserve S-9 will be diagonal from Core Preserve C-3, separated by Excelsior Road. Therefore, additional design features and Avoidance and Minimization Measures will be employed to ensure that habitat linkage functions are maintained (see AMM ROAD-2 and Figure 5-10).

Laguna Creek Wildlife Movement Corridor

Laguna Creek Wildlife Movement Corridor will connect south from Satellite Preserve S-7, trending due south approximately 0.75 mile to Gerber Road, where it will then trend due west for approximately 1 mile and connect to Core Preserve C-3 and an existing preserve. Within Core Preserve C-3 and the existing preserve, Laguna Creek trends southwest and exits an existing preserve at Excelsior Road, where it is again designated the Laguna Creek Wildlife Movement Corridor. It trends west–southwest approximately 2 miles as the Laguna Creek Wildlife Movement Corridor and existing preserve where it is bordered on both sides by the Wildhawk, Silver Springs, and Emerald Creek residential developments until it exits PPU 3 at the railroad line just east of Carmencita Avenue, where it continues southwest within the UDA but outside the PPUs. The minimum width of both the Laguna Creek Wildlife Movement Corridor and existing preserve between the residential developments is currently approximately 400 feet.

The Laguna Creek Wildlife Movement Corridor within PPU 3 is approximately 250 acres.

Linkage Preserves

An approximately 179-acre Linkage Preserve L-6 will connect to the Laguna Creek Wildlife Movement Corridor on the south where it exits Core Preserve C-3 at Excelsior Road. This parcel will add a setback between Laguna Creek and the Silver Springs and Dierks Ranch developments south of the creek.

7.5.1.4 PPU 4

PPU 4 encompasses 5,253 acres located in isolated areas in the northwestern portion of the Plan Area (see Figure 7-4). PPU 4 is generally bordered by the Sacramento City limits on the north,

Highway 99 on the east, Eschinger Road on the south, and Interstate 5 (I-5) on the west. Dominant land covers in PPU 4 are Cropland (1,817 acres), Valley Grassland (1,168 acres), and High- and Low-Density Development (1,122 acres combined). PPU 4 contains documented occurrences for many of the Covered Species, most notably two of the total 11 known occurrences for giant gartersnake (generally along Laguna Creek west of Highway 99), and occurrences for all of the covered bird species, including 17 occurrences for Swainson's hawk (Figure 3-25). Otherwise PPU 4 does not support large occurrence concentrations for any other particular species.

Overview of Conservation Strategy for PPU 4

Approximately 527 acres will be preserved in PPU 4 (Table 7-5).

Preserves in PPU 4 will focus primarily on preservation of Valley Grassland and Freshwater Marsh. These Preserves will connect to Preserves inside the UDA to the east of PPU 4, and will also connect to Cropland Preserve in PPU 6 to the south outside the UDA.

7.5.1.5 PPU 8

PPU 8 encompasses 7,133 acres located in the southern portion of the Plan Area, mostly within the city limits of Galt and Galt's sphere of influence (see Figures 7-4 and 7-5). PPU 8 is bordered by the northern boundary of Galt's sphere of influence on the north, Cherokee Lane on the east, Dry Creek on the south, and Sargent Avenue on the west. The dominant land cover in PPU 8 is Cropland, which occupies 1,773 acres (25%). PPU 8 also includes 986 acres of High-Density Development, 991 acres of Low-Density Development, 1,097 acres of Irrigated Pasture-Grassland, and 1,488 acres of Valley Grassland. Because the majority of PPU 8 is located within Galt's city limits or sphere of influence, it is anticipated that much of PPU 8 will eventually be urbanized.

PPU 8 contains documented occurrences of several Covered Species, including five occurrences of greater sandhill crane, 19 of Swainson's hawk, and a single occurrence of western red bat; otherwise, PPU 8 does not support occurrence concentrations of any particular species (Figures 3-3 through 3-30).

Overview of Conservation Strategy for PPU 8

The Preserve System in PPU 8 is limited to Cropland Preserve located in the northwest of the PPU and in the south of the PPU along Dry Creek. Preservation in PPU 8 focuses on high-value Swainson's hawk foraging habitat. This PPU also includes a greater sandhill crane roosting pond (Figure 3-22).

Cropland Preserve

PPU 8 will include 415 acres of Cropland Preserve composed mostly of Cropland and Irrigated Pasture-Grassland. Preservation will also include Valley Grassland, Seasonal Wetland, Swale, and Vernal Pool.

7.5.1.6 Outside PPUs

Laguna Creek Wildlife Movement Corridor Preserve

Laguna Creek runs west from PPU 3 southwest toward Elk Grove. Undeveloped lands and low-density residential occur along and immediately adjacent to the creek, but the area is urbanizing and beginning to develop the lands adjacent to the creek. An 82-acre portion of the Laguna Creek Wildlife Movement Corridor Preserve that is a criteria-based Preserve will extend southwest approximately 1.8 miles to Calvine Road.

7.5.2 Preserve System Outside the UDA by PPU

Table 7-6 provides a summary of the Preserve System outside the UDA by PPU, each of which is described in more detail in the following subsections. Preserve design outside the UDA is less constrained than in the UDA because it generally comprises rural land uses and large, undeveloped parcels. Therefore, the precise locations of SSHCP Preserves outside the UDA are less certain and are described with less detail than the Preserve System inside the UDA. Further, Covered Activities outside the UDA will have limited areas of effects because they are limited to linear road and infrastructure projects (Sections 5.2.3 and 5.2.4) and Preserve management activities (Section 5.2.7). Preserve design outside the UDA will also be guided by the Biological Goals and Measurable Objectives and the Conservation Actions in Table 7-1. As discussed in Chapter 9, SSHCP Preserve acquisitions proposed by the Implementing Entity will be reviewed and approved by the Permitting Agencies.

Table 7-6
Preservation of Natural Land Cover Types in the
Preserve System by PPU Outside the UDA

Land Cover Type	SSHCP Preserves (acres)					
	PPU 1	*PPU 5*	*PPU 6*	*PPU 7*	*Outside PPUs*	*Total*
Wetland Waters						
Freshwater Marsh	0	0	58	15	0	73
Seasonal Wetland	0	31	30	32	0	93
Swale	3	8	13	162	0	186
Vernal Pool	12	35	28	681	0	756

Table 7-6
Preservation of Natural Land Cover Types in the Preserve System by PPU Outside the UDA

Land Cover Type	SSHCP Preserves (acres)					
	PPU 1	*PPU 5*	*PPU 6*	*PPU 7*	*Outside PPUs*	*Total*
Non-Wetland Waters						
Open Water	0	6	45	33	0	84
Stream/Creek	0	33	41	14	0	88
Stream/Creek (VPIH)	0	0	0	0	0	0
Riparian						
Mixed Riparian Woodland/Mixed Riparian Scrub	0	440	447	5	0	892
Terrestrial						
Blue Oak Woodland/Blue Oak Savanna	0	0	0	47	0	47
Cropland/ Irrigated Pasture-Grassland	0	388	8,465	533	0	9,386
Valley Grassland	204	750	623	14,372	0	15,949
Total	**219**	**1,691**	**9,750**	**15,894**	**0**	**27,554**

The following subsections provide more detail for the Preserve System in each of the PPUs outside the UDA. This additional detail includes general descriptions for where criteria-based Preserves should be sited in order to meet the Biological Goals and Measurable Objectives. However, as is the case for the criteria-based preservation inside the UDA, the final spatial configuration of the SSHCP Preserve System outside the UDA may vary somewhat from that described in this section. While the exact Preserve configuration may differ somewhat from the descriptions provided below, the preservation acreages by Preserve category (e.g., Landscape Preserve, Core Preserve, Minor Preserve, etc.) must be achieved. Some shifting of Preserve acreages across PPUs that are located outside of the UDA and shifting of Preserve acres outside of the UDA to area within the UDA are allowable. To ensure that Preserve heterogeneity is maintained throughout the Plan Area, not more that 15% of the total Preserve acreage identified within each PPU can be shifted outside of that PPU (see Table 7-6). In addition, no more than 15% of the total Preserve acreage identified outside of the UDA can be shifted to locations inside of the UDA. The following subsections also provide qualitative discussions of Covered Species preservation in each PPU, as appropriate. The full conservation analysis for Covered Species is provided in Section 7.6.2.

7.5.2.1 PPU 1

Although PPU1 is mostly within the UDA, PPU1 also contains 2,156 acres outside the UDA (see Figures 1-1 and 7-3), of which 1,468 acres are Valley Grassland and 531 acres are Disturbed land cover.

Within PPU 1 outside the UDA, approximately 219 acres will be preserved overall (Table 7-6). The focus of the Preserve design for PPU 1 outside the UDA is to maintain connectivity with Linkage Preserve L-2 (Deer Creek Linkage) inside the UDA and to provide connectivity to an existing preserve both within and south of the UDA. This will be accomplished by establishing a Preserve in PPU 1 outside the UDA, which primarily will include Valley Grassland, as well as Vernal Pool Land Covers. Preservation in PPU 1 outside the UDA will contribute to achieving Objective L2 of Goal 1.

7.5.2.2 PPU 5

PPU 5 encompasses approximately 52,534 acres in the central–eastern portion of the Plan Area (see Figures 1-1 and 7-5). PPU 5 is situated between PPU 7 to the south and the UDA to the north (PPUs 1 and 3), and is bordered by the County line to the east. The dominant land cover in PPU 5 is Valley Grassland (27,463 acres). Blue Oak Woodland and Savanna (6,556 acres), agriculture (Cropland, Irrigated Pasture–Grassland, Orchards, and Vineyards; 8,692 acres), and non-habitat land cover types (Aqueducts, Disturbed, High-Density Development, Low-Density Development, Major Roads, Mine Tailing, Recreation/Landscaped; 6,542 acres) also comprise substantial areas of PPU 5. PPU 5 also has substantial acres of riparian land cover (Mine Tailing Riparian Woodland, Mixed Riparian Scrub, and Mixed Riparian Woodland; 1,401 acres), Seasonal Wetland (446 acres), Stream/Creek (481 acres), Open Water (365 acres), Vernal Pool (339 acres), and Freshwater Marsh (159 acres).

PPU 5 contains documented occurrences for many of the Covered Species (Figures 3-3 through 3-30), most notably virtually all of the documented occurrences for valley elderberry longhorn beetle (154 of 156) clustered in a reach of the Cosumnes River extending approximately 1.6 miles west of Jackson Road. All of the covered bird species have been documented in PPU 5, except for greater sandhill crane.

Overview of Conservation Strategy for PPU 5

Approximately 1,691 acres in PPU 5 will be preserved by the SSHCP (Table 7-6). The Preserve design focus in PPU 5 is primarily to provide habitat linkages among Preserves both outside and inside the UDA, primarily along the Cosumnes River/Deer Creek Corridor. All Preserves in PPU 5 will be criteria-based Preserve. PPU 5 also includes the vast majority of documented occurrences for valley elderberry longhorn beetle in the Plan Area, which is sensitive to habitat fragmentation.

Cosumnes River/Deer Creek Wildlife Movement Corridor

Approximately 1,482 acres will be preserved in PPU 5 in the Cosumnes River/Deer Creek Wildlife Movement Corridor. Valley Grassland and Mixed Riparian Woodland are co-dominant in the portion of the corridor in PPU 5, with some Vernal Pool. Other land covers in the Cosumnes River/Deer Creek Corridor in PPU 5 include Stream/Creek, Cropland, and Mixed Riparian Scrub. Because it is outside the UDA, this corridor has no defined width, but will provide habitat connectivity and a movement corridor. The Permittees estimate that this corridor will be up to 17 miles in length within PPU 5.

Linkage Preserves

Linkage Preserve L-6 will connect the Laguna Creek Wildlife Movement Corridor Preserve from the northwest in PPU 3 to the Cosumnes River/Deer Creek Wildlife Movement Corridor Preserve in PPU 5. Linkage Preserve L-6 will be mostly Valley Grassland . Linkage Preserve L-11 will connect Cosumnes River/Deer Creek Wildlife Movement Corridor to the large Landscape Preserve in PPU 7 to the southeast. The majority of Linkage Preserve L-11 will also be Valley Grassland, but may also include substantial areas of Cropland and Seasonal Wetland.

7.5.2.3 PPU 6

PPU 6 encompasses 95,196 acres outside the UDA in the southwestern portion of the Plan Area. PPU 6 is bisected by I-5. It is bordered on the west by the Sacramento River, on the south by the Mokelumne River, and by Dry Creek (Figures 1-1 and 7-4). The dominant land covers in PPU 6 are Agriculture (58,458 acres) and Valley Grassland (17,633 acres). PPU 6 contains 3,436 acres of Low-Density Development. Notably, PPU 6 contains much of the aquatic and riparian resources in the Plan Area, including 5,048 acres of non-vernal pool aquatic land cover types (Freshwater Marsh, Open Water, and Stream/Creek), which is 69% of these aquatic land covers in the Plan Area outside the UDA and 60% of these aquatic land covers in the entire Plan Area. The 5,097 acres of riparian land covers (Mine Tailing Riparian Woodland, Mixed Riparian Scrub, Mixed Riparian Woodland) in PPU 6 account for 70% of the riparian land cover in the Plan Area outside the UDA and 52% of the riparian land covers in the entire Plan Area. Finally, Vernal Pool and Swale cover 1,068 acres in PPU 6.

Reflecting its large size, substantial riparian, aquatic, valley grassland, and agricultural habitats, and relative lack of development, PPU 6 contains documented occurrences for many of the Covered Species (Figures 3-3 through 3-30). PPU 6 is the most important PPU for the covered bird species. All of the covered birds have been documented in PPU 6, including 281 (71%) occurrences for Swainson's hawk, 190 (92%) occurrences for greater sandhill crane, and 55% or more of the occurrences for northern harrier and white-tailed kite. In addition, PPU 6 includes 8

of the 10 occurrences of dwarf downingia in the Plan Area, 15 of the 53 occurrences of legenere, and 41 of the 62 occurrences of Sanford's arrowhead.

Overview of Conservation Strategy in PPU 6

Approximately 9,750 acres will be preserved in PPU 6 (Table 7-6). The Preserve design focus is preserving existing agricultural lands that provide habitat for several of the broad-ranging Covered Species, most notably Swainson's hawk (see Objectives SH1, SH2, SH5 in Table 7-1) and greater sandhill crane (see Objectives GS2, GS4, and GS6 in Table 7-1).

Cropland Preserve

The SSHCP will establish approximately 8,465 acres of Cropland Preserve in PPU 6, consisting mostly of Cropland and Irrigated Pasture–Grassland land cover types. Other natural land covers are also present in this Cropland Preserve, but these agricultural lands will be preserved and managed primarily for the benefit of Covered Species that forage in row crops, and will generally be adjacent to existing cropland preserve.

Cosumnes River/Deer Creek Wildlife Movement Corridor

Approximately 812 acres of the Cosumnes River/Deer Creek Wildlife Movement Corridor will be preserved within PPU 6, connecting to the Preserves within PPU 5. The corridor will connect where it exits PPU 3 on the northeast corner of PPU 6. The portion of the corridor in PPU 6 is composed mostly of Mixed Riparian Woodland and Agricultural lands.

Satellite Preserve

Satellite Preserve S-10, which is mostly located in PPU 4, may also have acreage located in PPU 6. Land covers in this portion of Satellite S-10 will be mostly Cropland, Mixed Riparian Woodland, and Freshwater Marsh.

7.5.2.4 PPU 7

PPU 7 encompasses 90,906 acres in the southeastern portion of the Plan Area (see Figure 7-5). PPU 7 is bordered by PPU 5 on the north, the Sacramento County line and Dry Creek on the south, the county line on the east, and the north–south alignments of Cherokee Lane and Davis Road on the west. The dominant land covers in PPU 7 are Valley Grassland, which comprises 52,278 acres of the PPU, and Agriculture which comprises 20,695 acres (much of it Vineyard in the southern and western portions). Low-Density Development also accounts for 5,306 acres of PPU 7. PPU 7 contains a large proportion of the Blue Oak Woodland and Savanna in the Plan Area, which together comprise 5,861 acres or 40% of the total Blue Oak Woodland and Savanna

in the Plan Area (second only to PPU 5, which contains 6,556 acres of Blue Oak Woodland/Savanna). PPU 7 also contains by far the largest area of Vernal Pool, with 2,221 acres, or 49% of the Vernal Pool in the Plan Area.

Reflecting its large size, substantial valley grassland and vernal pool habitats, and relative lack of development, PPU 7 contains documented occurrences for many of the Covered Species (Figures 3-3 through 3-30). With more than half of the vernal pool acreage in the Plan Area, PPU 7 is extremely important for preservation of vernal pool species and contains 315 of 533 documented occurrences for vernal pool fairy shrimp, all 48 occurrences for pincushion navarretia, all 28 occurrences for California tiger salamander, and 19 of 29 occurrences for western spadefoot in the Plan Area. Further, all of the covered birds except white-tailed kite have been documented in PPU 7.

Overview of Conservation Strategy for PPU 7

Approximately 15,894 acres of the Preserve System will be located in PPU 7. SSHCP Preserves in PPU 7 will include a large Landscape Preserve and Linkage Preserves that will connect to the Cosumnes River/Deer Creek Wildlife Movement Corridor in PPU 5. The Preserve design focus in PPU 7 is landscape-scale preservation of the Vernal Pool Ecosystem, in areas that are adjacent to or near existing preserves, including the 12,500-acre Chance Ranch and other mitigation sites and mitigation banks in the area.

Landscape Preserves

The Landscape Preserve in PPU 7 must be at least 10,500 acres in size and will be located strategically to connect with existing preserves. The vast majority of this Landscape Preserve will be Valley Grassland. This Landscape Preserve will also contain Vernal Pool, Swale, Stream/Creek, Seasonal Wetland, and other land covers.

Linkage Preserves

A 314-acre portion of Preserve Linkage L-11 will cross over from PPU 5 into PPU 7. This segment completes the connection between the Cosumnes River/Deer Creek Wildlife Movement Corridor in PPU 5 and the large Landscape Preserve in PPU 7. This segment of Linkage Preserve L-11 is composed almost entirely of Valley Grassland, with some Vernal Pool.

7.5.3 Preserve Connectivity

Core and Minor Preserves established by the SSHCP will be connected by Linkage Preserves to other SSHCP Preserves and existing preserves within the Plan Area. SSHCP Linkage Preserves will be designed to maintain connectivity among the preserves, providing for wildlife movement and, in many cases, hydrologic connections between preserves (see Objective L2 in Table 7-1). The ultimate

size and dimensions of the Linkage Preserves (i.e., width and length) will depend on several factors, including habitat types in the linkage, the ecological function (or functions) the linkage is designed to serve (e.g., overland wildlife movement, drainage), and adjacent land uses.

The three Core Preserves inside the UDA (Section 7.5.1) will be linked by minimum 600-foot-wide Linkage Preserves (see Objective L2 in Table 7-1). These Linkage Preserves will follow stream channels, where possible, to maintain hydrologic connectivity. In addition to linking the three Core Preserves within the UDA, smaller minor and Satellite Preserves will also be connected for a total of 10 Linkage Preserves in the UDA.

The Landscape Preserve located outside of the UDA in PPU 7 and some Cropland Preserve in PPU 6[6] will also be connected to preserves inside the UDA by linkages, including the Cosumnes River Wildlife Movement Corridor, Preserve L-5, and SSHCP Preserves and existing preserves connecting PPU 5 to PPU 1.

All Linkage Preserves will meet the Landscape Preserve selection criteria listed in Table 7-1. In limited circumstances, a Satellite Preserve may need to be established to protect a species occurrence, and that Preserve may not be able to be connected to other Preserves due to existing and planned development patterns.

Additional connectivity in the Plan Area will be provided by some streams with associated Stream Setbacks that are not part of the SSHCP Preserve System (see AMMs STREAM-1, STREAM-2, and STREAM-3 in Section 5.4). Protection of streams and Stream Setbacks, including those within Linkage Preserves, will help to achieve several Measurable Objectives, including Objectives W1 and W2 (Stream Setbacks) and Objective W3 (design and avoidance measures). These Stream Setbacks are intended to protect water quality but will also facilitate wildlife movement and dispersal of seeds and cysts via wildlife or water flows in the SSHCP Preserve System.

7.5.4 Studies Required by SSHCP Biological Goals and Measurable Objectives

Several of the measurable objectives listed in Table 7-1 require that the Implementing Entity conduct discrete studies to determine how AMMs should be implemented, or to better understand the ecology of Covered Species in the Plan Area (Table 7-7). These studies are different from the special studies that will help the Implementing Entity to monitor effectiveness of the Conservation Strategy (Section 8.3.3.5).

[6] Note that most SSHCP Covered Species that will use cropland preserves are avian species and are capable of flying from one Preserve to the next. Therefore, linkage of agricultural preserves is not essential and may not occur in many instances.

Table 7-7
Studies Required by SSHCP Measurable Objectives

Description of Required Study	Timing for Study
In accordance with Objective CTS3, prepare targeted species mobility studies to determine if California tiger salamander mobility between breeding ponds or between breeding ponds and upland refugia will be affected by Rural Transportation Project Covered Activities within California tiger salamander modeled habitat. Data relevant to determining California tiger salamander movement must be collected for at least 3 years, and the study will be updated through new data collection and consultation with USFWS and CDFW every 10 years. The mobility study methodology will be prepared in consultation with USFWS and CDFW, and will need approval from USFWS and CDFW prior to implementation. The data will be used by the project proponent to select the most appropriate design requirements to maintain and facilitate California tiger salamander movement. Modeled habitat near each of the following roadways will be the subject of targeted species mobility studies for California tiger salamander: • Twin Cities Road east of State Route 99 • Ione Road within PPU 7 • Clay Station Road from Dillard Road south to Sacramento County line with San Joaquin County (Plan Area boundary) After construction is complete, California tiger salamander movement across and along the road will be monitored to assess how their movement changed in response to the project, and if additional design considerations will be used as future projects are implemented along the roadway.	Study initiated within 18 months of SSHCP permit issuance. Study duration at least 3 years, and updated every 10 years.
In accordance with Objective GGS 3, measure hydrologic parameters (flow rate, temperature, timing of flows) within Badger Creek in locations known to be occupied by giant gartersnake. Three monthly hydrologic measurements will be made during the dry season of an average or better rainfall year. Each recording will occur over a full week to identify any regular interruptions in flow or changes in conditions due to diversions or inflows. After determining the baseline hydrologic parameters for occupied giant garter-snake habitat along Badger Creek, identify water sources that could be used to supplement natural and agricultural flows in the future to maintain that hydrology throughout Badger Creek during the summer months when agricultural runoff may wane.	Study initiated within 2 years of SSHCP permit issuance.
In accordance with Objective TB6, conduct study to identify management actions to protect tricolored blackbird colonies from environmental stressors. Stressors to be studied for reduction include nest predation (e.g., coarse netting to reduce nest predation, reducing trees and bushes around colonies to reduce perches for predators, mesopredator trapping). Select one or more existing tricolored blackbird colonies as experimental populations. If a large colony is available, test several potential feasible management actions within that one colony. Experimental treatments will be evaluated as to whether they indicate a measurable and biologically significant decrease in nest predation or increased fledgling success. Treatments will also be evaluated for feasibility,	Study initiated within 2 years of SSHCP permit issuance, and completed within 5 years of SSHCP permit issuance.

7.6 Conservation Analysis

This section describes the beneficial effects of the Conservation Strategy and compares those to the adverse effects described in Chapter 6 to make conclusions about the expected

effectiveness of the Conservation Strategy in achieving the Biological Goals and Measurable Objectives (see Table 7-1).

7.6.1 Natural Land Cover Analysis

This section analyzes the adverse effects of the Covered Activities and the benefits of the SSHCP Conservation Strategy for the SSHCP natural land cover types:

- **Aquatic Natural Land Covers**
  - Vernal Pool Ecosystem
    - Valley Grassland (inside the Vernal Pool Ecosystem)
    - Vernal Pool and Swale
    - Stream/Creek (VPIH)
  - Other Aquatic Natural Land Covers
    - Seasonal Wetland
    - Freshwater Marsh
    - Stream/Creek
    - Open Water
    - Riparian
- **Terrestrial Natural Land Covers**
  - Blue Oak Woodland/Savanna
  - Agriculture[7]

Detailed descriptions for SSHCP natural land covers are provided in Chapter 3.

As described in Section 6.5, indirect impacts to natural land covers were qualitatively analyzed collectively. Qualitatively, permanent indirect effects to natural land covers, including a decrease in habitat functionality and viability, will result from the following environmental stressors in the absence of AMMs: (1) permanent alterations to watershed hydrographs and degradation of water quality; (2) habitat fragmentation; (3) increased risk of wildfire, which can result in increased thatch, and the impacts from fire suppression (i.e., grading); (4) alterations of vernal pool hydrology; (5) increased human activity, which can result in trampling of natural land covers or increased trash and debris; (6) invasive weeds, which can alter the composition and structure of

[7] Agriculture includes Cropland and Irrigated Pasture–Grassland.

natural land covers; and (7) pesticides and fertilizers, which can reduce pollinators or exterminate or weaken species that comprise the habitat. Additionally, temporary construction-related indirect effects (see Section 6.3.2) will result from the following stressors in the absence of AMMs: (1) temporary alterations to hydrographs and degradation of water quality during construction; (2) laydown or trampling of vegetation during construction; (3) construction dust; (4) increased human presence during construction; and (5) construction trash and debris. Indirect permanent impacts to vernal pool, swale, and stream/creek (VPIH) were quantified and are discussed further in Section 7.6.1.1.1.

The conservation analysis for natural land covers is broken down into aquatic (Section 7.6.1.1) and terrestrial natural (Section 7.6.1.2) land covers.

7.6.1.1 Aquatic Natural Land Covers

The conservation analysis for aquatic natural land covers is broken down into those that make up the Vernal Pool Ecosystem (Section 7.6.1.1.1) and other aquatic land covers (Section 7.6.1.1.2).

The Vernal Pool Ecosystem considers the interconnectivity between Swale, Stream/Creek (VPIH), Vernal Pool, and Valley Grassland. Vernal pools cannot persist absent surrounding uplands, and, thus, an ecosystem approach will be used when establishing the SSHCP Preserve System to ensure a properly functioning Vernal Pool Ecosystem. Therefore, the Vernal Pool Ecosystem is discussed separately from other aquatic land covers.

7.6.1.1.1 Vernal Pool Ecosystem

As described in Chapter 3, the Vernal Pool Ecosystem includes the following natural land cover types: Vernal Pool, Swale, Stream/Creek (VPIH), and Valley Grassland that are hydrologically connected. The Vernal Pool Ecosystem in the Plan Area provides the primary constituent elements described in the Federal Critical Habitat (USFWS 2006c) identified for four of the vernal pool SSHCP Covered Species, including slender Orcutt grass, Sacramento Orcutt grass, vernal pool fairy shrimp, and vernal pool tadpole shrimp. The primary constituent elements of these Covered Species are described in Section 3.6. In short, these primary constituent elements include: (1) topographic features within a matrix of uplands that result in continuously, or intermittently, flowing surface water in the depressional features that provide for dispersal and promote hydroperiods of adequate length in the pools for each of four vernal pool SSHCP Covered Species; (2) depressional features that become inundated during winter rains and that continuously hold water for a period long enough to provide adequate water for incubation, maturation, and reproduction for the crustaceans and to promote germination, flowering, and seed production of predominantly annual native wetland species for the grasses; (3) sources of food for the crustaceans; and (4) organic and inorganic materials that provide shelter for the crustaceans.

Indirect impacts to the Vernal Pool Ecosystem were partially quantified; indirect impacts to Vernal Pool, Swale, and Stream/Creek (VPIH) were quantified, but indirect impacts to Valley Grassland were not quantified. In total, approximately 17,259 acres, or 16%, of the 103,210 acres of the Vernal Pool Ecosystem in the Plan Area would be removed or indirectly impacted over the proposed 50-year Permit Term; indirect impacts account for 142 acres of the total impact acreage (Table 7-8a). This includes the following impacts to the Vernal Pool Ecosystem: removal of 16,794 acres (64%) and indirect impacts to 132 acres (0.5%) of the 26,048 acres present inside the UDA; and removal of 322 acres (0.4%) and indirect impacts to 9.5 acres (0.01%) of 77,162 acres present outside the UDA. Permanent indirect effects to natural land covers, include the Vernal Pool Ecosystem, are collectively and qualitatively analyzed in Section 7.6.1.

In total, approximately 8,500 acres of the Vernal Pool Ecosystem in the Mather Core Recovery Area would be removed or indirectly impacted over the proposed 50-year Permit Term; indirect impacts account for 113 acres of the total impact acreage (Table 7-8b). This includes the following impacts to the Vernal Pool Ecosystem: removal of 8,118 acres of Valley Grassland, removal of 144 acres, and indirect impacts to 72 acres of Vernal Pool, removal of 112 acres and indirect impacts to 38 acres of Swale, and removal of 13 acres and indirect impacts of 3 acres of Stream/Creek (VPIH).

Table 7-8a
Permanent Effects and Conservation for the Vernal Pool Ecosystem

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Direct and Indirect Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Plan Area-Wide					
Vernal Pool Ecosystem	**17,117**	**142**	**17,259[a]**	**23,284**	**645**
Valley Grassland[b]	16,472	Qualitative	16,472	22,014	0[c]
Vernal Pool	389	94	483	966	389
Swale	234	44	278	278	256[d]
Stream/Creek (VPIH)	22	4	26	26	0

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[b] Refers to Valley Grassland hydrologically connected to the Vernal Pool Ecosystem.
[c] Valley Grassland may be re-established/established at the same time as re-establishment/establishment of Vernal Pool and Swale to form a complete Vernal Pool Ecosystem. However, much of the 645 acres of re-established/established modeled areas will occur on existing Valley Grassland; thus, it is not possible to identify the amount of Valley Grassland re-established/established under the SSHCP.
[d] Re-establishment/establishment to mitigate effects to Stream/Creek (VPIH) is assumed to be in the form of Swale, which has been added to the 234 acres necessary to mitigate effects to swale. Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool.

Table 7-8b
Permanent Effects and Conservation for the Vernal Pool Ecosystem Within the Mather Core Recovery Area

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Direct and Indirect Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Plan Area-Wide					
Vernal Pool Ecosystem	**8,386**	**114**	**8,500[a]**	**5,493**	**50**
Valley Grassland[b]	8,118	Qualitative	8,118	5,155	0
Vernal Pool	144	72	216	213	50
Swale	112	38	150	90	0
Stream/Creek (VPIH)	13	3	16	26	0

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[b] Refers to Valley Grassland hydrologically connected to the Vernal Pool Ecosystem.

To mitigate 17,259 acres of Covered Activity impacts to the Vernal Pool Ecosystem, the SSHCP preserves 23,284 acres of Vernal Pool Ecosystem, including 966 acres of Vernal Pool, 278 acres of Swale, 26 acres of Stream/Creek (VPIH), and 22,014 acres of hydrologically connected Valley Grassland (Table 7-8a). Of the 23,284 acres of Vernal Pool Ecosystem to be preserved, 5,493 acres of Vernal Pool Ecosystem will be preserved within the Mather Core Recovery Area, including 213 acres of Vernal Pool, 90 acres of Swale, 26 acres of Stream/Creek (VPIH), and 5,155 acres of hydrologically connected Valley Grassland (Table 7-8b). The Conservation Strategy for the Vernal Pool Ecosystem is based on preservation of large assemblages of interconnected Vernal Pool, Swale, and Stream/Creek (VPIH) embedded in Valley Grassland, protecting perched aquifers and maintaining vernal pool hydrology, and maintaining water quality in vernal pool micro-watersheds. Finally, the SSHCP will also re-establish and/or establish components of the Vernal Pool Ecosystem including approximately 389 acres of Vernal Pool and 256 acres of Swale in the form of any combination of Swale or Vernal Pool. Valley Grassland may be re-established/established at the same time as re-establishment/establishment of vernal pools and swales to form a complete Vernal Pool Ecosystem.

Each component or natural land cover comprising the Vernal Pool Ecosystem is described separately below. The Biological Goals and Measurable Objectives applicable to the Vernal Pool Ecosystem are listed in Table 7-9.

Valley Grassland

As discussed in Section 6.5, effects on Valley Grassland hydrologically connected to the Vernal Pool Ecosystem within the Plan Area include direct impacts to 16,471 acres of 97,349 acres in the Plan Area, or 17%. This includes direct impacts to 16,185 acres (66%) of the 24,584 acres present inside the UDA and direct impacts to 286 acres (0.4%) of the 72,765 acres present

outside the UDA. Permanent indirect effects to natural land covers, including Valley Grassland in the Vernal Pool Ecosystem, are qualitatively analyzed in Section 7.6.1.

A total of 22,014 acres of Valley Grassland within the Vernal Pool Ecosystem will be preserved by the SSHCP, including approximately 6,065 acres inside the UDA (Table 7-5) and 15,949 acres outside the UDA (Table 7-6). Also see Section 7.6.1.2, Terrestrial Natural Land Covers, for additional discussion regarding Valley Grasslands.

Vernal Pool

As discussed in Section 6.5, approximately 483 acres, or 11%, of the 4,536 acres of the Vernal Pool in the Plan Area would be removed or indirectly impacted; indirect impacts account for 94 acres of the total impact acreage. More specifically, impacts to Vernal Pool include the removal of 355 acres (38%) and indirect impacts to 85 acres (9%) of the 935 acres present inside the UDA; and removal of 34 acres (0.9%) and indirect impacts to 9 acres (0.2%) of 3,601 acres present outside the UDA.

A total of 995 acres of Vernal Pool will be preserved by the SSHCP, including approximately 210 acres inside the UDA (Table 7-5) and 756 acres outside the UDA (Table 7-6). As discussed in Chapter 3, 1,983 acres of Vernal Pool are already protected in existing preserves in the Plan Area. The Conservation Strategy for the Vernal Pool Ecosystem is based on preservation of large assemblages of vernal pools within the UDA and outside the UDA (primarily in PPU 7),

protecting perched aquifers and maintaining vernal pool hydrology, and maintaining water quality in vernal pool micro-watersheds. Vernal Pool will be re-established and/or established under the SSHCP, including approximately 389 acres with at least 50 acres within or adjacent to the Mather Core Recovery Area.

Swale

As discussed in Section 6.5, approximately 278 acres, or 22%, of the 1,252 acres of Swale in the Plan Area would be removed or indirectly impacted; indirect impacts account for 44 acres of the total impact acreage. More specifically, impacts to Swale include the removal of 232 acres (50%) and indirect impacts to 43 acres (9%) of the 461 acres present inside the UDA; and removal of 2 acres (0.2%) and indirect impacts to 1 acres (0.1%) of 791 acres present outside the UDA.

A total of 278 acres of Swale will be preserved by the SSHCP, including approximately 92 acres inside the UDA and 186 acres outside the UDA (see Tables 7-5 and 7-6). Approximately 256 acres of Swale will be re-established and/or established in the form of any combination of Swale or Vernal Pool.

Stream/Creek (VPIH)

Approximately 26 acres, or 36%, of the 73 acres of Stream/Creek (VPIH) in the Plan Area would be permanently removed or indirectly impacted; indirect impacts account for 4 acres of the total impact acreage. Of the 68 acres of Stream/Creek (VPIH) inside the UDA, 25 acres (37%) will be permanently impacted; of the 4.8 acres of stream/creek (VPIH) outside the UDA, 1 acre (1%) will be permanently impacted.

A total of 26 acres of Stream/Creek (VPIH) will be preserved by the SSHCP, including approximately 26 acres inside the UDA (see Tables 7-5). Re-establishment and/or establishment to mitigate effects on Stream/Creek (VPIH) will be in the form of any combination of Swale or Vernal Pool, which is included in the approximately 256 acres described above for swale.

Table 7-9
Biological Goals and Measurable Objectives Applicable to the Vernal Pool Ecosystem

Applicable Biological Goals	Related Measurable Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Objective L1. Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (Low-Impact Development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in this table (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and

Table 7-9
Biological Goals and Measurable Objectives Applicable to the Vernal Pool Ecosystem

Applicable Biological Goals	Related Measurable Objectives
	freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, and establish natural land covers, (including Cropland, and Irrigated Pasture–Grassland) that provide habitat for Covered Species.	**Objective VG1.** Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with Conservation Actions in Table 7-1 and in accordance with Section 7.5.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective VP5. Re-establish and/or establish a minimum of 256 acres of Swale or vernal pool for impacts to the Swale and Stream/Creek (VPIH) land covers. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.
	Objective VP6. Re-establish and/or establish a minimum of 300 acres of functional Vernal Pool Ecosystem within or adjacent to (within 1 mile of) the Mather Core Recovery Area.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture–Grassland) that are preserved within the Plan Area.	**Objective HAB3.** Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.

Analysis of Conservation of the Vernal Pool Ecosystem

The Biological Goals and Measurable Objectives that were developed in the SSHCP for Covered Species using the Vernal Pool Ecosystem land cover type will also ensure that the integrated hydrologic and ecological functions of the component land cover types are protected. To meet these Biological Goals and Measurable Objectives, the SSHCP Conservation Strategy will preserve and

link approximately 23,284 acres of the highest-quality Vernal Pool Ecosystem in the Plan Area. This will protect the hydrology and soil conditions necessary for persistence of Covered Species that use this ecosystem, including irreplaceable resources such as Sacramento Orcutt grass and a range of other Covered Species such as vernal pool fairy shrimp, mid-valley fairy shrimp, and California tiger salamander. In addition, the SSHCP Conservation Strategy will re-establish and/or establish approximately 645 acres of Swale and Vernal Pool to ensure adequate acreage remains for the persistence of Covered Species that rely on these land covers in the Plan Area. The SSHCP Preserve System targets preservation within the two vernal pool core recovery areas in the Plan Area. Most SSHCP Preserves containing the Vernal Pool Ecosystem will be entirely within or within 1 mile of the two core recovery areas. The Vernal Pool Ecosystem will be managed and monitored in perpetuity to ensure that the Vernal Pool Ecosystem remains functional over time.

To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves that are not part of the SSHCP Preserve System, thus making a larger-scale contiguous Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves. Large preserves will preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools. Large preserves will also protect subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

The SSHCP Preserve System will provide heterogeneity of the Vernal Pool Ecosystem by maintaining the existing ecosystem variability at three main spatial scales: (1) landscape heterogeneity (geologic formations, soils, location within the Plan Area) of preserved vernal pool complexes in the Plan Area; (2) heterogeneity of vernal pool types, spatial patterns, and connectivity within a Preserve; and (3) heterogeneity of individual pools, including sizes, water chemistry, and floristic components. A GIS exercise was conducted that analyzed one possible preserve scenario. From this exercise, Tables 7-10 and 7-11 were created that present the geologic formations and soil unit types that may compose the Preserve System, as compared to the composition of the Plan Area as a whole. These tables demonstrate that the Preserve System can comprise the full range and diversity of soil types and geologic formations associated with the Vernal Pool Ecosystem in the Plan Area. Table 7-12 similarly presents the variation in Vernal

Wetland Acre/Density Index scores for the Preserve System, which demonstrates that the Preserve System can generally maintain the diversity of vernal pool densities and pool sizes as compared to existing conditions in the Plan Area. The Preserve System would focus more on acquiring and preserving parcels with higher densities of pools or larger pools, as these tend to be more intact or more valuable as habitat for vernal pool species. However, large areas of less dense or smaller pools would also be acquired, retaining adequate distributions of these other Vernal Wetland Acre/Density Index (VWADI) categories for those species that preferentially occupy less dense or smaller pools. By preserving vernal pool heterogeneity at these three scales, the likelihood of capturing genetic diversity is increased, and preservation of biodiversity is better assured. By establishing Preserves on each of the geologic landforms throughout the Plan Area that currently support vernal pools, preserving the vernal pool heterogeneity as indicated by soil types and the VWADI index, and by ensuring connectivity among the existing and SSHCP Preserves in the Plan Area, the SSHCP will preserve a broad range of habitat types.

Table 7-10
Geologic Formations Supporting Vernal Pools in the SSHCP Preserve System

Geologic Formation	In Preserve System (acres)	% of Preserve System (acres)	In Plan Area (acres)	% of Plan Area
Laguna Formation	12,897	34.8%	61,282	19.3%
Mehrten Formation	6,138	16.6%	26,459	8.3%
Modesto-Riverbank Formation	2,236	6.0%	14,688	4.6%
Riverbank Formation	9,888	26.7%	122,228	38.5%
Valley Springs Formation	611	1.7%	13,690	4.3%
Total	**31,770**	**85.8%**	**238,347**	**75.0%**

Table 7-11
Soils Supporting Vernal Pools in the SSHCP Preserve System

Soil	In Preserve System (acres)	% of Preserve System	In Plan Area (acres)	% of Plan Area
Soils Supporting Vernal Pools				
Clear Lake clay, hardpan substratum, drained, 0 to 1 percent slopes	285	0.8%	3,294	1.0%
Clear Lake clay, partially drained, 0 to 2 percent slopes, frequently flooded	172	0.5%	1,956	0.6%
Corning-Redding complex, 8 to 30 percent slopes	473	1.3%	3,038	1.0%
Corning complex, 0 to 8 percent slopes	2,198	5.9%	14,481	4.6%
Durixeralfs, 0 to 1 percent slopes	117	0.3%	1,414	0.5%

Table 7-11
Soils Supporting Vernal Pools in the SSHCP Preserve System

Soil	In Preserve System (acres)	% of Preserve System	In Plan Area (acres)	% of Plan Area
Durixeralfs-Galt complex, 0 to 2 percent slopes	0	0%	306	0.1%
Red Bluff-Redding complex, 0 to 5 percent slopes	1,130	3.1%	4,799	1.5%
Redding gravelly loam, 0 to 8 percent slopes	6,446	17.4%	26,745	8.4%
Redding loam, 2 to 8 percent slopes	2,055	5.6%	6,396	2.0%
San Joaquin-Durixeralfs complex, 0 to 1 percent slopes	110	0.3%	2,888	0.9%
San Joaquin-Galt complex, 0 to 3 percent slopes	357	1.0%	3,081	1.0%
San Joaquin-Galt complex, leveled, 0 to 1 percent slopes	621	1.7%	5,917	1.9%
San Joaquin-Xerarents complex, leveled, 0 to 1 percent slopes	105	0.3%	4,067	1.3%
San Joaquin silt loam, 0 to 3 percent slopes	1,997	5.4%	21,883	6.9%
San Joaquin silt loam, 3 to 8 percent slopes	636	1.7%	7,749	2.4%
San Joaquin silt loam, leveled, 0 to 1 percent slopes	2,077	5.6%	39,516	12.4%
Xerarents-Redding complex, 0 to 2 percent slopes	167	0.5%	950	0.3%
Xerarents-San Joaquin complex, 0 to 1 percent slopes	71	0.2%	2,127	0.7%
Total	**19,017**	**51.6%**	**150,607**	**47.5%**

Table 7-12
Range of Vernal Pool Densities in the Preserve System

VWADI Class	In Preserve System (acres)	% of Preserve System (acres)	In Plan Area (acres)	% of Plan Area with VWADI Classes
VWADI Category 1 - most wetted acres with densest vernal pool complexes and largest number of large pools				
A5	445	1.2%	3,435	2.4%
B5	1,176	3.2%	6,322	4.4%
C5	2,170	5.9%	8,094	5.6%

Table 7-12
Range of Vernal Pool Densities in the Preserve System

VWADI Class	In Preserve System (acres)	% of Preserve System (acres)	In Plan Area (acres)	% of Plan Area with VWADI Classes
D5	2,403	6.5%	6,427	4.5%
D4	1,753	4.7%	3,818	2.7%
E5	885	2.4%	1,040	0.7%
E4	52	0.1%	120	0.1%
Subtotal	*8,884*	*24.0%*	*29,256*	*20.4%*
VWADI Category 2				
A4	107	0.3%	2,001	1.4%
B4	1,702	4.6%	5,150	3.6%
C4	2,113	5.7%	6,488	4.5%
D2	40	0.1%	80	0.1%
D3	264	0.7%	680	0.4%
Subtotal	*4,226*	*11.4%*	*14,399*	*10.0%*
VWADI Category 3				
A3	82	0.2%	2,159	1.5%
B3	1,373	3.7%	4,476	3.1%
C1	136	0.4%	280	0.2%
C2	1,218	3.3%	3,339	2.3%
C3	1,620	4.4%	4,904	3.4%
Subtotal	*4,429*	*12.0%*	*15,158*	*10.5%*
VWADI Category 4				
A2	558	1.5%	6,902	4.8%
B1	1,562	4.2%	9,825	6.8%
B2	1,724	4.7%	10,749	7.5%
Subtotal	*3,844*	*10.4%*	*27,476*	*19.1%*
VWADI Category 5 - least wetted acres, most isolated and smaller vernal pools				
A1	3,887	10.5%	57,717	40.1%
Total	**25,270**	**68.3%**	**144,006**	**100%**

The SSHCP recognizes that removal of 17,117 acres of the existing 103,210 acres of the Vernal Pool Ecosystem will result in the loss of habitat and cause habitat fragmentation. However, habitat fragmentation is less likely in the Plan Area than in other regions as connectivity of the Vernal Pool Ecosystem in the Plan Area will be maintained by establishing large preserves that augment or connect to existing preserves that are not part of the SSHCP Preserve System. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. The SSHCP Preserve System will preserve the upland land cover types that are connected to the

vernal pools both biologically and hydrologically. Burrowing animals and pollinators, for example, while not Covered Species, are essential components of the Vernal Pool Ecosystem and will be protected within Valley Grassland land covers in SSHCP Preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and habitat linkages between SSHCP Preserves and existing preserves would be minimal or would not occur at all.

In the Mather Core Recovery Area, the SSHCP will preserve at least 5,494 acres of the Vernal Pool Ecosystem. Approximately 2,300 of those 5,494 acres will be located within three Core Preserves, which, combined with 3 Minor Preserves, 9 Satellite Preserves, and 10 Linkage Preserves, are designed to connect to existing preserves and fill in the habitat gaps between preserves in the UDA.

Of the 23,284 acres of the Vernal Pool Ecosystem that will be preserved in the Plan Area, 15,578 acres (68%) will be conserved in PPU 7. This will include a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserve that is not part of the SSHCP Preserve System. This Landscape Preserve will encompass the full range of heterogeneity of natural land covers and soil types associated with the Vernal Pool Ecosystem in the Cosumnes/Rancho-Seco Core Recovery Area.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves are generally established without setbacks in developed areas and sacrifice a portion of the preserved lands to these edge effects, which may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual watersheds based on LIDAR–Preserve boundaries that were established outside the defined watershed, so even without a buffer, the perched aquifer and overland surface flow will not be impacted by adjacent activities. Using a rigorous Preserve Setback strategy and watershed protection in conjunction with low-impact and compatible uses in land planning, the Preserve will maintain existing functions and values of the Vernal Pool Ecosystem in the Preserve System.

In addition to preservation of the Vernal Pool Ecosystem, the Implementing Entity will also establish or re-establish approximately 645 acres of Vernal Pool and Swale in the Plan Area, with a priority on re-establishment before establishment. The SSHCP will prioritize re-establishment within areas that historically had vernal pools, and will limit the densities at which pools can be placed, especially where pools are being added to already functional vernal pool complexes. All re-establishment and establishment sites will be inoculated with inoculum from

the impact or other representative sites, which will assist in maintaining or re-establishing the historical distribution of the species that use the Vernal Pool Ecosystem in the Plan Area. The effectiveness of inoculation will be monitored through a special study, as described in Section 8.3.3.5. Re-establishing pools in historical vernal pool areas will further help to conserve the Vernal Pool Ecosystem by ensuring no net loss of the total acreage in the SSHCP Plan Area.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of the Vernal Pool Ecosystem protected in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 Objectives will benefit the Vernal Pool Ecosystem by preparing and implementing Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). These actions will improve habitat value of the Vernal Pool Ecosystem.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 Objectives will directly benefit the Vernal Pool Ecosystem by requiring that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), that Stream Setbacks be established, and that Avoidance and Minimization Measures be implemented (Objective W2, W3). Goal 3 Objectives will directly benefit the Vernal Pool Ecosystem by outlining Preserve selection and re-establishment/establishment criteria for Valley Grassland, Vernal Pool, and Swale that ensure that adequate acreage of each SSHCP natural land cover remains in the Plan Area to provide necessary breeding, foraging, or sheltering habitat for Covered Species and other Plan Area native species (Objective VG1, VP1, VP2, VP3, VP4, VP5).

As Preserve Management Plans are implemented, grazing will be managed for the benefit of Covered Species habitat, including the Vernal Pool Ecosystem, by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the soil profile and pools and allow filling from surface flows if present. Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing condition.

7.6.1.1.2 Other Aquatic Land Covers

Other than the Vernal Pool Ecosystem, described in Section 7.6.1.1.1, which is categorized as an aquatic land cover, the remaining aquatic land covers include Seasonal Wetland; Freshwater Marsh; Stream/Creek; Open Water; and Riparian, which includes Mine Tailing Riparian Woodland, Mixed Riparian Scrub, and Mixed Riparian Woodland. These aquatic natural land covers are referred to in this section as "other" aquatic land covers, which excludes the Vernal

Pool Ecosystem; the use of the term is intended to differentiate these resources from all aquatic natural land covers, which does include the Vernal Pool Ecosystem.

In total, approximately 1,095 acres, or 6%, of the 18,628 acres of the other aquatic land covers in the Plan Area would be removed over the proposed 50-year Permit Term (Table 7-13). This includes the removal of 1, 017 acres (64%) of the 1,660 acres present inside the UDA and removal of 78 acres (0.4%) of 16,968 acres present outside the UDA. Permanent indirect effects to natural land covers are collectively and qualitatively analyzed in Section 7.6.1. The only indirect effect to natural land covers analyzed that does not directly apply to other aquatic land covers is the alteration of vernal pool hydrology, which specifically applies to the Vernal Pool Ecosystem.

Table 7-13
Permanent Effects and Conservation for Other Aquatic Land Covers

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Direct and Indirect Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Plan Area-Wide					
Other Aquatic Land Covers	**1,095**	**Qualitative**	**1,095**	**1,468**	**1,095**
Seasonal Wetlands	105	Qualitative	105	105	105
Freshwater Marsh	127	Qualitative	127	127	127
Stream/Creeks	117	Qualitative	117	117	117
Open Water	155	Qualitative	155	155	155
Riparian[a]	591	Qualitative	591	964	591

[a] Approximately 591 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub will be re-established and/or established; of the 591 acres, 218 acres of the re-establishment or establishment will be for impacts to Mine Tailing Riparian Woodland.

To mitigate 1,095 acres of impacts to the other aquatic land covers, the SSHCP preserves 1,468 acres of these land covers, including 105 acres of Seasonal Wetland, 127 acres of Freshwater Marsh, 117 acres of Stream/Creek, 155 acres of Open Water, and 964 acres of Riparian. The SSHCP will also re-establish and/or establish 1,095 acres of other aquatic land covers, including 105 acres of Seasonal Wetland, 127 acres of Freshwater Marsh, 117 acres of Stream/Creek, 155 acres of Open Water, and 591 acres of Riparian (Table 7-13).

Each component, or natural land cover, that comprises the other aquatic land covers is described separately below. The Biological Goals and Measurable Objectives applicable to these other aquatic land covers are listed in Table 7-14.

Seasonal Wetland

Approximately 105 acres, or 4%, of the 2,600 acres of Seasonal Wetland in the Plan Area would be removed. More specifically, of the 163 acres of Seasonal Wetland in the UDA, approximately

102 acres, or 63% will be removed, and of the 2,438 acres of Seasonal Wetland outside of the UDA, approximately 3 acres, or 0.2%, will be removed.

A total of 105 acres of Seasonal Wetland will be preserved by the SSHCP, including approximately 12 acres inside the UDA (Table 7-5) and approximately 93 acres outside the UDA (Table 7-6). Preserve sites for Seasonal Wetland will be selected in areas that are modeled habitat for Covered Species and, at a minimum, on parcels that are 20 acres or greater. Seasonal wetlands will be re-established and/or established under the SSHCP, including approximately 105 acres.

Freshwater Marsh

Approximately 127 acres, or 4%, of the 2,954 acres of freshwater marsh in the Plan Area would be removed. This direct permanent impact includes the removal of approximately 119 acres, or 30%, of the 392 acres of Freshwater Marsh in the UDA and the removal of approximately 8 acres, or 0.3%, of the 2,562 acres of Freshwater Marsh outside of the UDA.

A total of 127 acres of Freshwater Marsh will be preserved by the SSHCP, including approximately 54 acres inside the UDA (Table 7-5) and approximately 73 acres outside the UDA (Table 7-6). Preserve sites for Freshwater Marsh will be selected in areas that are modeled habitat for Covered Species and that currently support emergent vegetation and that exhibit hydrology that can support Freshwater Marsh. Freshwater Marsh will be re-established and/or established under the SSHCP, including approximately 105 acres.

Stream/Creek

Approximately 117 acres, or 4%, of the 2,778 acres of Stream/Creek in the Plan Area would be removed. More specifically, of the 163 acres of Stream/Creek in the UDA, approximately 92 acres, or 56%, will be removed; of the 2,615 acres of Stream/Creek outside of the UDA, approximately 25 acres, or 1.0%, will be removed.

A total of 117 acres of Stream/Creek will be preserved by the SSHCP, including approximately 29 acres inside the UDA (Table 7-5) and approximately 88 acres outside the UDA (Table 7-6). Preserve sites for Stream/Creek will be selected in areas that have the potential to support Covered Species, are in proximity to the mouth of the Stream/Creek, support water during early spring to mid-fall, are adjacent to existing preserves that are not part of the SSHCP Preserve System, and can be enhanced through management. Approximately, 117 acres of Stream/Creek will be re-established and/or established under the SSHCP.

Open Water

Approximately 155 acres, or 7%, of the 2,344 acres of Open Water in the Plan Area would be removed. This direct permanent impact includes the removal of approximately 154 acres, or 65%, of the 237 acres of Open Water in the UDA and the removal of approximately 1 acre, or 0.03%, of the 2,107 acres of open water outside of the UDA.

A total of 155 acres of Open Water will be preserved by the SSHCP, including approximately 71 acres inside the UDA (Table 7-5) and approximately 84 acres outside the UDA (Table 7-6). Preserve sites for Open Water will be selected in areas that are and link to modeled habitat for Covered Species and can be enhanced through management. Approximately 155 acres of Open Water will be re-established and/or established under the SSHCP.

Riparian

Riparian includes the following land covers: Mine Tailing Riparian Woodland, Mixed Riparian Scrub, and Mixed Riparian Woodland. Approximately 591 acres, or 7%, of the 7,952 acres of Riparian in the Plan Area would be removed. Of the 705 acres of Riparian in the UDA, approximately 551 acres, or 78% will be removed and of the 7,246 acres of Riparian outside of the UDA, approximately 40 acres, or 0.6%, will be removed.

A total of 964 acres of Riparian will be preserved by the SSHCP, including approximately 72 acres inside the UDA (Table 7-5) and approximately 892 acres outside the UDA (Table 7-6). Preserve sites for Riparian will be selected in areas that are modeled habitat for Covered Species; are located within 3 miles of foraging habitat for Covered Species that use riparian habitat for nesting and/or roosting; are multilayered and have a closed canopy structure; are large; and can be enhanced through management. Approximately 591 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub will be re-establishment and/or establishment; of the 591 acres, 218 acres of the re-establishment or establishment will be for impacts to Mine Tailing Riparian Woodland.

Table 7-14
Biological Goals and Measurable Objectives Applicable to the Other Aquatic Land Covers

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5.

Table 7-14
Biological Goals and Measurable Objectives Applicable to the Other Aquatic Land Covers

Applicable Biological Goals	Related Biological Objectives
	(minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W1**. Ensure that during implementation of Objective L2 (establishing a minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.
	Objective W2. Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (Low-Impact Development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W6. Covered Activities will avoid a minimum of 20% of first and second order tributaries to Elder Creek, Frye Creek, Gerber Creek, Morrison Creek, Paseo Central, and Sun Creek in the UDA.
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, and establish natural land covers, (including Cropland and Irrigated Pasture–Grassland) that provide habitat for Covered Species.	**Objective SW1.** Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with Conservation Actions in Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with Conservation Actions in Table 7-1.
	Objective SC1. Preserve a minimum of 117 acres of the Stream/Creek land cover. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective SC2. Re-establish and/or establish a minimum of 117 acres of the Stream/Creek land cover. Re-establishment and/or establishment will occur in accordance with Conservation Actions in Table 7-1.

Table 7-14
Biological Goals and Measurable Objectives Applicable to the Other Aquatic Land Covers

Applicable Biological Goals	Related Biological Objectives
	Objective OW1. Preserve a minimum of acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-establishment and/or establishment will occur in accordance with Conservation Actions in Table 7-1.
	Objective RIP1. Objective RIP1. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective RIP2. Re-establish and/or establish a minimum of 591 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture–Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.

Analysis of Conservation of Other Aquatic Land Covers

The SSHCP Conservation Strategy for other aquatic land covers is similar to that of the Vernal Pool Ecosystem, described in Section 7.6.1.1.1; refer to this section for additional details on the SSHCP Conservation Strategy. Preservation of these other aquatic land covers will be consistent with the Conservation Strategy guiding principles (Section 7.1) because it will protect watersheds and their ecosystem functions, and maintain Plan Area land cover heterogeneity between preserves. Protecting and re-establishing and/or establishing the other aquatic land covers in SSHCP Preserves will assist in achieving Goal 2 of the Conservation Strategy to avoid or minimize

impacts of future Covered Activities on Plan Area aquatic resources and to ensure "no net loss" of aquatic resources and aquatic functions within the Plan Area. The Conservation Strategy for aquatic land covers is closely tied to the Aquatic Resources Program, which includes a process to assess and mitigate the effects of Covered Activities on watershed functions and conditions, and an alternatives analysis that would incentivize avoidance of on-site aquatic land covers.

Throughout the Plan Area, the SSHCP Conservation Strategy will preserve and link together the highest-quality aquatic resources, including approximately 1,468 acres of other aquatic land covers. The Preserve System will protect the hydrology and soil conditions necessary for persistence of Covered Species that use these aquatic resources, such as giant gartersnake and western pond turtle. In addition, the SSHCP Conservation Strategy will re-establish and/or establish approximately 1,095 acres of other aquatic land covers to ensure adequate acreage of these resources remain for the persistence of Covered Species that rely on them in the Plan Area. The aquatic land covers will be managed and monitored in perpetuity to ensure that they remain functional over time.

Preservation outside of the UDA will focus on the formation of large landscape-scale Preserves that connect to and augment existing preserve that is not part of the SSHCP Preserve System, which has direct ecological benefits to Covered Species, but also practical benefits, such as facilitation of land management, that result in ecological benefits. In the UDA, three Core Preserves, up to three Minor Preserves, and seven Satellite Preserves will be established and linked together within the UDA. Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves.

Another benefit of the SSHCP over project-by-project permitting is the strict requirements for the 50-foot Preserve Setbacks. The AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Stream and Preserve setbacks will be monitored by the Implementing Entity, easement held by the HCP Agency to ensure that they function as intended. Project-by-project permitting does not provide this level of guarantee for functionality of setbacks. Using a rigorous Preserve Setback strategy and watershed protection in conjunction with low-impact and compatible uses in land

planning, the Preserve will maintain existing functions and values of the other aquatic land cover types in the Preserve System.

While approximately 1,095 acres, or 6%, of the 18,628 acres of the other aquatic land covers in the Plan Area would be removed, resulting in habitat loss, the Implementing Entity will establish or re-establish 1,095 acres of other aquatic land covers ensuring that there would be no net loss of acreage (Table 7-13). Re-establishment and establishment sites will be selected based on the criteria outlined in the Conservation Actions for each Measurable Objective (Table 7-1) to maximize success. Species such as giant gartersnake, western pond turtle, and tricolored blackbird that are dependent on these other aquatic land cover types will benefit from these re-establishment/establishment efforts and this could assist in maintaining their distributions in the Plan Area. The Conservation Actions for each aquatic land cover type varies, but in general, re-establishment and/or establishment sites will be selected based on the following criteria: (1) the sites will link to aquatic land cover types that provide modeled Covered Species habitat or after re-establishment and/or establishment qualify as modeled Covered Species habitat; (2) there is sufficient hydrology on site or it can be re-established on site; (3) the site has appropriate soils and topography; and/or (4) management can be used to enhance or restore natural ecosystems. Additionally, Conservation Action SW2.1 ensures that sites for seasonal wetlands are re-established and/or established on parcels 20 acres or greater in size and/or occur in larger, open space areas, to the maximum extent feasible; Conservation Action FWM2.1 includes selecting sites that historically supported freshwater marsh; and Conservation Action SC2.1 includes selecting sites that are adjacent to an existing preserve and within proximity to the mouth of the stream/bank. Conservation Action RIP2.1 includes more detailed criteria for selecting re-establishment/establishment sites for Mixed Riparian Woodland and Mixed Riparian Scrub beyond those generally described for all other aquatic land cover types including selecting areas: (1) that are located within 3 miles of foraging habitat for Covered Species that use riparian habitat for nesting and/or roosting; (2) that have a multilayered and closed-canopy structure; (2) that are large, unfragmented, and connected to Valley Grassland and Agricultural areas; (3) that are located within a SSHCP Preserve; (4) that would avoid impacts to existing vernal pool landscapes, preserved or restored giant gartersnake habitat, and to existing functioning habitat; and (5) for establishment, did not historically support riparian vegetation, and for re-establishment, did historically support riparian vegetation.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of lands protected in the Preserve System will ensure that aquatic land covers are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 Objectives will benefit aquatic land covers by preparing and implementing Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4).

7.6.1.2 Terrestrial Natural Land Covers

The terrestrial natural land covers in the SSHCP Plan Area include: Valley Grassland; Blue Oak Woodland and Savanna; and Agriculture, which includes Cropland, Irrigated Pasture–Grassland, Orchard, and Vineyard.

In total, approximately 30,757 acres, or 10%, of the 150,758 acres of the terrestrial natural land covers in the Plan Area would be removed over the proposed 50-year Permit Term. This includes the removal of 14,244 acres (89%) of the 16,066 acres present inside the UDA and removal of 1,042 acres (0.8%) of 134,692 acres present outside the UDA. The only indirect effect to natural land covers analyzed that does not directly apply to terrestrial land covers is the alteration of vernal pool hydrology, which applies to the Vernal Pool Ecosystem. Additionally, while alterations to watershed hydrographs and degradation of water quality can indirectly impact terrestrial land covers, this particular stressor has a greater impact on aquatic natural land covers, including the Vernal Pool Ecosystem.

To mitigate impacts to terrestrial land covers, the SSHCP preserves 30,757 acres of these terrestrial land covers, including 21,014 acres of Valley Grassland, 47 acres of Blue Oak Woodland/Savanna, and 9,696 acres of Cropland and/or Irrigated Pasture–Grassland. The SSHCP will also re-establish and/ or establish 47 acres of Blue Oak Woodland/Savanna (Table 7-15).

Table 7-15
Permanent Effects and Conservation for Terrestrial Land Covers

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Direct and Indirect Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Plan Area-Wide					
Terrestrial Land Covers	**30,757**	**Qualitative**	**30,757**	**330,757**	**47**
Valley Grassland (Outside of Vernal Pool Ecosystem)	21,014	Qualitative	21,014	21,014	—
Blue Oak Woodland/Savanna	47	Qualitative	47	47[a]	47[b]
Agriculture	9,696	Qualitative	9,696	9,696[c]	—

[a] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.

[b] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.

[a] Impacts to Cropland, Irrigated Pasture-Grassland, orchards and vineyards can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.

Each component, or natural land cover, that comprises the terrestrial natural land covers is described separately below. The Biological Goals and Measurable Objectives applicable to these terrestrial natural land covers are listed in Table 7-16.

Valley Grassland

Approximately 21,014 acres, or 15%, of the 150,758 acres of Valley Grassland in the Plan Area would be removed. More specifically, of the 5,716 acres present in the UDA, 5,159 acres, or 90%, will be removed, and of the 32,042 acres present outside of the UDA, 383 acres, or 1.2%, will be removed.

A total of 21,014 acres of Valley Grassland will be preserved by the SSHCP, including approximately 6,065 acres inside the UDA (Table 7-5) and 15,949 acres outside the UDA (Table 7-6). Preserve sites for Valley Grassland are focused on Valley Grassland in the Vernal Pool Ecosystem, as described in Section 7.6.1.1.1.

Blue Oak Woodland/Savanna

Approximately 47 acres, or 0.3%, of the 14,769 acres of Blue Oak Woodland/Savanna in the Plan Area would be removed. This direct permanent impact includes the removal 3 acres, 14%, of the 18 acres of Blue Oak Woodland/Savanna in the UDA, and the removal of 45 acres, or 0.3%, of the 14,751 acres of Blue Oak/Savanna outside of the UDA.

A total of 47 acres of Blue Oak Woodland/Savanna will be preserved by the SSHCP, all located outside the of the UDA (Table 7-6). Preserve sites for Blue Oak Woodland/Savanna will be selected in areas that expand upon or link to the Deer Creek Hills Preserve to the maximum extent feasible, as the limited amount of Blue Oak Woodland/Savanna preservation in the SSHCP will be most effective when linked to that large existing expanse of Blue Oak Woodland/Savanna. Blue Oak Woodland/Savanna will be re-established and/or established under the SSHCP, including approximately 47 acres in areas that expand upon or link to the Deer Creek Hills Preserve, to the maximum extent feasible.

Agriculture

Agriculture includes the following land covers: Cropland, Irrigated Pasture–Grassland, Orchard, and Vineyard. Approximately 9,696 acres, or 10%, of the 98,187 acres of agriculture in the Plan Area would be removed. Of the 10,287 acres of agriculture in the UDA, 9,082 acres, or 88% will be removed and of the 87,899 acres of riparian outside of the UDA, 614 acres, or 0.7%, will be removed.

A total of 9,696 acres of agriculture will be preserved by the SSHCP, all located outside of the UDA (Table 7-6). Of the 9,696 total acres of preservation, 1,000 acres will be outside the 100-year floodplain to provide a refuge for giant gartersnakes from flood waters during the snake's dormant season in winter (see Table 7-1 for Objective GGS1.2). Preserve sites for Cropland and Irrigated Pasture–Grassland will be selected to maximize their benefit to foraging habitat for avian Covered Species and their value for agriculture production including sites: (1) containing soils that are highly productive for agricultural resources and that have irrigation systems for crop production; (2) supporting or capable of supporting high prey densities for avian Covered Species; (3) supporting or capable of supporting nesting or perching habitat for avian Covered Species; and (4) can be enhanced or restored through management.

Table 7-16
Biological Goals and Measurable Objectives Applicable to the Terrestrial Land Covers

Applicable Biological Goals	Related Measurable Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 3. Preserve, re-establish, and establish natural land covers, (including Cropland and Irrigated Pasture–Grassland) that provide habitat for Covered Species.	**Objective BOW1**. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this table.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture–Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.

Table 7-16
Biological Goals and Measurable Objectives Applicable to the Terrestrial Land Covers

Applicable Biological Goals	Related Measurable Objectives
	Objective HAB5. Monitor preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
	Objective AG2. Of the 9,696 acres preserved under Objective AG1, maintain at least 2,000 of those acres of high-quality foraging crops (such as corn, alfalfa, or wheat) preferred by tricolored blackbird (*Agelaius tricolor*), greater sandhill crane (*Grus canadensis*), and the Covered raptor species. The 2,000 acres will be distributed in strategic locations throughout PPUs 4, 5, or 6 in plots of 20 acres or more. The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective AG3. Maintain or increase raptor prey availability and improve raptor foraging habitat by strategically planting 10,000 linear feet of shrub or other substrate that provides cover and refugia for fossorial mammals and other prey species.

Analysis of Conservation of Terrestrial Natural Land Covers

The focus of the Conservation Strategy for terrestrial natural land cover types is mostly outside the UDA, where a large landscape-scale Preserve will connect to and augment existing preserve that is not part of the SSHCP Preserve System. The large size of this preserve would be consistent with the guiding principle (Section 7.1) to minimize habitat fragmentation, protect watersheds and their ecosystem functions, and minimize edge effects. Establishing large preserves also benefits preserve management as a single PMP can guide management of a large area in a coordinated fashion and minimize environmental stressors such as habitat fragmentation. Also, there are practical benefits for Preserve management, such as grazing herds could be used across large landscapes and less perimeter fencing is required than on multiple smaller preserves. The Conservation Strategy for Valley Grassland Blue Oak Woodland/ Savanna, and Agriculture are described in more detail in the following paragraphs.

The Conservation Strategy for Valley Grassland was discussed in Section 7.6.1.1.1 and emphasizes establishment of Preserves in areas that are adjacent or in proximity to existing preserves and where Valley Grasslands can be located in areas that provide benefits to the Vernal Pool Ecosystem. By adding on to existing preserves, the Preserve System will maximize overall size of preserved areas and habitat connectivity, and minimize the amount of edge exposed to urban development and other environmental stressors.

Blue Oak Woodland/Savanna composes a relatively small portion (4%) of the Plan Area land cover, mostly along its eastern edge, and none of the Covered Species are entirely dependent on

these communities for the species to persist within the Plan Area. Nonetheless, Blue Oak Woodland/Savanna in the Plan Area provide valuable wildlife habitat and serve other ecological functions that will contribute to the preservation of Covered Species, particularly in the eastern portion of the Plan Area in PPUs 5 and 7 where they are dominant habitat types. Of the 47 acres of Blue Oak Woodland/Savanna that will be preserved, all will be conserved in PPU 7. PPU 7 contains a large proportion of the Blue Oak Woodland and Savanna in the Plan Area, which comprise 5,861 acres or 40% of the total Blue Oak Woodland and Savanna in the Plan Area.

Agricultural uses are cyclical in nature (e.g., crop rotation) and interact with the foraging and other life history needs of SSHCP Covered Species. Therefore, the Conservation Strategy is designed to maintain a mosaic of agricultural crop types distributed throughout the main agricultural area of the Plan Area and is considered an ecologically sound method of preserving agricultural habitats that benefit the Covered Species. PPU 6 Preserves are where the majority of agriculture (8,465 acres, 82%, of 9,462 acres) will be conserved. The Preserve design focus for PPU 6 is preserving existing agricultural lands that provide habitat for several of the broad-ranging Covered Species, most notably Swainson's hawk and greater sandhill crane, as well as several occurrences for burrowing owl and white-tailed kite. The Cropland Preserve will allow for variation in crop types from year to year in specific fields, but overall will maintain important habitat functions that benefit SSHCP Covered Species that depend on Agriculture land covers. The Cropland Preserves established in the western portion of PPU 6 will also provide connectivity between the Cosumnes River floodplain and Stone Lakes National Wildlife Refuge (NWR), where greater sandhill crane populations are regularly observed.

In the UDA, three Core Preserves, up to three Minor Preserves, and seven Satellite Preserves will be established and linked together within the UDA. Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves.

Another benefit of the SSHCP over project-by-project permitting is the strict requirements for the 50-foot Preserve Setbacks. The AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Using a rigorous Preserve Setback strategy and watershed protection in conjunction with low-impact and

compatible uses in land planning, the Preserve will maintain existing functions and values of the terrestrial land cover types in the Preserve System.

While approximately 47 acres, or 0.3%, of the 14,769 acres of Blue Oak Woodland/Savanna in the Plan Area would be removed, resulting in habitat loss, the Implementing Entity will establish or re-establish 47 acres of Blue Oak Woodland/Savanna ensuring that there would be no net loss of acreage (Table 7-15). Re-establishment and/or establishment for Blue Oak Woodland/Savanna will be selected in areas that expand upon or link to the Deer Creek Hills Preserve, to the maximum extent feasible, and any potential re-establishment/ establishment sites would fill gaps in existing mixed Blue Oak Woodland or Blue Oak Savanna land covers, or would link existing Blue Oak Woodland or Blue Oak Savanna land covers. The Implementing Entity will also establish 300 acres of Vernal Pool Ecosystem, much of which will consist of Valley Grassland. This will be accomplished by converting agricultural land or disturbed areas within the UDA to Valley Grassland, Vernal Pools, and Swales. While there are no re-establishment/establishment objectives for Agriculture, the SSHCP Conservation Strategy minimizes habitat fragmentation by focusing on the establishment of large Preserves, and by linking SSHCP Preserves and existing preserves together. For example, PPU 7 encompasses 90,906 acres, and the dominant land covers in PPU 7 are Valley Grassland, which comprises 52,278 acres of the PPU, and Agriculture, which comprises 20,695 acres. Similarly, PPU 6 encompasses 95,196 acres the dominant land covers in PPU 6 are Agriculture (58,458 acres) and Valley Grassland (17,633 acres).

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of lands protected in the Preserve System will ensure that terrestrial natural land covers are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will benefit terrestrial natural land covers by preparing and implementing Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4).

7.6.2 Covered Species

This section provides the conservation analysis for the 28 Covered Species of the SSHCP. For each of the Covered Species, the following is provided:

- A summary of impacts to habitat and the proposed level of preservation of documented occurrences (as applicable) and modeled habitat;
- Analysis of the SSHCP Conservation Strategy for the species, including:
    - Analysis of how relevant Biological Goals and Measurable Objectives will directly or indirectly benefit the species, and quantitative or qualitative description of the benefits;

- Summary of how any Avoidance and Minimization Measures (AMMs) will benefit this species, especially species-specific AMMs; and
- Summaries of conservation for each Core Recovery Area and for each separate CHU for every Covered Species that was included in any Recovery Plan.

7.6.2.1 Ahart's Dwarf Rush

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 7,403 acres of Ahart's dwarf rush modeled habitat in the Plan Area. All impacted modeled habitat for Ahart's dwarf rush is within the Vernal Pool Ecosystem, comprising approximately 310 acres of Ahart's dwarf rush modeled aquatic habitat and approximately 7,093 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-17).

To mitigate these impacts to Ahart's dwarf rush modeled habitats and the take of all Ahart's dwarf rush occupying that habitat, the SSHCP will preserve approximately 12,592 acres of Vernal Pool Ecosystem, including 478 acres of Vernal Pool, 165 acres of Swale, and 11,949 acres of Valley Grassland (Table 7-17). The SSHCP will also re-establish and/or establish approximately 239 acres of Ahart's dwarf rush modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-18).

Table 7-17
Permanent Effects and Conservation for Ahart's Dwarf Rush

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Direct and Indirect Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	7,093	Qualitative	7,093[a]	11,949	0
Vernal Pool	149	51	200	478	149
Swale	90	20	110	165	90[b]
Vernal Pool Ecosystem	**7,332**	**71**	**7,403**	**12,592**	**239**

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[b] Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool

Table 7-18
Biological Goals and Measurable Objectives Applicable to Ahart's Dwarf Rush

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, and establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.

Table 7-18
Biological Goals and Measurable Objectives Applicable to Ahart's Dwarf Rush

Applicable Biological Goals	Related Biological Objectives
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPP1.** Protect the one currently documented unpreserved occurrence of Ahart's dwarf rush in the Plan Area. Prior to take of any occurrence of Ahart's dwarf rush (*Juncus leiospermus*), protect six currently unpreserved[8] and "biologically equivalent or superior" (as defined by the TAC) occurrences of Ahart's dwarf rush within the Plan Area. After six currently unpreserved occurrences are protected, prior to take of an occurrence of Ahart's dwarf rush, protect one currently unpreserved and "biologically equivalent or superior" (as defined by the TAC) occurrence of Ahart's dwarf rush within the Plan Area.

Analysis of Species Conservation

There is one documented occurrence of Ahart's dwarf rush in the Plan Area, which will be preserved in a 15-acre Satellite Preserve in PPU 1. This occurrence will not be directly or indirectly impacted. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area. With implementation of the SSHCP under Objective VPP1, prior to take of any occurrence of Ahart's dwarf rush, one currently unpreserved[9] and "biologically equivalent or superior" (as defined by the Technical Advisory Committee (TAC)) occurrence of Ahart's dwarf rush within the Plan Area will be preserved.

[8] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

[9] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

Although the conservation focus for Ahart's dwarf rush is on preserving known occurrences, the Preserve System could also benefit this species by preserving modeled habitat where previously unknown occurrences occur, or become established in the future. The SSHCP Conservation Strategy will preserve and link approximately 12,592 acres of modeled habitat for Ahart's dwarf rush in the Plan Area. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in or near these Core Recovery Areas, focusing conservation in the areas important for recovery of this species. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves, including spread of non-native plant species or degradation of water quality. Large preserves will protect the subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. Large preserves will also preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools.

By preserving existing populations and modeled habitat of Ahart's dwarf rush in large, interconnected Preserves that are protected from edge effects, the species will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow via interconnected systems of vernal pools and swales. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of Ahart's dwarf rush habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

Three Core Preserves, each including more than 300 acres of Ahart's dwarf rush modeled habitat (with a combined total of 1,867 acres), will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

Although there are no known occurrences of Ahart's dwarf rush outside the UDA, modeled habitat in the Cosumnes/Rancho-Seco Core Recovery Area where the species might occur would be protected within the large landscape-scale Preserve (at least 10,500 acres) established in PPU 7. The Landscape Preserve will be established through land acquisitions that are targeted to (1) preserve modeled Ahart's dwarf rush habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase Preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other. The preservation of known occurrences and modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the SSHCP Conservation Strategy will also establish or re-establish approximately 239 acres of Ahart's dwarf rush modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. The re-established and/or established Ahart's dwarf rush modeled aquatic habitat will be provided appropriate management and monitoring of lands to ensure that habitat remains functional in perpetuity for Ahart's dwarf rush. This will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System.

The SSHCP Preserve System will link SSHCP Preserves and existing preserves that have modeled Ahart's dwarf rush modeled habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of seeds through surface flows, predator wastes, wind, and mud carried on the feet of animals). The SSHCP Preserve System will maintain the Ahart's dwarf rush at its current distribution, and the re-establishment and establishment of additional habitat will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The SSHCP Preserve will establish Core Preserves and Linkage Preserves that will maintain connectivity between existing occurrences and modeled habitat in other SSHCP Preserves and existing preserves in the Plan Area. By establishing large Preserves, the SSHCP will also ensure that connectivity between vernal pools within SSHCP Preserves is maintained.

The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 7,403 acres of the existing 25,136 acres of Ahart's dwarf rush modeled habitat (the Vernal Pool Ecosystem) may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated Ahart's dwarf rush populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area Vernal Pools remains relatively good. Those Vernal Pools in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve Ahart's dwarf rush modeled habitat with a range of vernal pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem. By preserving a range of Ahart's dwarf rush habitats in the Plan Area, the SSHCP will help Ahart's dwarf rush persist during expected climate change effects on precipitation and temperature.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of Ahart's dwarf rush modeled habitat in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit Ahart's dwarf rush habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present. Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing conditions. These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2 (SSHCP Biological Goals and Measurable Objectives), Goal 2 objectives will directly benefit Ahart's dwarf rush by requiring that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), establishing Stream Setbacks, and requiring implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit Ahart's dwarf rush by ensuring there are selection criteria and re-establishment/establishment criteria for Valley Grassland, Vernal Pool, and Swale (Objective VG1, VP1, VP2, VP3, VP4, VP5). Further, Objective VPP1 (Goal 5) will assure the preservation of Ahart's dwarf rush occurrences and distribution within the Plan Area.

Recovery Plan

As discussed in Section 7.6.3, the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Recovery Plan), includes recovery criteria for Ahart's dwarf rush (USFWS 2005a).To conserve this species, the Recovery Plan prioritizes preservation of Vernal Pool Ecosystem within several core areas, including the Mather Core Recovery Area and the Cosumnes/Rancho Seco Core Recovery Area in the Plan Area. SSHCP Covered Activities are anticipated to impact up to approximately 5,045 acres of Ahart's dwarf rush modeled habitat in the Mather Core Recovery Area and 18 acres in the Cosumnes/Rancho Seco Core Recovery Area (Table 7-19). Total impacts to Core Recovery Areas within the Plan Area are 5,062 acres. The SSHCP Conservation Strategy will preserve and link approximately 3,530 acres of modeled habitat for Ahart's dwarf rush in the Mather Core Recovery Area and approximately 3,771 acres within the Cosumnes/Rancho Seco Core Recovery Area. Total preservation within Core Recovery Areas within the Plan Area is 7,301 acres.

Table 7-19
Ahart's Dwarf Rush Effects and Conservation in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	4,825	6,802	4,809	3,291	16	3,511
Vernal Pool	148	401	147	185	0.8	215
Swale	89	98	88	54	1	44
Vernal Pool Ecosystem	**5,062**	**7,301**	**5,045**	**3,530**	**18**	**3,771**

See Section 7.6.3 for a detailed description of how the SSHCP's Conservation Actions carried out to meet SSHCP Biological Goals and Measurable Objectives will incorporate, or be consistent with, many of the species-specific recovery criteria for the nine Covered Species addressed in the Recovery Plan. The SSHCP provides an alternative Conservation Strategy for preserving vernal pool species habitat and meeting the six recovery criteria listed (see Section 7.6.3).

Although less than 100% of Ahart's dwarf rush occurrences may be preserved within the Plan Area, the SSHCP Conservation Strategy is the equivalent of the Recovery Plan's Species-Specific Recovery Criteria for each Core Area located inside the Plan Area (USFWS 2005a), as described in Section 7.6.3.

7.6.2.2 Boggs Lake Hedge-Hyssop

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 8,724 acres of Boggs Lake hedge-hyssop modeled habitat in the Plan Area. Total impacts to modeled Boggs Lake hedge-hyssop Vernal Pool Ecosystem are 8,711 acres, comprising 292 acres of Boggs Lake hedge-hyssop modeled aquatic habitat and 8,419 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-20). In addition, the SSHCP will impact approximately 13 acres of Seasonal Wetland in the Plan Area. In all, 98% of impacts to the Vernal Pool Ecosystem and 91% to Seasonal Wetland will occur in the UDA.

To mitigate these impacts to Boggs Lake hedge-hyssop modeled habitats and the take of all Boggs Lake hedge-hyssop occupying that habitat, the SSHCP will preserve approximately 9,074 acres of modeled habitat, including 9,039 acres of Vernal Pool Ecosystem (i.e., 382 acres of Vernal Pool and 8,657 acres of Valley Grassland) and 35 acres of Seasonal Wetland (see Table 7-20). The SSHCP will also re-establish and/or establish approximately 252 acres of Boggs Lake hedge-hyssop modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-21).

Table 7-20
Permanent Effects and Conservation for Boggs Lake Hedge-Hyssop

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	8,419	Qualitative	8,419[a]	8,657	0
Vernal Pool	240	52	292	382	239
Subtotal Vernal Pool Ecosystem	*8,659*	*52*	*8,711*	*9,039*	*239*
Seasonal Wetland	13	Qualitative	13[a]	35	13
GRAND TOTAL	**8,672**	**52**	**8,724**	**9,074**	**252**

[a] Total impacts to Valley Grassland and Seasonal Wetland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-21
Biological Goals and Measurable Objectives Applicable to Boggs Lake Hedge-Hyssop

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, and establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.

Table 7-21
Biological Goals and Measurable Objectives Applicable to Boggs Lake Hedge-Hyssop

Applicable Biological Goals	Related Biological Objectives
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPP2.** Prior to take of any occurrence of Boggs Lake hedge-hyssop (*Gratiola heterosepala*), preserve one currently unpreserved[10] and "biologically equivalent or superior" (as defined by the TAC) occurrence of Boggs Lake hedge-hyssop within the Plan Area.

Analysis of Species Conservation

Of the 30 known occurrences of Boggs Lake hedge-hyssop in the Plan Area, one falls within an SSHCP Preserve, and four will be impacted. With implementation of the SSHCP under Objective VPP2, prior to take of any occurrence of Boggs Lake hedge-hyssop, one currently unpreserved[11] and "biologically equivalent or superior" (as defined by the TAC) occurrence of Boggs Lake hedge-hyssop within the Plan Area will be preserved. Therefore, if more than one occurrence is to be impacted the Implementing Entity will ensure that additional occurrences are protected in SSHCP Preserves. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Although the conservation focus for Boggs Lake hedge hyssop is on preserving known occurrences, the Preserve System could also benefit this species by preserving modeled habitat where previously unknown occurrences occur, established in the future. The SSHCP Conservation Strategy will

[10] Includes occurrences in the SSHCP geographic information system (GIS) database (January 2014) and any future occurrences found in the Plan Area.

[11] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

preserve and link approximately 9,074 acres of the highest-quality Seasonal Wetland and Vernal Pool Ecosystem for Boggs Lake hedge-hyssop in the Plan Area. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in or near these Core Recovery Areas, focusing conservation in the areas important for recovery of this species. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves, including spread of non-native plant species or degradation of water quality. Large preserves will protect the subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. Large preserves will also preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools.

By preserving existing populations and modeled habitat of Boggs Lake hedge hyssop in large, interconnected Preserves that are protected from edge effects, the species will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow via interconnected systems of vernal pools and swales. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of Boggs Lake hedge hyssop habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

As discussed in Section 7.5, the conservation focus for Boggs Lake hedge-hyssop is focused in PPU 1 and PPU 3 where documented occurrences occur. Three Core Preserves, each including more than 450 acres of Boggs Lake hedge-hyssop modeled habitat (with a combined total of approximately 2,058 acres), will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

The conservation focus outside the UDA is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserve that is not part of the SSHCP Preserve System. The Landscape Preserve will be established through land acquisitions that are targeted to (1) preserve modeled Boggs Lake hedge-hyssop habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase Preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish approximately 252 acres of Boggs Lake hedge-hyssop modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. Re-establishing pools in historical vernal pool areas will further help to conserve Boggs Lake hedge-hyssop by ensuring no net loss of the total acreage of Boggs Lake hedge-hyssop habitat in the SSHCP Plan Area. All re-establishment and/or established sites for seasonal wetlands will link existing areas of seasonal wetlands and support soils and topography modeled for re-establishing and/or establishing seasonal wetlands. The SSHCP will also preserve a minimum of approximately 105 acres of seasonal wetlands on parcels 20 acres or greater in size and/or sites that occur in larger, open space areas, to the maximum extent feasible.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. The SSHCP Preserve System will link SSHCP Preserves and existing preserves that have modeled Boggs Lake hedge-hyssop modeled habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of seeds through surface flows, predator wastes, wind, and mud carried on the feet of animals). The SSHCP Preserve System will maintain the Boggs Lake hedge-hyssop at its current distribution, and the re-establishment and establishment of additional habitat will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The SSHCP Preserve will establish Core Preserves and Linkage Preserves that will maintain

connectivity between existing occurrences and modeled habitat in other SSHCP Preserves and existing preserves in the Plan Area. By establishing large Preserves, the SSHCP will also ensure that connectivity between pools within SSHCP Preserves is maintained.

The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 8,724 acres of the existing 37,000 acres of Boggs Lake hedge-hyssop modeled habitat (i.e., seasonal wetlands and the Vernal Pool Ecosystem) may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated Boggs Lake hedge-hyssop populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area pools and seasonal wetlands remains relatively good. Those pools and seasonal wetlands in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve Boggs Lake hedge-hyssop modeled habitat with a range of vernal pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem. By preserving a range of Boggs Lake hedge-hyssop habitats in the Plan Area, the SSHCP will help Boggs Lake hedge-hyssop persist during expected climate change effects on precipitation and temperature.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of Boggs Lake hedge-hyssop modeled habitat in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit Boggs Lake hedge-hyssop habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present.

Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing conditions. These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 objectives will directly benefit Boggs Lake hedge-hyssop from the requirement that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), Stream Setbacks and implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit Boggs Lake hedge-hyssop by ensuring there are selection criteria and re-establishment/establishment criteria for Valley Grassland, Vernal Pool, and Seasonal Wetland (Objective VG1, VP1, VP2, VP3, VP4, VP5, SW1, SW2). Further, Objective VPP2 (Goal 5) will assure the preservation of Boggs Lake hedge-hyssop occurrences and distribution within the Plan Area.

Recovery Plans

As discussed in Section 7.6.3, the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Recovery Plan) includes recovery criteria for Bogg's Lake hedge-hyssop (USFWS 2005a). To conserve this species, the Recovery Plan prioritizes preservation of Vernal Pool Ecosystem within several core areas, including the Mather Core Recovery Area and the Cosumnes/Rancho Seco Core Recovery Area in the Plan Area. SSHCP Covered Activities are anticipated to impact up to approximately 5,005 acres of Bogg's Lake hedge-hyssop modeled habitat in the Mather Core Recovery Area and 20 acres in the Cosumnes/Rancho Seco Core Recovery Area (Table 7-22). Total impacts to Core Recovery Areas within the Plan Area are 5,024 acres. The SSHCP Conservation Strategy will preserve and link approximately 3,853 acres of modeled habitat for Bogg's Lake hedge-hyssop in the Mather Core Recovery Area and approximately 4,450 acres within the Cosumnes/Rancho Seco Core Recovery Area. Total preservation within Core Recovery Areas within the Plan Area is 8,303 acres.

Table 7-22
Boggs Lake Hedge-Hyssop Permanent Effects and Conservation in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	4,867	7,931	4,848	3,686	19	4,245
Vernal Pool	155	357	154	167	1	191
Vernal Pool Ecosystem	**5,022**	**8,288**	**5,003**	**3,853**	**20**	**4,436**
Seasonal Wetland	1.9	14	1.9	**0**	0	14
Grand Total	**5,024**	**8,303**	**5,005**	**3,853**	**20**	**4,450**

See Section 7.6.3 for a detailed description of how the SSHCP's Conservation Actions carried out to meet SSHCP Biological Goals and Measurable Objectives will incorporate, or be consistent with, many of the species-specific recovery criteria for the nine Covered Species addressed in the Recovery Plan. The SSHCP provides an alternative Conservation Strategy for preserving vernal pool species habitat and meeting the six recovery criteria listed (see Section 7.6.3).

7.6.2.3 Dwarf Downingia

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 1,982 acres of dwarf downingia modeled habitat in the Plan Area. All impacted modeled habitat for dwarf downingia is within the Vernal Pool Ecosystem, comprising approximately 159 acres of dwarf downingia modeled aquatic habitat and 1,823 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-23). In all, 98% of impacts to the Vernal Pool Ecosystem will occur in the UDA.

To mitigate these impacts to dwarf downingia modeled habitats (i.e., the Vernal Pool Ecosystem) and the take of all dwarf downingia occupying that habitat, the SSHCP will preserve approximately 3,975 acres of Vernal Pool Ecosystem, including 186 acres of Vernal Pool, 56 acres of Swale, and 3,733 acres of Valley Grassland (Table 7-23). The SSHCP will also re-establish and/or establish approximately 141 acres of dwarf downingia modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-24).

Table 7-23
Permanent Effects and Conservation for Dwarf Downingia

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	1,823	Qualitative	1,823[a]	3,733	0
Vernal Pool	94	13	107	186	95
Swale	46	6	52	56	46[b]
Vernal Pool Ecosystem	**1,963**	**19**	**1,982**	**3,975**	**141**

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[b] Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool.

Table 7-24
Biological Goals and Measurable Objectives Applicable to Dwarf Downingia

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, and establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.

Table 7-24
Biological Goals and Measurable Objectives Applicable to Dwarf Downingia

Applicable Biological Goals	Related Biological Objectives
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPP3.** Prior to take of any occurrence of Dwarf downingia (*Downingia pusilla*), preserve one currently unpreserved[12] and "biologically equivalent or superior" (as defined by the TAC) occurrence of dwarf downingia within the Plan Area.

Analysis of Species Conservation

None of the 10 occurrences of dwarf downingia in the Plan Area will be enclosed within the Preserve System. However, Covered Activities are not projected to impact any documented occurrences of dwarf downingia. Exhaustive surveys for dwarf downingia have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area. Implementation of Objective VPP3 will require that, prior to take of any occurrence of dwarf downingia, one currently unpreserved[13] and "biologically

[12] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the SSHCP Plan Area.

[13] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

equivalent or superior" (as defined by the TAC) occurrence of dwarf downingia within the Plan Area will be preserved.

Although the conservation focus for dwarf downingia is on preserving known occurrences, the Preserve System could also benefit this species by preserving modeled habitat where previously unknown occurrences occur, or become established in the future. The SSHCP Conservation Strategy will preserve and link approximately 3,975 acres of modeled habitat for dwarf downingia in the Plan Area. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in or near these Core Recovery Areas, focusing conservation in the areas important for recovery of this species. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves, including spread of non-native plant species or degradation of water quality. Large preserves will protect the subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. Large preserves will also preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools.

By preserving existing populations and modeled habitat of dwarf downingia in large, interconnected Preserves that are protected from edge effects, the species will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow via interconnected systems of vernal pools and swales. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of dwarf downingia habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

The habitat conservation focus for dwarf downingia is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that

connects to and augments existing preserve that is not part of the SSHCP Preserve System. The Landscape Preserve will be established through land acquisitions that are targeted to (1) preserve modeled dwarf downingia habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase Preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish approximately 141 acres of dwarf downingia modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. Re-establishing pools in historical vernal pool areas will further help to conserve dwarf downingia by ensuring no net loss of the total acreage of dwarf downingia habitat in the SSHCP Plan Area.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. The SSHCP Preserve System will link SSHCP Preserves and existing preserves that have modeled dwarf downingia modeled habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of seeds through surface flows, predator wastes, wind, and mud carried on the feet of animals). The SSHCP Preserve System will maintain the dwarf downingia at its current distribution, and the re-establishment and establishment of additional habitat will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The SSHCP Preserve will establish Core Preserves and Linkage Preserves that will maintain connectivity between existing occurrences and modeled habitat in other SSHCP Preserves and existing preserves in the Plan Area. By establishing large Preserves, the SSHCP will also ensure that connectivity between pools within SSHCP Preserves is maintained.

The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not

requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 1,982 acres of the existing 24,261 acres of dwarf downingia modeled habitat (i.e., the Vernal Pool Ecosystem) may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated dwarf downingia populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area pools and seasonal wetlands remains relatively good. Those pools and seasonal wetlands in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve dwarf downingia modeled habitat with a range of vernal pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem. By preserving a range of dwarf downingia habitats in the Plan Area, the SSHCP will help dwarf downingia persist during expected climate change effects on precipitation and temperature.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of dwarf downingia modeled habitat in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit dwarf downingia habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present. Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing conditions. These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 objectives will directly benefit dwarf downingia from the requirement that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective

W4, W5), Stream Setbacks and implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit dwarf downingia by ensuring there are selection criteria and re-establishment/establishment criteria for Valley Grassland, Vernal Pool, and Swale (Objective VG1, VP1, VP2, VP3, VP4, VP5). Further, Objective VPP2 (Goal 5) will assure the preservation of dwarf downingia occurrences and distribution within the Plan Area.

7.6.2.4 Legenere

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 10,778 acres of legenere modeled habitat in the Plan Area. Total impacts to modeled legenere Vernal Pool Ecosystem are approximately 10,742 acres, comprising approximately 341 acres of legenere modeled aquatic habitat and 10,401 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-25). In addition, the SSHCP will impact approximately 36 acres of Seasonal Wetland in the Plan Area. In all, 98% of impacts to the Vernal Pool Ecosystem and 95% to Seasonal Wetland will occur in the UDA.

To mitigate these impacts to legenere modeled habitats and the take of all legenere occupying that habitat, the SSHCP will preserve approximately 11,615 acres of modeled habitat including 11,573 acres of Vernal Pool Ecosystem (i.e., 512 acres of Vernal Pool and 11,061 acres of Valley Grassland) and 42 acres of Seasonal Wetland (Table 7-25). The SSHCP will also re-establish and/or establish approximately 130 acres of legenere modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-26).

Table 7-25
Permanent Effects and Conservation for Legenere

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	10,401	Qualitative	10,401[a]	11,061	0
Vernal Pool	276	65	341	512	95
Subtotal Vernal Pool Ecosystem	**10,677**	**65**	**10,742**	**11,573**	**95**
Seasonal Wetland	36	Qualitative	36[a]	42	35
GRAND TOTAL	**10,713**	**65**	**10,778**	**11,615**	**130**

[a] Total impacts to Valley Grassland and Seasonal Wetland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-26
Biological Goals and Measurable Objectives Applicable to Legenere

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, and establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.

Table 7-26
Biological Goals and Measurable Objectives Applicable to Legenere

Applicable Biological Goals	Related Biological Objectives
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPP4.** Protect and maintain in perpetuity a minimum of 14 occurrences of legenere (*Legenere limosa*) within the SSHCP Preserve System. Legenere occurrences will be preserved in accordance with the Conservation Actions in Table 7-1. Prior to take of any occurrence of legenere, one currently unpreserved and "biologically equivalent or superior" (as defined by the TAC) occurrence of legenere will be preserved and maintained within the Plan Area.

Analysis of Species Conservation

Of the 56 occurrences of legenere, 15 will be preserved in SSHCP Preserves, with 14 inside the UDA (in PPU 1, PPU 2, PPU 3, PP 4) and 1 outside the UDA (PPU 7). Covered Activities will impact 5 documented occurrences, only within the UDA. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area. With implementation of the SSHCP, a minimum of seven occurrences of legenere within the hardline Preserve areas in the UDA (see Section 7.4) will be preserved and maintained in perpetuity; a minimum of seven additional occurrences within the criteria-based Preserve areas in the UDA (in accordance with the Conservation Actions described in Table 7-1) will be preserved and maintained in perpetuity; and prior to take

of any occurrence of legenere, one currently unpreserved[14] and "biologically equivalent or superior" (as defined by the TAC) occurrence of legenere will be preserved and maintained within the Plan Area.

Although the conservation focus for legenere is on preserving known occurrences, the Preserve System could also benefit this species by preserving modeled habitat where previously unknown occurrences occur, or become established in the future. The SSHCP Conservation Strategy will preserve and link approximately 11,615 acres of the highest-quality Seasonal Wetland and Vernal Pool Ecosystem habitat for legenere in the Plan Area. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in or near these Core Recovery Areas, focusing conservation in the areas important for recovery of this species. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves, including spread of non-native plant species or degradation of water quality. Large preserves will protect the subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. Large preserves will also preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools.

By preserving existing populations and modeled habitat of legenere in large, interconnected Preserves that are protected from edge effects, the species will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow via interconnected systems of vernal pools and swales. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of legenere habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

The conservation focus for legenere is focused in PPU 1 and PPU 3 where documented occurrences occur. Three Core Preserves, each including more than 500 acres of legenere modeled habitat (with a combined total of 2,203 acres), will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked within the UDA. The size and shape of all Preserves in the UDA are constrained by

[14] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the SSHCP Plan Area.

existing land use and zoning designations. However, implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

The conservation focus outside the UDA is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserve that is not part of the SSHCP Preserve System. The Landscape Preserve will be established through land acquisitions that are targeted to (1) preserve modeled legenere habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase Preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish approximately 130 acres of legenere modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. Re-establishing pools in historical vernal pool areas will further help to conserve legenere by ensuring no net loss of the total acreage of legenere habitat in the SSHCP Plan Area. All re-establishment and/or established sites for seasonal wetlands will link existing areas of seasonal wetlands and support soils and topography modeled for re-establishing and/or establishing seasonal wetlands. The SSHCP will also preserve a minimum of approximately 105 acres of seasonal wetlands on parcels 20 acres or greater in size and/or sites that occur in larger, open space areas, to the maximum extent feasible.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. The SSHCP Preserve System

will link SSHCP Preserves and existing preserves that have modeled legenere modeled habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of seeds through surface flows, predator wastes, wind, and mud carried on the feet of animals). The SSHCP Preserve System will maintain the legenere at its current distribution, and the re-establishment and establishment of additional habitat will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The SSHCP Preserve will establish Core Preserves and Linkage Preserves that will maintain connectivity between existing occurrences and modeled habitat in other SSHCP Preserves and existing preserves in the Plan Area. By establishing large Preserves, the SSHCP will also ensure that connectivity between pools within SSHCP Preserves is maintained.

The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 10,778 acres of the existing 50,973 acres of legenere modeled habitat (i.e., seasonal wetlands and the Vernal Pool Ecosystem) may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated legenere populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area pools and seasonal wetlands remains relatively good. Those pools and seasonal wetlands in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve legenere modeled habitat with a range of vernal pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem. By preserving a range of legenere habitats in the Plan Area, the SSHCP will help legenere persist during expected climate change effects on precipitation and temperature.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of legenere modeled habitat in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit legenere habitat from the preparation and

implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present. Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing conditions. These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 objectives will directly benefit legenere from the requirement that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), Stream Setbacks and implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit legenere by ensuring there are selection criteria and re-establishment/establishment criteria for Valley Grassland, Vernal Pool, and Seasonal Wetland (Objective VG1, VP1, VP2, VP3, VP4, VP5, SW1, SW2). Further, Objective VPP2 (Goal 5) will assure the preservation of Boggs Lake hedge-hyssop occurrences and distribution within the Plan Area.

Recovery Plan

As discussed in Section 7.6.3, the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Recovery Plan) includes recovery criteria for Legenere (USFWS 2005a). To conserve this species, the Recovery Plan prioritizes preservation of Vernal Pool Ecosystem within several core areas, including the Mather Core Recovery Area and the Cosumnes/Rancho Seco Core Recovery Area in the Plan Area. SSHCP Covered Activities are anticipated to impact up to approximately 5,913 acres of legenere modeled habitat in the Mather Core Recovery Area and 23 acres in the Cosumnes/Rancho Seco Core Recovery Area (Table 7-27). Total impacts to Core Recovery Areas within the Plan Area are 5,936 acres. The SSHCP Conservation Strategy will preserve and link approximately 4,275 acres of modeled habitat for legenere in the Mather Core Recovery Area and approximately 6,503 acres within the Cosumnes/Rancho Seco Core Recovery Area. Total preservation within Core Recovery Areas within the Plan Area is 10,777 acres.

Table 7-27
Legenere Permanent Effects and Conservation in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	5,756	10,288	5,734	4,087	22	6,201

Table 7-27
Legenere Permanent Effects and Conservation in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Vernal Pool	174	473	173	187	1.1	286
Vernal Pool Ecosystem	**5,930**	**10,761**	**5,930**	**4,274**	**23**	**6,487**
Seasonal Wetland	5.5	16	5.5	0.9	0	16
Grand Total	**5,936**	**10,777**	**5,913**	**4,275**	**23**	**6,503**

See Section 7.6.3 for a detailed description of how the SSHCP's Conservation Actions carried out to meet SSHCP Biological Goals and Measurable Objectives will incorporate, or be consistent with, many of the species-specific recovery criteria for the nine Covered Species addressed in the Recovery Plan. The SSHCP provides an alternative Conservation Strategy for preserving vernal pool species habitat and meeting the six recovery criteria listed (see Section 7.6.3).

7.6.2.5 Pincushion Navarretia

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 8,258 acres of pincushion navarretia modeled habitat in the Plan Area. All impacted modeled habitat for pincushion navarretia is within the Vernal Pool Ecosystem, comprising approximately 271 acres of pincushion navarretia modeled aquatic habitat and approximately 7,987 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-28). In all, 98% of impacts to the Vernal Pool Ecosystem will occur in the UDA.

To mitigate these impacts to pincushion navarretia modeled habitats (i.e., the Vernal Pool Ecosystem) and the take of all pincushion navarretia occupying that habitat, the SSHCP will preserve approximately 14,642 acres of Vernal Pool Ecosystem, including 514 acres of Vernal Pool, 183 acres of Swale, and 13,945 acres of Valley Grassland (Table 7-28). The SSHCP will also re-establish and/or establish approximately 141 acres of pincushion navarretia modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-29).

Table 7-28
Permanent Effects and Conservation for Pincushion Navarretia

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	7,987	Qualitative	7,987[a]	13,945	0
Vernal Pool	118	36	154	514	95
Swale	96	21	117	183	46[b]
Vernal Pool Ecosystem	**8,201**	**57**	**8,258**	**14,642**	**141**

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[b] Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool.

Table 7-29
Biological Goals and Measurable Objectives Applicable to Pincushion Navarretia

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.

Table 7-29
Biological Goals and Measurable Objectives Applicable to Pincushion Navarretia

Applicable Biological Goals	Related Biological Objectives
Goal 3. Preserve, re-establish, and establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPP5.** Prior to take of any occurrence of pincushion navarretia (*Navarretia myersii* ssp. *myersii*), preserve one currently unpreserved[15] and "biologically equivalent or superior" (as defined by the TAC) occurrence of pincushion navarretia within the Plan Area.

[15] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the SSHCP Plan Area.

Analysis of Species Conservation

Of the 48 documented occurrences of pincushion navarretia in the Plan Area, all are located outside the UDA in PPU 7. No known occurrences of pincushion navarretia are enclosed in the Preserve System, but no known occurrences will be impacted by Covered Activities. Exhaustive surveys for pincushion navarretia have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area. With implementation of the SSHCP under Objective VPP5, prior to take of any occurrence of pincushion navarretia, one currently unpreserved[16] and "biologically equivalent or superior" (as defined by the TAC) occurrence of pincushion navarretia within the Plan Area will be preserved.

Although the conservation focus for pincushion navarretia is on preserving occurrences as they are discovered, the Preserve System could also benefit this species by preserving modeled habitat where previously unknown occurrences occur, or become established in the future. The SSHCP Conservation Strategy will preserve and link approximately 14,642 acres of the highest-quality habitat for pincushion navarretia in the Plan Area. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in or near these Core Recovery Areas, focusing conservation in the areas important for recovery of this species. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves, including spread of non-native plant species or degradation of water quality. Large preserves will protect the subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. Large preserves will also preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools.

By preserving existing populations and modeled habitat of pincushion navarretia in large, interconnected Preserves that are protected from edge effects, the species will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow via interconnected systems of vernal pools and swales. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of pincushion navarretia habitat, like prescribed livestock grazing and prescribed burning. For

[16] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the SSHCP Plan Area.

example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

Three Core Preserves that include a combined total of approximately 1,099 acres of pincushion navarretia modeled habitat will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked within the UDA. However, as discussed in Section 7.5, the conservation focus for pincushion navarretia is focused outside the UDA in PPU 7 where documented occurrences occur. A large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area will connect to and augment existing preserve that is not part of the SSHCP Preserve System. The Landscape Preserve will be established through land acquisitions that are targeted to (1) preserve modeled pincushion navarretia habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase Preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish approximately 141 acres pincushion navarretia modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. Re-establishing vernal pools and swales in historical vernal pool areas will further help to conserve pincushion navarretia by ensuring no net loss of the total acreage of pincushion navarretia habitat in the SSHCP Plan Area.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool

watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System.

The SSHCP Preserve System will link SSHCP Preserves and existing preserves that have modeled pincushion navarretia modeled habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of seeds through surface flows, predator wastes, wind, and mud carried on the feet of animals). The SSHCP Preserve System will maintain the pincushion navarretia at its current distribution, and the re-establishment and establishment of additional habitat will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The SSHCP Preserve will establish Core Preserves and Linkage Preserves that will maintain connectivity between existing occurrences and modeled habitat in other SSHCP Preserves and existing preserves in the Plan Area. By establishing large Preserves, the SSHCP will also ensure that connectivity between pools within SSHCP Preserves is maintained.

The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 8,258 acres of the existing 57,438 acres of pincushion navarretia modeled habitat (i.e., the Vernal Pool Ecosystem) may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated pincushion navarretia populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area pools and seasonal wetlands remains relatively good. Those pools and seasonal wetlands in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve pincushion navarretia modeled habitat with a range of vernal pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem. By preserving a range of pincushion navarretia habitats in the Plan Area,

the SSHCP will help pincushion navarretia persist during expected climate change effects on precipitation and temperature.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of pincushion navarretia modeled habitat in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit pincushion navarretia habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present. Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing conditions. These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 objectives will directly benefit pincushion navarretia from the requirement that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), Stream Setbacks and implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit pincushion navarretia by ensuring there are selection criteria and re-establishment/establishment criteria for Valley Grassland, Vernal Pool, and Swale (Objective VG1, VP1, VP2, VP3, VP4, VP5). Further, Objective VPP2 (Goal 5) will assure the preservation of pincushion navarretia occurrences and distribution within the Plan Area.

7.6.2.6 Sacramento Orcutt Grass

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 7,187 acres of Sacramento Orcutt grass modeled habitat in the Plan Area. All impacted modeled habitat for Sacramento Orcutt grass is within the Vernal Pool Ecosystem, comprising 196 acres of Sacramento Orcutt grass modeled aquatic habitat and 6,991 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-30). These impacts include direct and indirect effects to up to approximately 248 acres of Vernal Pool Ecosystem within Sacramento Orcutt grass Critical Habitat. In all, 98% of impacts to the Vernal

Pool Ecosystem will occur in the UDA, including approximately 191 acres of impact to Sacramento Orcutt grass modeled habitat and 6,925 acres of impact to supporting uplands.

To mitigate these impacts to Sacramento Orcutt grass modeled habitats and the take of all Sacramento Orcutt grass occupying that habitat, the SSHCP will preserve approximately 14,459 acres of Vernal Pool Ecosystem, including 514 acres of Vernal Pool and 13,945 acres of Valley Grassland (Table 7-30). The approximately 14,459 acres of preserved Vernal Pool Ecosystem includes 4,001 acres of preservation of Vernal Pool Ecosystem within Sacramento Orcutt grass Critical Habitat (Table 7-31).

Finally, the SSHCP will also re-establish and/or establish approximately 148 acres of Sacramento Orcutt grass modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-32).

Table 7-30
Permanent Effects and Conservation for Sacramento Orcutt Grass

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	6,991	Qualitative	6,991[a]	13,945	0
Vernal Pool	148	48	196	514	148
Vernal Pool Ecosystem	**7,139**	**48**	**7,187**	**14,459**	**148**

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-31
Sacramento Orcutt Grass Permanent Effects and Conservation in Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)		Critical Habitat Unit 2 (acres)		Critical Habitat Unit 3 (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	236	3,867	223	276	13	3,591
Vernal Pool	12	134	12	11	0	123
Vernal Pool Ecosystem	**248**	**4,001**	**235**	**287**	**13**	**3,714**

Table 7-32
Biological Goals and Measurable Objectives Applicable to Sacramento Orcutt Grass

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of

Table 7-32
Biological Goals and Measurable Objectives Applicable to Sacramento Orcutt Grass

Applicable Biological Goals	Related Biological Objectives
quality habitat for Covered Species within the Plan Area.	habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.

Table 7-32
Biological Goals and Measurable Objectives Applicable to Sacramento Orcutt Grass

Applicable Biological Goals	Related Biological Objectives
Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB2.** Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPP6**. Preserve and maintain in perpetuity all known currently unpreserved occurrences of Sacramento Orcutt grass (*Orcuttia viscida*) in the Plan Area to preserve existing distribution, and any currently unknown sites discovered in locations subject to an SSHCP Covered Activity.

Analysis of Species Conservation

There are 40 documented occurrences of Sacramento Orcutt grass distributed in the Plan Area, 30 of which are outside the UDA. Of the 40 occurrences of Sacramento Orcutt grass, 6 will be protected in an SSHCP Preserve. Objective VPP6 requires that all occurrences be preserved; this is a species for which no take of occurrences is allowed so project proponents would be required to avoid occurrences and they would not be impacted. Exhaustive surveys for Sacramento Orcutt grass have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area; however, additional occurrences will be avoided. Before a site is disturbed by a Covered Activity, surveys will be conducted in modeled habitat during the appropriate time of year when Sacramento Orcutt grass is observable. Any occurrences will be preserved by the Project Proponent within a minimum satellite-sized Preserve that encloses the entire vernal pool watershed. In addition, surveys will be conducted after the first year of preservation and every 5 years thereafter to monitor persistence. If monitoring indicates that the preserved population is not persisting, the Implementing Entity will conduct remediation efforts.

Although the conservation focus for Sacramento Orcutt grass is on preserving known occurrences, the Preserve System could also benefit this species by preserving modeled habitat

where previously unknown occurrences occur or become established in the future. The SSHCP Conservation Strategy will preserve and link approximately 14,459 acres of modeled habitat for Sacramento Orcutt grass in the Plan Area. In particular, preservation of the Vernal Pool Ecosystem will protect the hydrology and soil conditions necessary for persistence of preserved Sacramento Orcutt grass aquatic habitat. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in or near these Core Recovery Areas, focusing conservation in the areas important for recovery of this species. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves, including spread of non-native plant species or degradation of water quality. Large preserves will protect the subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. Large preserves will also preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools.

By preserving existing populations and modeled habitat of Sacramento Orcutt grass in large, interconnected Preserves that are protected from edge effects, the species will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow via interconnected systems of vernal pools and swales. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of Sacramento Orcutt grass habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

As discussed in Section 7.5, the conservation focus for Sacramento Orcutt grass is focused inside PPU 1, PPU 3, and PPU 7 where documented occurrences occur. Three Core Preserves, each including more than 300 acres of Sacramento Orcutt grass modeled habitat (with a combined total of 1,733 acres), will be established in PPU 1 and PPU 3. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. For example, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would

not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

The conservation focus in PPU 7 is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserves that is not part of the SSHCP Preserve System. The Landscape Preserve will be established through land acquisitions that are targeted to (1) preserve occupied Sacramento Orcutt grass habitat, (2) capture desired vernal pool types and supporting uplands, (3) add parcels onto existing preserves that increase Preserve size and minimize habitat fragmentation and edge effects, and (4) provide connections to existing preserves that are currently isolated from each other.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 7,187 acres of the existing 34,492 acres of Sacramento Orcutt grass modeled habitat (i.e., Vernal Pool Ecosystem) may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated Sacramento Orcutt grass populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area pools remains relatively good. Those pools in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve Sacramento Orcutt grass modeled habitat with a range of pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem. By preserving a range of Sacramento Orcutt grass habitats in the Plan Area, the SSHCP will help Sacramento Orcutt grass persist during expected climate change effects on precipitation and temperature.

The preservation of known occurrences and modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish approximately 148 acres of Sacramento Orcutt grass modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. The re-established and/or established Sacramento Orcutt grass modeled aquatic habitat will be provided appropriate management and monitoring of lands to ensure that habitat remains functional in perpetuity for Sacramento Orcutt grass. This will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area.

The SSHCP Preserve System will link SSHCP Preserves and existing preserves that have Sacramento Orcutt grass modeled habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of seeds through surface flows, predator wastes, wind, and mud carried on the feet of animals). The SSHCP Preserve System will maintain the Sacramento Orcutt grass at its current distribution, and the re-establishment and establishment of additional habitat will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The SSHCP Preserve will establish Core Preserves and Linkage Preserves that will maintain connectivity between these existing occurrences and modeled habitat in other SSHCP Preserves and existing preserves in the Plan Area. By establishing large Preserves, the SSHCP will also ensure that connectivity between vernal pools within SSHCP Preserves is maintained. The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of habitat for Sacramento Orcutt grass protected in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit Sacramento Orcutt grass habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present.

Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing conditions. These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 objectives will directly benefit Sacramento Orcutt grass from the requirement that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), Stream Setbacks and implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit Sacramento Orcutt grass by ensuring there are selection criteria and re-establishment/establishment criteria for Valley Grassland, Vernal Pool, and Swale (Objective VG1, VP1, VP2, VP3, VP4, VP5). Further, Objective VPP6 (Goal 5) will assure the protection of Sacramento Orcutt grass occurrences and distribution within the Plan Area.

Critical Habitat

As defined in Section 3.6.1, the Vernal Pool Ecosystem includes Valley Grassland and Vernal Pool land cover types, each of which include one or more Primary Constituent Elements (PCEs) that have been defined for Sacramento Orcutt grass (USFWS 2006c). To compensate for impacts to 248 acres of Vernal Pool Ecosystem within Sacramento Orcutt grass Critical Habitat, the SSHCP Conservation Strategy will preserve a total of approximately 4,001 acres of Vernal Pool Ecosystem within Sacramento Orcutt grass Critical Habitat. Of this preservation, 287 acres of Vernal Pool Ecosystem will be preserved in CHU 2 and 3,714 acres in CHU 3. Monitoring and adaptive management under the SSHCP will ensure that the PCEs for Sacramento Orcutt grass are maintained within these CHUs and allow the PCEs to provide their intended conservation function for the species.

Recovery Plan

The SSHCP will be consistent with the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005a), which recommends preserving 100% of documented occurrences. And the SSHCP Conservation Strategy is the equivalent of the Recovery Plan's Species Specific Recovery Criteria for each Core Recovery Area located inside the Plan Area (USFWS 2005a), as described below. Where occurrences exist in locations still suitable for a functioning Core Preserve, these locations will be prioritized for preservation to achieve SSHCP and USFWS (2005a) Recovery Plan conservation goals.

SSHCP Covered Activities are anticipated to impact up to approximately 5,913 acres of Sacramento Orcutt grass modeled habitat in the Mather Core Recovery Area, and approximately 23 acres in the Cosumnes/Rancho Seco Core Recovery Area. To conserve this species, a total of approximately 6,503 acres of Vernal Pool Ecosystem will be preserved within the

Cosumnes/Rancho Seco Core Recovery Area and a total of approximately 4,275 acres will be preserved within the Mather Core Recovery Area (Table 7-33). When combined with existing preserves, 80% of the modeled Sacramento Orcutt grass habitat in the Cosumnes/Rancho-Seco Core Recovery Area will be preserved. Although this is less than the 95% habitat preservation target of the 2005 Recovery Plan, this large preservation area combined with the other elements of the SSHCP Conservation Strategy (e.g., monitoring and adaptive management, preservation of all occurrences) will allow consistency with the 2005 Recovery Plan. When combined with existing preserves, 50% of the modeled Sacramento Orcutt grass habitat in the Mather Core Recovery Area will be preserved.

Table 7-33
Sacramento Orcutt Grass Permanent Effects and Conservation in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	4,558	9,063	4,538	3,273	20	5,790
Vernal Pool	146	374	145	147	1	227
Vernal Pool Ecosystem	**4,704**	**9,437**	**4,683**	**3,420**	**21**	**6,017**

The SSHCP Conservation Strategy is equivalent to implementation of the 2005 Recovery Plan for the Plan Area because it provides an alternative Conservation Strategy for conserving Sacramento Orcutt grass and contains the six elements of recovery. The manner in which the SSHCP achieves this consistency for Sacramento Orcutt grass is discussed in detail in Section 7.6.3.

7.6.2.7 Slender Orcutt Grass

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 7,187 acres of slender Orcutt grass modeled habitat in the Plan Area. All impacted modeled habitat for slender Orcutt grass is within the Vernal Pool Ecosystem, comprising 196 acres of slender Orcutt grass modeled aquatic habitat and 6,991 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-34). These impacts include direct and indirect effects to up to approximately 235 acres of Vernal Pool Ecosystem within slender Orcutt grass Critical Habitat. In all, 98% of impacts to the Vernal Pool Ecosystem will occur in the UDA, including approximately 191 acres of impact to slender Orcutt grass modeled habitat and 6,925 acres of impact to supporting uplands.

To mitigate these impacts to slender Orcutt grass modeled habitats and the take of all slender Orcutt grass occupying that habitat, the SSHCP will preserve approximately 9,710 acres of Vernal Pool Ecosystem, including 378 acres of Vernal Pool and 9,332 acres of Valley Grassland (Table 7-34). The 9,710 acres of preserved Vernal Pool Ecosystem includes 287 acres of preservation of Vernal Pool Ecosystem within slender Orcutt grass Critical Habitat (Table 7-35).

Finally, the SSHCP will also re-establish and/or establish approximately 148 acres of slender Orcutt grass modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-36).

Table 7-34
Permanent Effects and Conservation for Slender Orcutt Grass

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	6,991	Qualitative	6,991[a]	9,332	0
Vernal Pool	148	48	196	378	148
Vernal Pool Ecosystem	**7,139**	**48**	**7,187**	**9,710**	**148**

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-35
Slender Orcutt Grass Permanent Effects and Conservation in Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)		Critical Habitat Unit 6 (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	223	276	223	276
Vernal Pool	12	11	12	11
Vernal Pool Ecosystem	**235**	**287**	**235**	**287**

Table 7-36
Biological Goals and Measurable Objectives Applicable to Slender Orcutt Grass

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.

Table 7-36
Biological Goals and Measurable Objectives Applicable to Slender Orcutt Grass

Applicable Biological Goals	Related Biological Objectives
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program

Table 7-36
Biological Goals and Measurable Objectives Applicable to Slender Orcutt Grass

Applicable Biological Goals	Related Biological Objectives
	for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPP7.** Preserve and maintain in perpetuity all known currently unpreserved occurrences of slender Orcutt grass in the Plan Area to preserve existing distribution, and any currently unknown sites discovered in locations subject to an SSHCP Covered Activity.

Analysis of Species Conservation

There are four documented occurrences of slender Orcutt grass distributed in the Plan Area, all within the UDA. Three (75%) of the four occurrences will be preserved in an SSHCP Preserve (all inside the UDA in PPU 3). No documented occurrences of slender Orcutt grass will be impacted by currently known Covered Activity project footprints. Further, Objective VPP7 requires that all occurrences of slender Orcutt grass be preserved; this is a species for which no take of occurrences is allowed. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area; however, additional occurrences will be avoided. Before a site is disturbed by a Covered Activity, surveys will be conducted in modeled habitat during the appropriate time of year when slender Orcutt grass is observable. Any occurrences will be preserved by the Project Proponent within a minimum satellite-sized Preserve that encloses the entire vernal pool watershed. In addition, surveys will be conducted after the first year of preservation and every 5 years thereafter to monitor persistence. If monitoring indicates that the preserved population is not persisting, the Implementing Entity will conduct remediation efforts.

Although the conservation focus for slender Orcutt grass is on preserving known occurrences, the Preserve System could also benefit this species by preserving modeled habitat where previously unknown occurrences occur, or become established in the future. The SSHCP Conservation Strategy will preserve and link approximately 9,710 acres of modeled habitat for slender Orcutt grass in the Plan Area. In particular, preservation of the Vernal Pool Ecosystem will protect the hydrology and soil conditions necessary for persistence of preserved slender Orcutt grass aquatic habitat. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area

and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in or near these Core Recovery Areas, focusing conservation in the areas important for recovery of this species. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the Vernal Pool Ecosystem within Preserves, including spread of non-native plant species or degradation of water quality. Large preserves will protect the subsurface hydrology that supports the Vernal Pool Ecosystem by protecting the perched aquifer from punctures or disruption related to grading and other surface-disturbing activities. Large preserves will also preserve vernal pool surface hydrology by maintaining the connections between swales and vernal pools.

By preserving existing populations and modeled habitat of slender Orcutt grass in large, interconnected Preserves that are protected from edge effects, the species will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow via interconnected systems of vernal pools and swales. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of slender Orcutt grass habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

As discussed in Section 7.5, the conservation focus for slender Orcutt grass is focused inside PPU 1, and PPU 3, where documented occurrences occur. Three Core Preserves, each including more than 300 acres of slender Orcutt grass modeled habitat (with a combined total of 1,733 acres), will be established in PPU 1 and PPU 3. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. For example, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

Although there are no known occurrences of slender Orcutt grass outside the UDA, modeled habitat in the Cosumnes/Rancho-Seco Core Recovery Area where the species might occur would be protected within the large landscape-scale Preserve (at least 10,500 acres) established in PPU 7. The Landscape Preserve will be established through land acquisitions that are targeted to (1) preserve

modeled slender Orcutt grass habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase Preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 7,187 acres of the existing 34,492 acres of slender Orcutt grass modeled habitat (i.e., Vernal Pool Ecosystem) may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated slender Orcutt grass populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area pools remains relatively good. Those pools in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve slender Orcutt grass modeled habitat with a range of pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem. By preserving a range of slender Orcutt grass habitats in the Plan Area, the SSHCP will help slender Orcutt grass persist during expected climate change effects on precipitation and temperature.

The preservation of known occurrences and modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish approximately 148 acres of slender Orcutt grass modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. The re-established and/or established slender Orcutt grass modeled aquatic habitat will be provided appropriate management and monitoring of lands to

ensure that habitat remains functional in perpetuity for slender Orcutt grass. This will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area.

The SSHCP Preserve System will link SSHCP Preserves and existing preserves that have slender Orcutt grass modeled habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of seeds through surface flows, predator wastes, wind, and mud carried on the feet of animals). The SSHCP Preserve System will maintain the slender Orcutt grass at its current distribution, and the re-establishment and establishment of additional habitat will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The SSHCP Preserve will establish Core Preserves and Linkage Preserves that will maintain connectivity between these existing occurrences and modeled habitat in other SSHCP Preserves and existing preserves in the Plan Area. By establishing large Preserves, the SSHCP will also ensure that connectivity between vernal pools within SSHCP Preserves is maintained. The larger Preserves (Core and Landscape) will facilitate appropriate vegetation management activities that improve functionality of the Vernal Pool Ecosystem as habitat, such as prescribed livestock grazing and prescribed burning. Large preserves make grazing more feasible by not requiring grazing operators to constantly shuttle livestock between disjunct preserve areas, and allow use of prescribed burning by establishing large separations between burn areas inside the preserve and developed areas outside the preserve. Grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' competition with native vernal pool plants and limit their use of water from the perched aquifer.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of habitat for slender Orcutt grass protected in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit slender Orcutt grass habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present. Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing conditions. These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 objectives will directly benefit slender Orcutt grass from the requirement that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), Stream

Setbacks, and implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit slender Orcutt grass by ensuring there are selection criteria and re-establishment/ establishment criteria for Valley Grassland, Vernal Pool, and Swale (Objective VG1, VP1, VP2, VP3, VP4, VP5). Further, Objective VPP6 (Goal 5) will assure the protection of slender Orcutt grass occurrences and distribution within the Plan Area.

Critical Habitat

As defined in Section 3.6.1, the Vernal Pool Ecosystem includes Valley Grassland and Vernal Pool land cover types, each of which include one or more PCEs that have been defined for slender Orcutt grass (USFWS 2006c). To compensate for impacts to 235 acres of Vernal Pool Ecosystem within slender Orcutt grass Critical Habitat, the SSHCP Conservation Strategy will preserve a total of approximately 287 acres of Vernal Pool Ecosystem within slender Orcutt grass Critical Habitat, all of which will be preserved in CHU 6. Monitoring and adaptive management under the SSHCP will ensure that the PCEs for slender Orcutt grass are maintained within this CHU, and allow the PCEs to provide their intended conservation function for the species.

Recovery Plan

The SSHCP will be consistent with the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005a), which recommends preserving 100% of documented occurrences. The SSHCP Conservation Strategy is the equivalent of the Recovery Plan's Species-Specific Recovery Criteria for each Core Recovery Area located inside the Plan Area (USFWS 2005a), as described below. Where occurrences exist in locations still suitable for a functioning Core Preserve, these locations will be prioritized for preservation to achieve SSHCP and USFWS (2005a) Recovery Plan conservation goals.

SSHCP Covered Activities are anticipated to impact up to approximately 4,683 acres of slender Orcutt grass modeled habitat in the Mather Core Recovery Area, and approximately 21 acres in the Cosumnes/Rancho Seco Core Recovery Area. To conserve this species, a total of approximately 6,017 acres of Vernal Pool Ecosystem will be preserved within the Cosumnes/Rancho Seco Core Recovery Area and a total of approximately 3,420 acres will be preserved within the Mather Core Recovery Area (Table 7-37). When combined with existing preserves, 80% of the modeled slender Orcutt grass habitat in the Cosumnes/Rancho Seco Core Recovery Area will be preserved. Although this is less than the 95% habitat preservation target of the 2005 Recovery Plan, this large preservation area combined with the other elements of the SSHCP Conservation Strategy (e.g., monitoring and adaptive management, preservation of all occurrences) will allow consistency with the 2005 Recovery Plan. When combined with existing preserves, 50% of the modeled slender Orcutt grass habitat in the Mather Core Recovery Area will be preserved.

Table 7-37
Slender Orcutt Grass Permanent Effects and Conservation in Core Recovery Areas

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho-Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	4,558	9,063	4,538	3,273	20	5,790
Vernal Pool	146	374	145	147	1	227
Vernal Pool Ecosystem	**4,704**	**9,437**	**4,683**	**3,420**	**21**	**6,017**

The SSHCP Conservation Strategy is equivalent to implementation of the 2005 Recovery Plan for the Plan Area because it provides an alternative Conservation Strategy for conserving slender Orcutt grass and contains the six elements of recovery. The manner in which the SSHCP achieves this consistency for slender Orcutt grass is discussed in detail in Section 7.6.2.1, Ahart's Dwarf Rush, Recovery Plans.

7.6.2.8 Sanford's Arrowhead

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 10,620 acres of the Sanford's arrowhead modeled habitat in the Plan Area, comprising 103 acres of Freshwater Marsh, 68 acres of Open Water, 72 acres of Seasonal Wetland, 83 acres of Stream/Creek, and 10,294 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-38). In all, 98% of impacts to Sanford's arrowhead modeled habitat will occur in the UDA.

To mitigate these impacts to Sanford's arrowhead modeled habitats and the take of all Sanford's arrowhead occupying that habitat, the SSHCP will preserve approximately 12,089 acres of modeled habitat, including 127 acres of Freshwater Marsh, 23 acres of Open Water, 87 acres of Seasonal Wetland, 117 acres of Stream/Creek, and 11,735 acres of Valley Grassland (Table 7-38). The SSHCP will also re-establish and/or establish approximately 326 acres of Sanford's arrowhead modeled habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-39).

Table 7-38
Permanent Habitat Impacts and Conservation for Sanford's Arrowhead

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Freshwater Marsh	103	Qualitative	103	127	103
Open Water	68	Qualitative	68	23 [a]	68 [b]
Seasonal Wetland	72	Qualitative	72	87	72
Streams/Creeks	83	Qualitative	83	117	83
Valley Grassland	10,294	Qualitative	10,294 [c]	11,735	0
GRAND TOTAL	**10,620**	**Qualitative**	**10,620**	**12,089**	**326**

[a] Preservation of Open Water can be achieved by preserving any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[b] Re-establishment and/or establishment of Open Water can be achieved by re-establishing and/or establishing any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-39
Biological Goals and Measurable Objectives Applicable to Sanford's Arrowhead

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (low-impact development (LID) and ROAD AMMs) • Ground disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).

Table 7-39
Biological Goals and Measurable Objectives Applicable to Sanford's Arrowhead

Applicable Biological Goals	Related Biological Objectives
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W6. Covered Activities will avoid a minimum of 20% of first and second order tributaries to Elder Creek, Frye Creek, Gerber Creek, Morrison Creek, Paseo Central, and Sun Creek in the UDA.
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective OW1. Preserve a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective SC1. Preserve a minimum of 117 acres of the Stream/Creek land cover. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SC2. Re-establish and/or establish a minimum of 117 acres of the Stream/Creek land cover. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.

Table 7-39
Biological Goals and Measurable Objectives Applicable to Sanford's Arrowhead

Applicable Biological Goals	Related Biological Objectives
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective SA1.** Prior to take of an occurrence of Sanford's arrowhead (*Sagittaria sanfordii*), protect one currently unpreserved[17] and "biologically equivalent or superior" (as defined by the TAC) occurrence of Sanford's arrowhead within the Plan Area.
	Objective SA2. During re-establishment and/or establishment of Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek, translocate impacted Sanford's arrowhead (*Sagittaria sanfordii*) from other sites.

Analysis of Species Conservation

Of the 63 documented occurrences of Sanford's arrowhead within the Plan Area, 14 are located inside the UDA and 49 occurrences are located outside the UDA. One of the 63 occurrences of Sanford's arrowhead will be protected in an SSHCP Preserve, and 12 of the documented occurrences will be impacted by UDA Covered Activities. Implementation of Objective SA1 will require that, prior to take of any occurrence of Sanford's arrowhead, one currently unpreserved[18] and "biologically equivalent or superior" (as defined by the TAC) occurrence of Sanford's arrowhead within the Plan Area will be preserved. Exhaustive surveys for this species have not been conducted in the Plan Area or region, and it is likely that additional occurrences will be found in the future in the Plan Area.

Although the conservation focus for Sanford's arrowhead is on preserving known occurrences, the Preserve System could also benefit this species by preserving modeled habitat where previously

[17] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

[18] Includes occurrences in the SSHCP GIS database (January 2014) and any future occurrences found in the Plan Area.

unknown occurrences occur, or become established in the future. The SSHCP Conservation Strategy will preserve and link approximately 12,089 acres of modeled habitat for Sanford's arrowhead in the Plan Area. In particular, preservation of Valley Grassland will protect the hydrology and soil conditions necessary for persistence of preserved Sanford's arrowhead aquatic habitat. To the extent possible, SSHCP Preserves will be adjacent to and contiguous with existing preserves, increasing the effective size of the Preserve System. By ensuring SSHCP Preserves are large and/or connected to existing preserves, the Conservation Strategy will minimize indirect effects of urban development on the modeled habitat within Preserves, including spread of non-native plant species or degradation of water quality.

Sanford's arrowhead conservation will focus on preservation/re-establishment/establishment sites that will provide the necessary hydrologic parameters, seed, tuber/rhizome fragment dispersal, and colonization of available now-unoccupied emergent marsh sites. Sanford's arrowhead preservation inside the UDA will focus on areas along the Laguna Creek Wildlife Movement Corridor. Except where prevented by existing development, the Laguna Creek Wildlife Movement Corridor will have on average a minimum width of 600 feet. This stream riparian corridor will include preserved freshwater marsh as well as mixed riparian scrub and mixed riparian woodland. In addition to preserving existing Sanford's arrowhead populations, the stream riparian corridor will include re-establishment and/or establishment of these habitats at a 1:1 ratio along reaches with suitable soils and landforms. Areas targeted for re-establishment/establishment will include Seasonal Wetland, Freshwater Marsh, Open Water, and Stream/Creek that provide opportunities for establishing new occurrences of Sanford's arrowhead, as well as opportunities for dispersal and colonization of nearby modeled habitat.

Conservation of Sanford's arrowhead habitat outside the UDA will focus on areas in stream riparian corridors, marshes, and other areas that are modeled habitat for this species. Areas that will be the focus of habitat Preserves include Cosumnes River, Deer Creek, Badger Creek, Willow Creek, Laguna Creek south, Brown Creek, and Skunk Creek. Select portions of Bear Slough, Cosumnes Slough, Deadman's Gulch, Griffith Creek, Hadselville Creek, North Fork Badger Creek, Rolling Draw Creek, Windmill Creek, and unnamed creeks and drainage canals also will be considered. The goal within Sanford's arrowhead habitat will be to maintain, on average, a minimum stream riparian corridor width of 600 feet with, on average, 300 feet on both sides of the stream. A corridor width of this size is expected to protect streams and associated habitats from adverse effects by adjacent land uses. Stream reaches that currently support associated Freshwater Marsh or that could be restored to this habitat type will be the focus of preservation efforts. Through management and monitoring, the Preserve will continue to provide existing functions and values and may exceed the existing condition.

By preserving existing populations and modeled habitat of Sanford's arrowhead in large, interconnected Preserves that are protected from edge effects, the species will be less affected by

future stochastic events and more likely to exchange genetic material among adjacent populations via pollinators and inadvertent tracking of seeds through water flow. The larger Preserves will also facilitate appropriate vegetation management activities that improve functionality of Sanford's arrowhead habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish approximately 326 acres of Sanford's arrowhead modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of approximately 10,620 acres of the existing 52,823 acres of Sanford's arrowhead modeled habitat may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated Sanford's arrowhead populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance. This is less likely in the Plan Area than in other regions because connectivity within Plan Area modeled habitat remains relatively good. Those areas in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve Sanford's arrowhead modeled habitat with a range of modeled habitat types within the Plan Area.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of habitat for Sanford's arrowhead protected in the Preserve System will ensure that

modeled habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit Sanford's arrowhead habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3), monitoring objectives (HAB5, HAB7), and invasive species eradication on Preserves (Objective HAB4). These actions will result in higher overall reproductive success and productivity of the Plan Area population.

In addition, as discussed in Section 7.3.2, SSHCP Biological Goals and Measurable Objectives, Goal 2 objectives will directly benefit Sanford's arrowhead from the requirement that aquatic resources are re-established/established or preserved and managed in perpetuity (Objective W4, W5), Stream Setbacks and implementation of AMMs (Objective W2, W3). Goal 3 objectives will directly benefit Sanford's arrowhead by ensuring there are selection criteria and re-establishment/ establishment criteria for Valley Grassland, Freshwater Marsh, Seasonal Wetland, Open Water, and Stream/Creek (Objective VG1, FWM1, FWM2, SW1, SW2, OW1, OW2, SC1, SC2). Further, Objective SA1 (Goal 5) will assure the preservation of Sanford's arrowhead occurrences and distribution within the Plan Area.

7.6.2.9 Vernal Pool Fairy Shrimp

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 17,259 acres of vernal pool fairy shrimp modeled habitat in in the Plan Area. All impacted modeled habitat for vernal pool fairy shrimp is within the Vernal Pool Ecosystem, comprising 787 acres of vernal pool fairy shrimp modeled aquatic habitat and 16,472 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-40). These impacts include direct and indirect effects to up to 746 acres of Vernal Pool Ecosystem within vernal pool fairy shrimp Critical Habitat. The majority of impacts to the Vernal Pool Ecosystem (98%) occur in the UDA, including 741 acres of impact to vernal pool fairy shrimp modeled aquatic habitat and 16,186 acres of impact to supporting uplands. The SSHCP assumes that all modeled aquatic habitat is occupied by vernal pool fairy shrimp, and thus impacts to known occurrences are not analyzed.

To mitigate these impacts to vernal pool fairy shrimp modeled habitats and the take of all vernal pool fairy shrimp occupying that habitat, the SSHCP preserves 23,284 acres of Vernal Pool Ecosystem, including 966 acres of Vernal Pool, 278 acres of Swale, 26 acres of Stream/Creek (VPIH) and 22,014 acres of Valley Grassland (Table 7-40). The 22,414 acres of preserved Vernal Pool Ecosystem includes 11,920 acres of preservation that will occur within the Vernal Pool Ecosystem that is within vernal pool fairy shrimp Critical Habitat (Table 7-41).

Finally, the SSHCP will also re-establish and/or establish 645 acres of vernal pool fairy shrimp modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-42).

Table 7-40
Permanent Effects and Conservation for Vernal Pool Fairy Shrimp

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	16,472	Qualitative	16,472 [a]	22,014	0
Vernal Pool	389	94	483	966	389
Swale	234	44	278	278	256 [b]
Stream/Creek(VPIH)	22	4	26	26	0 [c]
Vernal Pool Ecosystem	**17,117**	**142**	**17,259**	**23,284**	**645**

[a] Total impacts to Valley Grassland include an unknown but small amount of indirect impact that was analyzed qualitatively in Chapter 6.

[b] Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool.

[c] Re-establishment/establishment to mitigate direct effects to 22 acres of Stream/Creek (VPIH) will be in the form of Swale, which has been added to the 234 acres necessary to mitigate direct effects to swale.

Table 7-41
Permanent Effects and Preservation for Vernal Pool Fairy Shrimp Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)		Critical Habitat Unit 13 (acres)		Critical Habitat Unit 14a (acres)		Critical Habitat Unit 14b (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	707	11,219	663	439	44	10,775	0	5
Vernal Pool	25	539	19	12	6	527	0	0
Swale	10	155	9	6	1	149	0	0
Stream/Creek (VPIH)	4	7	4	7	0	0	0	0
Vernal Pool Ecosystem	**746**	**11,920**	**695**	**464**	**51**	**11,451**	**0**	**5**

Table 7-42
Biological Goals and Measurable Objectives Applicable to Vernal Pool Fairy Shrimp

Applicable Biological Goals	Related Biological Measurable Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide

Table 7-42
Biological Goals and Measurable Objectives Applicable to Vernal Pool Fairy Shrimp

Applicable Biological Goals	Related Biological Measurable Objectives
	interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4 • Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.

Table 7-42
Biological Goals and Measurable Objectives Applicable to Vernal Pool Fairy Shrimp

Applicable Biological Goals	Related Biological Measurable Objectives
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland, and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPI2.** Protect and maintain in perpetuity 1,270 acres of vernal pool fairy shrimp *(Branchinecta lynchi)* modeled aquatic habitat within the Plan Area to preserve existing distribution.
	Objective VPI5. Ensure that during implementation of Objective VP2, re-established and/or established vernal pools are inoculated with soils from impacted vernal pools within 1 mile of re-establishment/establishment, in accordance with Conservation Actions in Table 7-1.

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link 23,284 acres of the highest-quality habitat for vernal pool fairy shrimp in the Plan Area. In particular, preservation of the Vernal Pool Ecosystem will protect the hydrology and soil conditions necessary for persistence of preserved vernal pool fairy shrimp aquatic habitat.

The Conservation Strategy for vernal pool fairy shrimp targets preservation of vernal pool fairy shrimp habitat within Core Recovery Areas and Critical Habitat. These areas have been identified by the Wildlife Agencies as having the highest priority for preservation. Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho- Seco Core Recovery Area will be mitigated through preservation in these

Core Recovery Areas. In addition, many impacts occurring outside the Core Recovery Areas will be mitigated within or near the Core Recovery Areas. This mitigation focus will provide improved conservation for the species as compared to the existing project-by-project permitting.

As discussed in Section 7.5, the conservation focus outside the UDA is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserve that is not part of the SSHCP Preserve System. This Landscape Preserve will encompass a heterogeneous range of natural land covers and soil types associated with the Vernal Pool Ecosystem in the Plan Area. To the extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves. Required selection criteria for vernal pool fairy shrimp preserved habitat are listed in Conservation Action VPI1.1 and VPI1.2, and will assure that appropriate vernal pool densities, soil types, geology, adjacent modeled habitat, and other factors are included in the SSHCP Preserve System. By preserving a range of vernal pool fairy shrimp aquatic habitats in the Plan Area, the SSHCP will help vernal pool fairy shrimp persist during expected climate change effects on precipitation and temperature.

The Landscape Preserve will be established through land acquisitions that are targeted to (1) protect occupied vernal pool fairy shrimp habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

Three Core Preserves, each including more than 500 acres of modeled vernal pool fairy shrimp habitat, will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked together within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. Further, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from locating new SSHCP Preserves next to existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between SSHCP Preserves and existing preserves would be minimal or would not occur at all.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban

development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. By preserving existing populations of vernal pool fairy shrimp in large, interconnected Preserves that are protected from edge effects, the shrimp will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via inadvertent tracking of cysts and through water flow via interconnected systems of vernal pool, swale, and stream/creek (VPIH). The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of vernal pool fairy shrimp habitat, like prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of 17,259 acres of the existing 103,210 acres of vernal pool fairy shrimp modeled habitat (i.e., Vernal Pool Ecosystem), especially the removal or modification of 8,500 acres within the Mather Core Recovery Area, may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated vernal pool fairy shrimp populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance (Simovich 1998). This is less likely in the Plan Area than in other regions as connectivity within Plan Area pools remains relatively good. Those pools in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve vernal pool fairy shrimp modeled habitat with a range of pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish 645 acres of vernal pool fairy shrimp modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. All re-establishment and establishment sites will be inoculated with inoculum from the impact or other representative sites, which will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The effectiveness of inoculation will be

monitored through a special study, as described in Section 8.3.3.5. Re-establishing pools in historical vernal pool areas will further help to conserve vernal pool fairy shrimp by ensuring no net loss of the total acreage of vernal pool fairy shrimp aquatic habitat in the Plan Area.

The SSHCP Preserve System will link together SSHCP Preserves and existing preserves that have modeled vernal pool fairy shrimp habitat, to help maintain dispersal between vernal pool complexes (e.g., dispersal of cysts through surface flows, predator wastes, wind, and mud carried on the feet of animals). For example, 12 documented occurrences for vernal pool fairy shrimp are located in existing preserves in PPU 1, which would be linked together under the SSHCP by Core Preserves, Linkage Preserves, and Satellite Preserves to other existing preserves in PPUs 1, 2, and 3. By establishing large Preserves, the SSHCP will also ensure that connectivity between pools within Preserves is maintained.

As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for vernal pool fairy shrimp protected in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit vernal pool fairy shrimp habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3, HAB5) and invasive species eradication on Preserves (Objective HAB4). Further, effectiveness monitoring of the Conservation Strategy for vernal pool fairy shrimp will include a special study to investigate indirect effects of development on vernal pool crustaceans. The results of that study will inform adaptive management of SSHCP Condition 2 AMMs, as well as adaptive management of SSHCP Preserves. As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool fairy shrimp habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools, and allow filling from surface flows if present.

Critical Habitat

As defined in Section 3.2.3, the Vernal Pool Ecosystem includes Valley Grassland, Vernal Pool, Swale, and Stream/Creek (VPIH) land cover types, each of which include one or more PCEs that have been defined for vernal pool fairy shrimp (USFWS 2006c). The SSHCP Conservation Strategy will preserve a total of 11,920 acres of Vernal Pool Ecosystem within vernal pool fairy shrimp Critical Habitat. Of this preservation, 464 acres of Vernal Pool Ecosystem will be preserved in CHU 13, 11,451 acres in CHU 14a, and 5 acres in CHU 14b. Monitoring and adaptive management under the SSHCP will ensure that the PCEs for vernal pool fairy shrimp are maintained within these CHUs, and allow the PCEs to provide their intended conservation function for the species.

Recovery Plan

SSHCP Covered Activities are anticipated to impact up to approximately 8,500 acres of vernal pool fairy shrimp modeled habitat in the Mather Core Recovery Area, and approximately 53 acres in the Cosumnes/Rancho Seco Core Recovery Area. To conserve this species, a total of approximately 15,294 acres of Vernal Pool Ecosystem will be preserved within the Cosumnes/Rancho Seco Core Recovery Area and a total of approximately 5,484 acres will be preserved within the Mather Core Recovery Area (Table 7-43). When combined with existing preserves that are not part of the SSHCP Preserve System, more than 99% of the modeled vernal pool fairy shrimp habitat in the Cosumnes/Rancho Seco Core Recovery Area will be preserved, consistent with the 80% target of the 2005 Recovery Plan. When combined with existing preserves that are not part of the SSHCP Preserve System, 48% of the modeled vernal pool fairy shrimp habitat in the Mather Core Recovery Area will be preserved.

Table 7-43
Permanent Effects and Conservation in Core Recovery Areas for Vernal Pool Fairy Shrimp

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	8,164	19,557	8,118	5,155	46	14,402
Vernal Pool	222	916	216	213	6	703
Swale	151	279	150	90	1	189
Stream/Creek (VPIH)	16	26	16	26	0	0
Vernal Pool Ecosystem	**8,553**	**20,778**	**8,500**	**5,484**	**53**	**15,294**

The SSHCP Conservation Strategy is equivalent to implementation of the 2005 Recovery Plan for the Plan Area because it provides an alternative conservation strategy for conserving vernal pool fairy shrimp and contains the six elements of Recovery. The manner in which the SSHCP achieves this consistency for vernal pool fairy shrimp is discussed in detail in Section 7.6.3.

7.6.2.10 Mid-Valley Fairy Shrimp

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 12,639 acres of mid-valley fairy shrimp modeled habitat in the Plan Area. All impacted modeled habitat for mid-valley fairy shrimp is within the Vernal Pool Ecosystem, comprising 633 acres of mid-valley fairy shrimp modeled aquatic habitat and 12,006 acres of surrounding uplands (valley

grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-44). The majority of impacts to the Vernal Pool Ecosystem (98%) occur in the UDA, including 625 acres of impact to mid-valley fairy shrimp modeled aquatic habitat and 11,799 acres of impact to supporting uplands. The SSHCP assumes that all modeled aquatic habitat is occupied by mid-valley fairy shrimp, and thus impacts to known occurrences are not analyzed.

To mitigate these impacts to mid-valley fairy shrimp modeled habitats and the take of all mid-valley fairy shrimp occupying that habitat, the SSHCP preserves 11,297 acres of Vernal Pool Ecosystem, including 603 acres of Vernal Pool, 201 acres of Swale, and 10,493 acres of Valley Grassland (Table 7-44).

Finally, the SSHCP will also re-establish and/or establish 546 acres of mid-valley fairy shrimp modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-45).

Table 7-44
Permanent Effects and Conservation for Mid-Valley Fairy Shrimp

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	12,006	Qualitative	12,006 [a]	10,493	0
Vernal Pool	337	71	408	603	336
Swale	190	35	225	201	210[b]
Vernal Pool Ecosystem	**12,533**	**106**	**12,639**	**11,297**	**546**

[a] Total impacts to Valley Grassland include an unknown but small amount of indirect impact that was analyzed qualitatively in Chapter 6.
[b] Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool.
[c] Re-establishment/establishment to mitigate direct effects to 20 acres of Stream/Creek (VPIH) will be in the form of Swale, which has been added to the 190 acres necessary to mitigate direct effects to swale.

Table 7-45
Biological Goals and Measurable Objectives Applicable to Mid-Valley Fairy Shrimp

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in

Table 7-45
Biological Goals and Measurable Objectives Applicable to Mid-Valley Fairy Shrimp

Applicable Biological Goals	Related Biological Objectives
	Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.

Table 7-45
Biological Goals and Measurable Objectives Applicable to Mid-Valley Fairy Shrimp

Applicable Biological Goals	Related Biological Objectives
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPI3.** Protect and maintain in perpetuity 1,059 acres of mid-valley fairy shrimp (*Branchinecta mesovallensis*) modeled aquatic habitat within the Plan Area to preserve existing distribution.
	Objective VPI5. Ensure that during implementation of Objective VP2, re-established and/or established vernal pools are inoculated with soils from impacted vernal pools within 1 mile of re-establishment/establishment, in accordance with Conservation Actions in Table 7-1.

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link 11,397 acres of the highest-quality habitat for mid-valley fairy shrimp in the Plan Area. In particular, preservation of the Vernal Pool Ecosystem will protect the hydrology and soil conditions necessary for persistence of preserved mid-valley fairy shrimp aquatic habitat.

The Conservation Strategy for mid-valley fairy shrimp targets preservation of mid-valley fairy shrimp habitat within Core Recovery Areas. These areas have been identified by the Wildlife Agencies as having the highest priority for preservation. Impacts to mid-valley fairy shrimp occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in these Core Recovery Areas, providing improved conservation for the species as compared to the existing project-by-project permitting.

As discussed in Section 7.5, the conservation focus outside the UDA is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserve that is not part of the SSHCP Preserve System. This Landscape Preserve will encompass a heterogeneous range of natural land covers and soil types associated with the Vernal Pool Ecosystem in the Plan Area. To the extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves. Required selection criteria for mid-valley fairy shrimp preserved habitat are listed in Conservation Action VPI1.1, and will assure that appropriate vernal pool densities, soil types, geology, adjacent modeled habitat, and other factors are included in the SSHCP Preserve System. By preserving a range of mid-valley fairy shrimp aquatic habitats in the Plan Area, the SSHCP will help mid-valley fairy shrimp persist during expected climate change effects on precipitation and temperature.

The Landscape Preserve will be established through land acquisitions that are targeted to (1) protect occupied mid-valley fairy shrimp habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

Three Core Preserves, each including more than 500 acres of modeled mid-valley fairy shrimp habitat, will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked together within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. Further, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs, in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. By preserving existing populations of mid-valley fairy shrimp in large, interconnected Preserves that are protected from edge effects, the shrimp will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via inadvertent tracking of cysts and through water flow via interconnected systems of vernal pool, swale, and stream/creek (VPIH). The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of mid-valley fairy shrimp habitat, such as prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of 12,639 acres of the existing 53,698 acres of mid-valley fairy shrimp modeled habitat (i.e. Vernal Pool Ecosystem), especially the removal or modification of 6,280 acres within the Mather Core Recovery Area, may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated mid-valley fairy shrimp populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance (Simovich 1998). This is less likely in the Plan Area than in other regions as connectivity within Plan Area pools remains relatively good. Those pools in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve mid-valley fairy shrimp modeled habitat with a range of pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish 546 acres of mid-valley fairy shrimp modeled aquatic habitat in the Plan Area, with a priority on re-establishment before

establishment. All re-establishment and establishment sites will be inoculated with inoculum from the impact or other representative sites, which will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The effectiveness of inoculation will be monitored through a special study, as described in Section 8.3.3.5. Re-establishing pools in historical vernal pool areas will further help to conserve mid-valley fairy shrimp by ensuring no net loss of the total acreage of mid-valley fairy shrimp aquatic habitat in the Plan Area.

The SSHCP Preserve System will link together SSHCP Preserves and existing preserves that have modeled mid-valley fairy shrimp habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of cysts through surface flows, predator wastes, wind, and mud carried on the feet of animals). For example, seven documented occurrences for mid-valley fairy shrimp are located in existing preserves in PPU 3, which would be linked together under the SSHCP by Core Preserves and Linkage Preserves to other existing preserves in PPU 2. By establishing large Preserves, the SSHCP will also ensure that connectivity between pools within Preserves is maintained.

As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for mid-valley fairy shrimp protected in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit mid-valley fairy shrimp habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3, HAB5) and invasive species eradication on Preserves (Objective HAB4). Further, effectiveness monitoring of the Conservation Strategy for mid-valley fairy shrimp will include a special study to investigate indirect effects of development on vernal pool crustaceans. The results of that study will inform adaptive management of SSHCP Condition 2 AMMs, as well as adaptive management of SSHCP Preserves. As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools, and allow filling from surface flows if present.

Recovery Plan

SSHCP Covered Activities are anticipated to impact up to approximately 6,280 acres of mid-valley fairy shrimp modeled habitat in the Mather Core Recovery Area, and approximately 41 acres in the Cosumnes/Rancho Seco Core Recovery Area. To conserve this species, a total of approximately 5,392 acres of Vernal Pool Ecosystem will be preserved within the Cosumnes/Rancho Seco Core Recovery Area and a total of approximately 4,737 acres will be preserved within the Mather Core Recovery Area (Table 7-46). When combined with existing preserves that are not part of the

SSHCP Preserve System, 77% of the modeled mid-valley fairy shrimp habitat in the Cosumnes/Rancho Seco Core Recovery Area will be preserved, nearly reaching the 80% target of the 2005 Recovery Plan. When combined with existing preserves that are not part of the SSHCP Preserve System, 52% of the modeled mid-valley fairy shrimp habitat in the Mather Core Recovery Area will be preserved.

Table 7-46
Permanent Effects and Conservation in Core Recovery Areas for Mid-Valley Fairy Shrimp

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	6,009	9,388	5,975	4,352	34	5,036
Vernal Pool	182	535	176	250	6	285
Swale	117	177	116	106	1	71
Stream/Creek (VPIH)	13	29	13	29	0	0
Vernal Pool Ecosystem	**6,321**	**10,129**	**6,280**	**4,737**	**41**	**5,392**

The SSHCP Conservation Strategy is equivalent to implementation of the 2005 Recovery Plan for the Plan Area because it provides an alternative conservation strategy for conserving mid-valley fairy shrimp and contains the six elements of recovery. The manner in which the SSHCP achieves this consistency for mid-valley fairy shrimp is discussed in detail in Section 7.6.3.

7.6.2.11 Vernal Pool Tadpole Shrimp

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 17,259 acres of vernal pool tadpole shrimp modeled habitat in the Plan Area. All impacted modeled habitat for vernal pool tadpole shrimp is within the Vernal Pool Ecosystem, comprising 787 acres of vernal pool tadpole shrimp modeled aquatic habitat and 16,472 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-47). These impacts include direct and indirect effects to approximately 746 acres of Vernal Pool Ecosystem within vernal pool tadpole shrimp Critical Habitat. The majority of impacts to the Vernal Pool Ecosystem (98%) occur in the UDA, including 741 acres of impact to vernal pool fairy shrimp modeled aquatic habitat and 16,186 acres of impact to supporting uplands. The SSHCP assumes that all modeled aquatic habitat is occupied by vernal pool tadpole shrimp, and thus impacts to known occurrences are not analyzed.

To mitigate these impacts to vernal pool tadpole shrimp modeled habitats and the take of all vernal pool tadpole shrimp occupying that habitat, the SSHCP preserves 23,284 acres of Vernal Pool Ecosystem, including 966 acres of Vernal Pool, 278 acres of Swale, 26 acres of Stream/Creek (VPIH), and 22,014 acres of Valley Grassland (Table 7-47). The 23,284 acres of preserved Vernal Pool Ecosystem includes 11,920 acres of preservation of Vernal Pool Ecosystem within vernal pool tadpole shrimp Critical Habitat (Table 7-48).

Finally, the SSHCP will also re-establish and/or establish 645 acres of vernal pool tadpole shrimp modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-49).

Table 7-47
Permanent Effects and Conservation for Vernal Pool Tadpole Shrimp

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	16,472	Qualitative	16,472[a]	22,014	0
Vernal Pool	389	94	483	966	389
Swale	234	44	278	278	256[b]
Stream/Creek (VPIH)	22	4	26	26	0[c]
Vernal Pool Ecosystem	**17,117**	**142**	**17,259**	**23,284**	**645**

[a] Total impacts to Valley Grassland include an unknown but small amount of indirect impact that was analyzed qualitatively in Chapter 6.
[b] Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool.
[c] Re-establishment/establishment to mitigate direct effects to 22 acres of Stream/Creek (VPIH) will be in the form of Swale, which has been added to the 234 acres necessary to mitigate direct effects to Swale.

Table 7-48
Permanent Effects and Preservation for Vernal Pool Tadpole Shrimp Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)		Critical Habitat Unit 8 (acres)		Critical Habitat Unit 9a (acres)		Critical Habitat Unit 9b (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	707	11,219	663	439	0	5	44	10,775
Vernal Pool	25	539	19	12	0	0	6	527
Swale	10	155	9	6	0	0	1	149
Stream/Creek (VPIH)	4	7	4	7	0	0	0	0
Vernal Pool Ecosystem	**746**	**11,920**	**695**	**464**	**0**	**5**	**51**	**11,451**

Table 7-49
Biological Goals and Measurable Objectives Applicable to Vernal Pool Tadpole Shrimp

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.

Table 7-49
Biological Goals and Measurable Objectives Applicable to Vernal Pool Tadpole Shrimp

Applicable Biological Goals	Related Biological Objectives
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland, and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter, etc.).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPI1.** Protect and maintain in perpetuity 1,270 acres of vernal pool tadpole shrimp modeled aquatic habitat within the Plan Area to preserve existing distribution.
	Objective VPI5. Ensure that during implementation of Objective VP2, re-established and/or established vernal pools are inoculated with soils from impacted vernal pools within 1 mile of re-establishment/establishment, in accordance with Conservation Actions in Table 7-1.

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link 23,284 acres of the highest-quality habitat for vernal pool tadpole shrimp in the Plan Area. In particular, preservation of the Vernal Pool Ecosystem will protect the hydrology and soil conditions necessary for persistence of preserved vernal pool tadpole shrimp aquatic habitat.

The Conservation Strategy for vernal pool tadpole shrimp targets preservation of vernal pool tadpole shrimp habitat within Core Recovery Areas and Critical Habitat. These areas have been identified by the Wildlife Agencies as having the highest priority for preservation.

Objective VP1b requires that impacts occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in these Core Recovery Areas, providing improved conservation for the species as compared to the existing project-by-project permitting.

As discussed in Section 7.5, the conservation focus outside the UDA is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserve that is not part of the SSHCP Preserve System. This Landscape Preserve will encompass a heterogeneous range of natural land covers and soil types associated with the Vernal Pool Ecosystem in the Plan Area. To the extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, thus making a larger-scale contiguous Preserve System. Required selection criteria for vernal pool tadpole shrimp preserved habitat are listed in Conservation Action VPI1.1, and will ensure that appropriate vernal pool densities, soil types, geology, adjacent modeled habitat, and other factors are included in the SSHCP Preserve System. By preserving a range of vernal pool tadpole shrimp aquatic habitats in the Plan Area, the SSHCP will help vernal pool tadpole shrimp persist during expected climate change effects on precipitation and temperature.

The Landscape Preserve will be established through land acquisitions that are targeted to (1) protect occupied vernal pool tadpole shrimp habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

Three Core Preserves, each including more than 500 acres of modeled vernal pool tadpole shrimp habitat, will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked together within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. Further, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed

of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. By preserving existing populations of vernal pool tadpole shrimp in large, interconnected Preserves that are protected from edge effects, the shrimp will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via inadvertent tracking of cysts and through water flow via interconnected systems of vernal pool, swale, and stream/creek (VPIH). The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of vernal pool tadpole shrimp habitat, such as prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of 17,259 acres of the existing 103,210 acres of vernal pool tadpole shrimp modeled habitat (i.e., Vernal Pool Ecosystem), especially the removal or modification of 8,500 acres within the Mather Core Recovery Area may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated vernal pool tadpole shrimp populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance (Simovich 1998). This is less likely in the Plan Area than in other regions as connectivity within Plan Area pools remains relatively good. Those pools in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve vernal pool tadpole shrimp modeled habitat with a range of pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish 645 acres of vernal pool tadpole shrimp modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. All re-establishment and establishment sites will be inoculated with inoculum from the impact or other representative sites, which will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The effectiveness of inoculation will be monitored through a special study, as described in Section 8.3.3.5.

The SSHCP Preserve System will link together SSHCP Preserves and existing preserves that have modeled vernal pool tadpole shrimp habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of cysts through surface flows, predator wastes, wind, and mud carried on the feet of animals). For example, 21 known occurrences for vernal pool

tadpole shrimp are located in existing preserves in PPU 2, which would be linked together under the SSHCP by Core Preserves and Linkage Preserves to other existing preserves in PPU 3. By establishing large Preserves, the SSHCP will also ensure that connectivity between vernal pools within SSHCP Preserves is maintained.

As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for vernal pool tadpole shrimp protected in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit vernal pool tadpole shrimp habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3, HAB5), and invasive species eradication on Preserves (Objective HAB4). Further, effectiveness monitoring of the Conservation Strategy for vernal pool tadpole shrimp will include a special study to investigate indirect effects of development on vernal pool crustaceans. The results of that study will inform adaptive management of SSHCP Condition 2 AMMs, as well as adaptive management of SSHCP Preserves. As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools, and allow filling from surface flows if present.

Critical Habitat

As defined in Section 3.2.3, the Vernal Pool Ecosystem includes Valley Grassland, Vernal Pool, Swale, and Stream/Creek (VPIH) land cover types, each of which include one or more PCEs that have been defined for vernal pool tadpole shrimp (USFWS 2006c). The SSHCP Conservation Strategy will preserve a total of 11,920 acres of Vernal Pool Ecosystem within vernal pool tadpole shrimp Critical Habitat. Of this preservation, 464 acres of Vernal Pool Ecosystem will be preserved in CHU 8, 5 acres in CHU 9a, and 11,451 acres in CHU 9b. Monitoring and adaptive management under the SSHCP will ensure that the PCEs for vernal pool tadpole shrimp are maintained within these CHUs, and allow the PCEs to provide their intended conservation function for the species.

Recovery Plan

SSHCP Covered Activities are anticipated to impact up to approximately 8,500 acres of vernal pool tadpole shrimp modeled habitat in the Mather Core Recovery Area, and approximately 53 acres in the Cosumnes/Rancho Seco Core Recovery Area. To conserve this species, a total of approximately 15,294 acres of Vernal Pool Ecosystem will be preserved within the Cosumnes/Rancho Seco Core Recovery Area and a total of approximately 5,484 acres will be

preserved within the Mather Core Recovery Area (Table 7-50). When combined with existing preserves that are not part of the SSHCP Preserve System, 83% of the modeled vernal pool tadpole shrimp habitat in the Cosumnes/Rancho Seco Core Recovery Area will be preserved, consistent with the 80% target of the 2005 Recovery Plan. When combined with existing preserves that are not part of the SSHCP Preserve System, 46% of the modeled vernal pool tadpole shrimp habitat in the Mather Core Recovery Area will be preserved.

Table 7-50
Permanent Effects and Conservation in Core Recovery Areas for Vernal Pool Tadpole Shrimp

Habitat Model Land Cover Types	Total Core Recovery Areas (acres)		Mather Core Area (acres)		Cosumnes/Rancho-Seco Core Area (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Valley Grassland	8,164	19,557	8,118	5,155	46	14,402
Vernal Pool	222	916	216	213	6	703
Swale	151	279	150	90	1	189
Stream/Creek (VPIH)	16	26	16	26	0	0
Vernal Pool Ecosystem	**8,553**	**20,778**	**8,500**	**5,484**	**53**	**15,294**

The SSHCP Conservation Strategy is an acceptable alternative to implementation of the 2005 Recovery Plan (refer to Section 7.6.3).

7.6.2.12 Ricksecker's Water Scavenger Beetle

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 17, 233 acres of Ricksecker's water scavenger beetle modeled habitat in the Plan Area. All impacted modeled habitat for Ricksecker's water scavenger beetle is within the Vernal Pool Ecosystem, comprising 761 acres of Ricksecker's water scavenger beetle modeled aquatic habitat and 16,472 acres of surrounding uplands (Valley Grassland) needed to support continued habitat functions and values of the aquatic habitats (Table 7-51). The majority of impacts to the Vernal Pool Ecosystem (98%) occur in the UDA, including 715 acres of impact to Ricksecker's water scavenger beetle modeled aquatic habitat and 16,186 acres of impact to supporting uplands. The SSHCP assumes that all modeled aquatic habitat is occupied by Ricksecker's water scavenger beetle, and thus impacts to known occurrences are not analyzed.

To mitigate these impacts to Ricksecker's water scavenger beetle modeled habitats and the take of all Ricksecker's water scavenger beetle occupying that habitat, the SSHCP preserves

approximately 23,258 acres of Vernal Pool Ecosystem, including 966 acres of Vernal Pool, 278 acres of Swale, and 22,014 acres of Valley Grassland (Table 7-51).

Finally, the SSHCP will also re-establish and/or establish 623 acres of Ricksecker's water scavenger beetle modeled aquatic habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-52).

Table 7-51
Permanent Effects and Conservation for Ricksecker's Water Scavenger Beetle

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	16,472	Qualitative	16,472 [a]	22,014	0
Vernal Pool	389	94	483	966	389
Swale	234	44	278	278	234 [b]
Vernal Pool Ecosystem	**17,095**	**138**	**17,233**	**23,258**	**623**

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[b] Swale re-establishment/establishment may occur in the form of any combination of Swale or Vernal Pool.

Table 7-52
Biological Goals and Measurable Objectives Applicable to Ricksecker's Water Scavenger Beetle

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)

Table 7-52
Biological Goals and Measurable Objectives Applicable to Ricksecker's Water Scavenger Beetle

Applicable Biological Goals	Related Biological Objectives
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).

Table 7-52
Biological Goals and Measurable Objectives Applicable to Ricksecker's Water Scavenger Beetle

Applicable Biological Goals	Related Biological Objectives
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VPI4.** Protect and maintain in perpetuity 1,245 acres of Ricksecker's water scavenger beetle (*Hydrochara ricksecker*i) modeled aquatic habitat within the Plan Area to preserve existing distribution.
	Objective VPI5. Ensure that during implementation of Objective VP2, re-established and/or established vernal pools are inoculated with soils from impacted vernal pools within 1 mile of re-establishment/establishment, in accordance with Conservation Actions in Table 7-1.

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link 23,258 acres of the highest-quality habitat for Ricksecker's water scavenger beetle in the Plan Area. In particular, preservation of the Vernal Pool Ecosystem will protect the hydrology and soil conditions necessary for persistence of preserved Ricksecker's water scavenger beetle aquatic habitat.

Although the *Recovery Plan for Vernal Pool Ecosystems* does not include Ricksecker's water scavenger beetle, the Core Recovery Areas designated in the Recovery Plan represent the highest-quality intact habitat available in the Plan Area. Therefore, the Conservation Strategy for Ricksecker's water scavenger beetle targets preservation of Ricksecker's water scavenger beetle habitat within Core Recovery Areas. Impacts to Ricksecker's water scavenger beetle occurring within or near the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in these Core Recovery areas, providing improved conservation for the species as compared to the existing project-by-project permitting.

As discussed in Section 7.5, the conservation focus outside the UDA is on formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserve that is not part of the SSHCP Preserve System. This Landscape Preserve will encompass a heterogeneous range of natural land covers and soil types associated with the Vernal Pool Ecosystem in the Plan Area. To the extent

possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, thus making a larger-scale contiguous Preserve System. Required selection criteria for Ricksecker's water scavenger beetle preserved habitat (see Conservation Actions for Objective VPI4) will ensure that appropriate vernal pool densities, soil types, geology, adjacent modeled habitat, and other factors are included in the SSHCP Preserve System. By preserving a range of Ricksecker's water scavenger beetle aquatic habitats in the Plan Area, the SSHCP will help Ricksecker's water scavenger beetle persist during expected climate change effects on precipitation and temperature.

The Landscape Preserve will be established through land acquisitions that are targeted to (1) protect occupied Ricksecker's water scavenger beetle habitat; (2) capture desired vernal pool types, swales, and supporting uplands; (3) add parcels onto existing preserves that increase preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

Three Core Preserves, each including more than 500 acres of modeled Ricksecker's water scavenger beetle habitat, will be established in the UDA. In addition to the three Core Preserves, up to three Minor Preserves and seven Satellite Preserves will be established and linked together within the UDA. The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. Further, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and linkages between preserves would be minimal or would not occur at all.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. By preserving existing

populations of Ricksecker's water scavenger beetle in large, interconnected Preserves that are protected from edge effects, the beetle will be less affected by future stochastic events and more likely to exchange genetic material among adjacent populations via inadvertent tracking of eggs and through water flow via interconnected systems of vernal pool and swale. The larger Preserves will also facilitate appropriate vernal pool vegetation management activities that improve functionality of Ricksecker's water scavenger beetle habitat, such as prescribed livestock grazing and prescribed burning. For example, grazing, fire, and other land management actions will reduce aboveground biomass and control non-native grasses' use of water from the perched aquifer.

Despite the establishment of the Preserve System, the SSHCP recognizes that removal or modification of 17,233 acres of the existing 102,676 acres of Ricksecker's water scavenger beetle modeled habitat (i.e., Vernal Pool Ecosystem), especially the removal or modification of 16,901 acres within the UDA, may result in some loss of species genetic diversity. The SSHCP further recognizes that small, isolated Ricksecker's water scavenger beetle populations that are not preserved under the SSHCP may contain genetic diversity of conservation importance (Simovich 1998). This is less likely in the Plan Area than in other regions as connectivity within Plan Area pools remains relatively good. Those pools in the Plan Area that are isolated have become so relatively recently, thus limiting the amount of genetic divergence from non-isolated populations. Nonetheless, to maximize preservation of genetic diversity and species distribution, the SSHCP will preserve Ricksecker's water scavenger beetle modeled habitat with a range of pool sizes, soil types, geologic landforms, and locations within the Plan Area. Refer to Section 7.6.1.1.1 for a discussion of how the Preserve System maintains the heterogeneity of the Vernal Pool Ecosystem.

The preservation of modeled habitat under the Conservation Strategy represents mitigation to the maximum extent possible. However, to maximize beneficial effects on the species, the Implementing Entity will also establish or re-establish 623 acres of Ricksecker's water scavenger beetle modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. All re-establishment and establishment sites will be inoculated with inoculum from the impact or other representative sites, which will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. The effectiveness of inoculation will be monitored through a special study, as described in Section 8.3.3.5. Re-establishing pools in historical vernal pool areas will further help to conserve Ricksecker's water scavenger beetle by ensuring no net loss of the total acreage of Ricksecker's water scavenger beetle aquatic habitat in the Plan Area.

The SSHCP Preserve System will link together SSHCP Preserves and existing preserves that have modeled Ricksecker's water scavenger beetle habitat to help maintain dispersal between vernal pool complexes (e.g., dispersal of eggs through surface flows, predator wastes, and mud carried on the feet of animals such as waterfowl). For example, four known occurrences for

Ricksecker's water scavenger beetle are located in existing preserves in PPU 2. The SSHCP will establish Core Preserves and Linkage Preserves that will maintain connectivity between these existing occurrences and modeled habitat in other SSHCP Preserves or existing preserves. By establishing large Preserves, the SSHCP will also ensure that connectivity between vernal pools within SSHCP Preserves is maintained.

As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for Ricksecker's water scavenger beetle protected in the Preserve System will ensure that vernal pool hydrology, vegetation, and other vernal pool habitat characteristics within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives (Table 7-49) will directly benefit Ricksecker's water scavenger beetle habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, HAB3, HAB5) and invasive species eradication on Preserves (Objective HAB4). Further, effectiveness monitoring of the Conservation Strategy for Ricksecker's water scavenger beetle will include a special study to investigate indirect effects of development on vernal pool crustaceans. The results of that study will inform adaptive management of SSHCP Condition 2 AMMs, as well as adaptive management of SSHCP Preserves. As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species habitat by reducing residual dry matter in pools and density of non-native grasses in the surrounding uplands, which will reduce grasses' water consumption from the perched aquifer and pools and allow filling from surface flows if present.

7.6.2.13 Valley Elderberry Longhorn Beetle

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 591 acres of modeled habitat for valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) in the Plan Area, all of which is located in Riparian land cover types (Table 7-53). The majority of impacts (550 acres) to the modeled valley elderberry longhorn beetle habitat will occur in the UDA, including 218 acres of impact to Mine Tailing Riparian Woodland, 186 acres of impact to Mixed Riparian Scrub, and 146 acres of impact to Mixed Riparian Woodland. The SSHCP assumes that all modeled habitat is occupied by valley elderberry longhorn beetle, and thus impacts to known occurrences are not analyzed.

To mitigate these impacts to valley elderberry longhorn beetle modeled habitat and the take of all valley elderberry longhorn beetles occupying that habitat, the SSHCP preserves 964 acres of modeled habitat for valley elderberry longhorn beetle. Preservation of the 964 acres of valley elderberry longhorn beetle modeled habitat includes the preservation of any combination of

Mixed Riparian Woodland and Mixed Riparian Scrub.(Table 7-53). Most of the preserved land is likely to occur in the Cosumnes River and Deer Creek areas that provide excellent habitat for valley elderberry longhorn beetle. Conservation actions for the valley elderberry longhorn beetle are consistent with the Biological Goals and Measurable Objectives for this species (Table 7-54).

Table 7-53
Permanent Effects and Conservation for Valley Elderberry Longhorn Beetle

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Mine Tailing Riparian Woodland	218	Qualitative	218	218 [a]	218 [b]
Mixed Riparian Woodland	184	Qualitative	184	368 [c]	184 [d]
Mixed Riparian Scrub	189	Qualitative	189	378 [c]	189 [d]
GRAND TOTAL	**591**	Qualitative	**591**	**964**	**591**

[a] Impacts to Mine Tailing Riparian Woodland will be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[b] Impacts to Mine Tailing Riparian Woodland will be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[c] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[d] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

Table 7-54
Biological Goals and Measurable Objectives Applicable to Valley Elderberry Longhorn Beetle

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs)

Table 7-54
Biological Goals and Measurable Objectives Applicable to Valley Elderberry Longhorn Beetle

Applicable Biological Goals	Related Biological Objectives
	• Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective RIP1**. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Re-establish and/or establish a minimum of 591 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective VELB1**. Relocate or replace each impacted elderberry shrub (*Sambucus* spp.) according to USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b). Mitigation will occur in locations that are not inundated for 2 continuous weeks, as determined by the TAC.
	Objective VELB2. During implementation of riparian habitat re-establishment

Table 7-54
Biological Goals and Measurable Objectives Applicable to Valley Elderberry Longhorn Beetle

Applicable Biological Goals	Related Biological Objectives
	and/or establishment, strategically include elderberry shrub in the planting palette (see Objectives RIP2 and RIP4).

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link 964 acres of the highest-quality riparian habitat for valley elderberry longhorn beetle in the Plan Area. The SSHCP conservation focus for valley elderberry longhorn beetle is outside the UDA in PPU 5 and PPU 6, which encompass the Cosumnes River and Deer Creek areas. To the extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, thus making a larger-scale contiguous Preserve System. By preserving a range of valley elderberry longhorn beetle habitats in the Plan Area, the SSHCP will help valley elderberry longhorn beetle persist during expected climate change effects on precipitation and temperature.

Preserves benefiting valley elderberry longhorn beetle will be established through land acquisitions that are targeted to (1) protect occupied valley elderberry longhorn beetle habitat; (2) capture long stretches of desired Riparian land cover types; (3) add parcels onto existing preserves that increase preserve size and minimize habitat fragmentation and edge effects; and (4) provide connections to existing preserves that are currently isolated from each other.

The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves that include riparian habitat for valley elderberry longhorn beetle will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and preservation of long stretches of intact riparian habitat would not occur.

Another benefit of the SSHCP that would not occur on a project-by-project basis is the requirement for Preserve Setbacks, which will establish a minimum 50-foot buffer between Urban Development Covered Activities and SSHCP Preserves or existing preserves. Stream Setbacks will also protect riparian areas that are not part of Preserves. These setbacks will ensure that Preserves and avoided streams are protected from edge effects such as urban runoff, proliferation of non-native plants, light and noise exposure, and other environmental stressors.

Under existing project-by-project mitigation, Preserves are generally established without setbacks in developed areas and sacrifice a portion of the preserved lands to these edge effects, reducing the effective preservation area. By preserving existing populations of valley elderberry longhorn beetle in long, interconnected riparian areas that are protected from edge effects, the beetle will be less affected by future stochastic events and more likely to exchange genetic material between more remote populations.

In addition to modeled habitat preservation, the Implementing Entity will also re-establish and/or establish 591 acres of valley elderberry longhorn beetle modeled habitat in the Plan Area, with a priority on re-establishment before establishment. Under Objective VELB-2, re-establishment/establishment of riparian habitat will include planting of elderberry, further ensuring no net loss of the total acreage of valley elderberry longhorn beetle habitat in the Plan Area.

Objective VELB-1 will also require that any elderberry shrubs impacted by Covered Activities will be relocated or replaced in a suitable location identified by the TAC. This, coupled with the above described re-establishment and/or establishment of modeled habitat, will ensure no net loss of habitat for valley elderberry longhorn beetle. Relocation or replacement of elderberry shrubs will be implemented according to USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b).

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs, in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for valley elderberry longhorn beetle protected in the Preserve System will ensure that elderberry plants and other habitat requirements within the SSHCP Preserve System are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Measurable objectives (Table 7-51) that in particular will directly benefit valley elderberry longhorn beetle are those designed to maintain and enhance habitat, including Preserve Management Plans (Objectives HAB1 and HAB2), consideration of management history (Objective HAB3), invasive species eradication program (Objective HAB4), collecting weather data to develop status and trends (Objective

HAB6), and monitoring the groundwater table as it relates to status and trends for riparian habitat (Objective RIP5). Permanent indirect effects on modeled habitat, such as weeds, litter, and hydrologic alterations will be addressed by Objective HAB5. These actions should result in higher overall reproductive success and productivity of the Plan Area population.

Covered Activities will directly affect one documented occurrence within the UDA (within PPU 1) and no documented occurrences outside the UDA, out of a total of 156 occurrences in the Plan Area. Covered activities are not expected to indirectly affect any occurrences. At least one of the 156 occurrences will be protected in an SSHCP preserve in PPU 5, and another 111 of the 156 occurrences are already protected in existing preserves.

Recovery Plans

The USFWS published the *Valley Elderberry Longhorn Beetle Recovery Plan* in 1984. The Recovery Plan states that in order to recover the beetle, habitat must be protected along the several rivers, including the American, Sacramento, Feather, Stanislaus, Mokelumne, Calavera, Cosumnes, and San Joaquin. The Mokelumne and Cosumnes Rivers are located in the central and southern portions of the Plan Area. The main components of the Recovery Plan include: surveys for presence of the valley elderberry longhorn beetle; development of habitat protection plans; restoration of preserved sites (including exotics removal); and management and maintenance, including minimizing the use of herbicides and insecticides, preventing removal of riparian vegetation, and preventing riprapping of habitat sites. The Recovery Plan includes narratives for the following objectives (USFWS 1984).

1. *Preserve and protect known habitat sites to provide adequate habitat conditions for valley elderberry longhorn beetle.*

   The Recovery Plan identified occupied sites along three specific rivers for habitat preservation through long-term administrative actions: American River, Merced River, and Putah Creek (USFWS 1984, p. 22). The Mokelumne and Cosumnes Rivers within the Plan Area are not specifically identified for protection in the Recovery Plan. The Recovery Plan has a specific objective for developing management plans for protected sites.

2. *Survey riparian forests of the Sacramento and San Joaquin valleys for presence of valley elderberry longhorn beetle and incorporate findings into short-term and long-term management programs.*

   This objective includes surveys along the Mokelume River from Comanche Reservoir Dam and along the Cosumnes River from Bridgehouse downstream to their confluences with the San Joaquin River.

3. *Determine ecological requirements and management needs of valley elderberry longhorn beetle.*

   This objective includes field studies of the autecology of the species at known and newly discovered sites; laboratory studies on life history; field studies on potential management needs at certain sites (Goethe Park, Ancil Hoffman Park, American River Parkway, and Solano Lake Park); studies of habitat rehabilitation methods for riparian areas and incorporation of results into short- and long-term management programs; determination of population status and success of management; and determination of delisting criteria.

   With the exception of management needs at certain sites, these actions could be conducted throughout the Plan Area, and so including one or more of these studies as part of the SSHCP Monitoring and Management Program will be determined as the Monitoring and Management Program is developed in the early years of implementation (see Chapter 8).

4. *Preserve and protect newly discovered valley elderberry longhorn beetle habitat to provide suitable habitat conditions for the species.*

   This objective includes minimizing further degradation, development, or modification of habitat (41); protecting newly discovered populations; minimizing use of insecticides, herbicides, and other toxic substances; and minimizing other activities that are incompatible with habitat maintenance. These actions are all general conservation actions that will be incorporated into the SSHCP.

5. *Re-establish valley elderberry longhorn beetle at rehabilitated sites within the species' historical range.*

   This objective includes determining suitability of potential existing habitat and rehabilitation sites for reintroduction; protecting habitat sites; developing and implementing a management program for each site; and reintroducing valley elderberry longhorn beetle at selected sites. These actions are all general conservation actions that will be incorporated into the SSHCP.

6. *Increase public awareness of valley elderberry longhorn beetle through education and information programs.*

   This objective includes signage at county parks; various audio-visual programs, publications, brochures, and press releases; and distribution of information to local parks, schools, newspapers, radio, and television. Specific site-specific actions for education are not identified in the Recovery Plan, but the Preserve System Monitoring and Management Program will include this action as appropriate (see Chapter 8). Also, because the Recovery Plan dates back to 1984, education actions will need to be updated to take advantage of current information technologies (e.g., websites, social media).

7. *Enforce law and regulation to protect valley elderberry longhorn beetle.*

   This objective includes informing local agencies about legal status of valley elderberry longhorn beetle, including applicable laws and regulations; eliminating illegal collecting; and examining the effectiveness of existing laws and regulations and proposing changes as necessary. The SSHCP itself is a means to inform local agencies about the species, and the other actions are addressed though implementation of the SSHCP, such as management of the Preserve System and any changes in local ordinances that relate to protection and management of the Preserve System.

Critical Habitat

Critical Habitat designated for the valley elderberry longhorn beetle does not occur within the Plan Area. Critical Habitat is located north of the Plan Area along the American River.

7.6.2.14 California Tiger Salamander

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 1,757 acres of modeled habitat for California tiger salamander within the Plan Area. The SSHCP will impact up to approximately 80 acres of modeled aquatic breeding and foraging habitat and up to approximately 1,677 acres of modeled upland habitat within the Plan Area (Table 7-55). The majority of impacts to modeled habitat (81%) occur inside the UDA, including 1,366 acres of modeled upland habitat and 55 acres of modeled aquatic habitat. Covered Activities outside the UDA will directly impact 311 acres of modeled upland habitat and 25 acres of modeled aquatic habitat. SSHCP Covered Activities will not impact aquatic or upland habitat within California tiger salamander Critical Habitat (Table 7-56).

To mitigate these impacts, the SSHCP will preserve a total of 17,062 acres of California tiger salamander modeled habitat, including 885 acres of modeled aquatic habitat (Vernal Pool and Seasonal Wetland) and 16,177 acres of modeled upland habitat (Blue Oak Savanna and Valley Grassland). Of the preserved habitat, 1,872 acres will be in Critical Habitat in PPU 7, including 61 acres of modeled aquatic habitat and 1,811 acres of modeled upland habitat. The SSHCP will also re-establish and/or establish 79 acres of modeled aquatic habitat within the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-57).

Table 7-55
Permanent Effects and Conservation for California Tiger Salamander

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Upland Habitat					
Blue Oak Savanna	0	Qualitative	0	33 [a]	0
Valley Grassland	1,677	Qualitative	1,677 [b]	16,144	0
Total Upland Habitat	**1,677**	**Qualitative**	**1,677**	**16,177**	**0**
Aquatic Habitat					
Vernal Pool	57	2	59	762	58
Seasonal Wetland	21	Qualitative	21	123	21
Total Aquatic Habitat	**78**	**2**	**80**	**885**	**79**
Total Plan-Wide Habitat	**1,755**	**2**	**1,757**	**17,062**	**79**

[a] Impacts to Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.
[b] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-56
Permanent Effects and Preservation for California Tiger Salamander Critical Habitat

Habitat Model Land Cover Types	Total Critical Habitat (acres)		Critical Habitat Unit 3 (acres)	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Upland Habitat				
Blue Oak Savanna	0	0	0	0
Valley Grassland	0	1,811	0	1,811
Total Upland Habitat	**0**	**1,811**	**0**	**1,811**
Aquatic Habitat				
Vernal Pool	0	58	0	58
Seasonal Wetland	0	3	0	3
Total Aquatic Habitat	**0**	**61**	**0**	**61**
Total in Critical Habitat Area	**0**	**1,872**	**0**	**1,872**

Table 7-57
Biological Goals and Measurable Objectives Applicable to California Tiger Salamander

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.

Table 7-57
Biological Goals and Measurable Objectives Applicable to California Tiger Salamander

Applicable Biological Goals	Related Biological Objectives
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization measures (low-impact development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.

Table 7-57
Biological Goals and Measurable Objectives Applicable to California Tiger Salamander

Applicable Biological Goals	Related Biological Objectives
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether preserves are being managed and maintained for the benefit of Covered Species
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective CTS1.** Preserve at least five occupied California tiger salamander breeding ponds.
	Objective CTS2. During assembly of the SSHCP Preserve System, ensure that modeled aquatic and upland habitat for California tiger salamander is preserved. Minimum preservation will total: • 141 acres of aquatic habitat • 1,677 acres of upland habitat. Ensure that mitigation for modeled high-value habitat impacted within California tiger salamander Critical Habitat occurs within California tiger salamander Critical Habitat (see Objectives BOW1, VP1, SW1, and VG1).
	Objective CTS3. Rural Transportation Project Covered Activities within California tiger salamander modeled habitat will be designed to allow California tiger salamander movement across the roadway area.
	Objective VPI5. Ensure that during implementation of Objective VP2, re-established and/or established vernal pools are inoculated with soils from impacted vernal pools within 1 mile of re-establishment/establishment, in accordance with Conservation Actions in Table 7-1.

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link a total of 17,062 acres of California tiger salamander modeled habitat Plan-wide, including 16,177 acres of modeled upland habitat and 885 acres of modeled aquatic habitat (Table 7-52). Additionally, the preservation of Vernal Pool Ecosystem (including pools that provide modeled breeding habitat for California tiger salamander) will protect the hydrology and soil conditions necessary for persistence of preserved California tiger salamander aquatic habitat.

Objective VP1b requires that impacts occurring within or near the Cosumnes/Rancho Seco Core Recovery Area will be mitigated through preservation in this Core Recovery Area, providing improved conservation for the species as compared to the existing project-by-project permitting.

As discussed in Section 7.5, the primary conservation focus for California tiger salamander in the Plan Area is on the formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserves that are not part of the SSHCP Preserve System. This Landscape Preserve will encompass a heterogeneous range of natural land covers and soil types associated with California tiger salamander modeled habitat and the Vernal Pool Ecosystem in the Plan Area. To the extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, resulting in a larger-scale contiguous Preserve System.

Of the 17,062 acres of California tiger salamander modeled habitat to be preserved in the Plan Area, virtually all of this preservation will occur outside the UDA, and the majority of this preservation will occur in PPU 7. The preserve design focus in PPU 7 is primarily landscape-scale preservation of natural land covers, targeting Vernal Pool and Valley Grassland in areas that are adjacent, or in proximity, to existing preserves, including other mitigation sites and mitigation banks in the area. The SSHCP Preserves in PPU 7 will be consolidated with the 12,500-acre Chance Ranch, providing continuous aquatic and upland habitat that will meet the life history needs of the California tiger salamander.

Most of the SSHCP Preserve in PPU 7 will be located within the Cosumnes/Rancho-Seco Core Recovery Area, including 752 acres of modeled aquatic habitat and 14,434 acres of modeled upland habitat (Table 7-53). Since only approximately 52 acres of California tiger salamander modeled habitat will be affected within the Cosumnes/Rancho Seco Core Area, this preservation will more than compensate for the loss.

The SSHCP Preserve System will link together SSHCP Preserves and existing preserves that have modeled California tiger salamander habitat, to help maintain dispersal between breeding

sites and modeled upland habitat. For example, there are 14 known occurrences for California tiger salamander in existing preserves and 6 known occurrences in SSHCP Preserves outside the UDA in PPU 7. The SSHCP Preserves in PPU 7 will, in most cases, directly abut existing preserves, providing seamless continuity of modeled habitat. The Preserve System also includes 312 acres of Linkage Preserve that will connect from the Landscape Preserve in PPU 7 to the Cosumnes River corridor located in PPU 5. By establishing large Preserves, the SSHCP will also ensure that connectivity between breeding pools within SSHCP Preserves is maintained.

To ensure that California tiger salamander populations are protected and continue to expand within the Plan Area, several species-specific objectives (CTS1 – CTS3) will be implemented as part of the Conservation Strategy (Table 7-54). Objective CTS1 will benefit California tiger salamander by preserving at least five occupied breeding ponds within the SSHCP Preserve System. The conservation actions for this objective also identify the necessary criteria for selecting the location and suitability of California tiger salamander breeding ponds, as well as associated upland habitats. As a result, both occupied breeding ponds and additional aquatic and upland habitat for California tiger salamander will be preserved and maintained within the Plan Area, which would not occur on a project-by-project basis. Improved management and monitoring under the SSHCP will also allow for expansion of California tiger salamander into areas not currently used by the species.

Objective CTS2 benefits California tiger salamander by requiring preservation of modeled aquatic and upland California tiger salamander habitat in SSHCP Preserves, as described above. This objective ensures that selected preserve sites contain both modeled aquatic (breeding) habitat and upland habitat (that supports fossorial mammals and occurs within 1.5 miles of aquatic habitat) for California tiger salamander. By preserving a range of California tiger salamander aquatic habitats in the Plan Area, the SSHCP will help California tiger salamander persist during expected climate change effects on precipitation and temperature.

Objective CTS3 will also benefit California tiger salamander occurring near rural transportation projects by requiring that these Covered Activities allow safe California tiger salamander movement across the roadway. This objective requires targeted species mobility studies to determine if movement between breeding ponds or between breeding ponds and upland refugia will be affected by rural transportation Covered Activities within California tiger salamander modeled habitat. This information will be used to determine if culvert under-crossings are needed and the appropriate locations for these structures. This objective will minimize or eliminate ongoing take of California tiger salamander from vehicles traveling on the roadways.

In addition to modeled habitat preservation, the Implementing Entity will also re-establish and/or establish 79 acres of California tiger salamander modeled aquatic habitat in the Plan Area, with a priority on re-establishment before establishment. Re-established and/or established aquatic

habitat will be located no more than 0.5 mile from preserved aquatic habitat to increase the likelihood that the re-established and/or established aquatic habitat will be occupied by California tiger salamander in the future, which will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. Re-establishing and/or establishing breeding pools will also ensure no net loss of the acreage of California tiger salamander aquatic habitat in the Plan Area.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for California tiger salamander protected in the Preserve System will ensure that vernal pool and seasonal wetland hydrology, vegetation, and other vernal pool and seasonal wetland habitat characteristics within the SSHCP Preserve System are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit California tiger salamander habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, and HAB4) designed to maintain and enhance aquatic habitat, including early detection and eradication of invasive species such as American bullfrogs (*Lithobates catesbeianus*) and crayfish (*Procambarus* sp.) in Preserves. Additionally, Objective HAB7 will include monitoring of vegetation height, management of which will benefit California tiger salamander since this species has difficulty migrating across areas with tall or dense vegetation. Monitoring and managing grazing practices in grassland habitats can help to maintain migration pathways between upland sites and aquatic locations. These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population. Permanent indirect effects on aquatic habitats such as hydrologic alterations will be tracked through studies of edge effects at Preserve boundaries, as directed by Objective HAB5. This information will feed into adaptive management of vernal pools and will benefit the California tiger salamander using that habitat.

Further, effectiveness monitoring of the Conservation Strategy for California tiger salamander will include a special study to investigate indirect effects of development on the Vernal Pool Ecosystem. The results of that study will inform adaptive management of SSHCP Condition 2 AMMs, as well as adaptive management of SSHCP Preserves. As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species and California tiger salamander by reducing the density of non-native grasses in the surrounding uplands, which will not only improve the ability of California tiger salamander to move through upland habitat, but will also reduce water consumption from the perched aquifer and pools and allow filling from surface flows if present.

Critical Habitat

The California tiger salamander primary Critical Habitat constituent elements (USFWS 2005b) are described in a similar manner as the SSHCP aquatic (Vernal Pool and Seasonal Wetland) and terrestrial upland (Blue Oak Savanna, Blue Oak Woodland, and Valley Grassland) land cover types located anywhere within designated Critical Habitat.

The SSHCP Conservation Strategy will preserve a total of 1,872 acres of modeled aquatic and upland habitat within California tiger salamander CHU 3. SSHCP Covered Activities will not impact aquatic or upland habitat within California tiger salamander Critical Habitat. Monitoring and adaptive management under the SSHCP will ensure that the PCEs for California tiger salamander are maintained within the CHU, and allow the PCEs to provide their intended conservation function for the species.

Recovery Plan

USFWS has prepared a *Draft Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamande*r (Ambystoma californiense) (USFWS 2016). The Draft Recovery Plan includes three recovery objectives for the species:

1. Secure self-sustaining populations of Central California tiger salamander throughout the full range of the Distinct Population Segment, ensuring conservation of genetic variability and diverse habitat types (e.g., across elevation and precipitation gradients).
2. Ameliorate or eliminate the threats that caused the species to be listed, and any future threats.
3. Restore and conserve a healthy ecosystem supportive of Central California tiger salamander populations.

The Plan Area is located within the Central Valley Recovery Unit of the Draft Recovery Plan, and contains approximately 62,937 acres of the 207,100-acre Rancho Seco Management Unit. SSHCP Covered Activities would impact up to 45 acres of modeled upland habitat and 6 acres

of modeled aquatic habitat in the Rancho Seco Management Unit of the Central Valley Recovery Unit (Table 7-58).

Table 7-58
Permanent Effects and Conservation in Recovery Area for California Tiger Salamander

Habitat Model Land Cover Types	Rancho Seco Management Unit	
	Total Effect	*Total Habitat Preservation*
Upland Habitat		
Blue Oak Savanna	0	33
Valley Grassland	45	14,530
Total Upland Habitat	*45*	*14,563*
Aquatic Habitat		
Vernal Pool	6	697
Seasonal Wetland	0	47
Total Aquatic Habitat	*6*	*744*
Total in Management Unit	**51**	**15,308**

The Draft Recovery Plan stipulates that preserves in the Central Valley Recovery Unit must be at least 3,398 acres in size to allow for sufficient upland and breeding habitat. The target number of preserves for the Rancho Seco Management Unit is 5, with a total area of 16,990. The SSHCP would create approximately 15,308 acres of preserve in the Rancho Seco Management Unit, including a Landscape Preserve of greater than 10,000 acres. Many of the recovery actions identified in the Draft Recovery Plan are included in the SSHCP, including locating preserves where fossorial mammals create adequate burrow habitat (Objective CTS2), removal of non-native invasive vegetation and invasive wildlife (Objective HAB4), maintaining linkages between preserves (Objective L2), design undercrossings to minimize road mortality of California tiger salamanders (Objective CTS3), and ensure long-term monitoring and management of preserve sites in perpetuity (refer to Chapter 8).

7.6.2.15 Western Spadefoot

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 23,207 acres of modeled habitat for western spadefoot within the Plan Area. The SSHCP will impact up to approximately 1,164 acres of modeled aquatic breeding and foraging habitat, which includes Vernal Pool, Swale, Seasonal Wetland, Open Water, Stream/Creek, and Stream/Creek (VPIH); and up to approximately 22,043 acres of modeled upland habitat, which includes Blue Oak Savanna, Blue Oak Woodland, and Valley Grassland within the Plan Area

(Table 7-59). The majority of impacts to modeled habitat (97%) will occur inside the UDA, including 21,329 acres of modeled upland habitat and 1,089 acres of modeled aquatic habitat.

To mitigate these impacts, the SSHCP will preserve a total of approximately 23,708 acres of western spadefoot modeled habitat, including approximately 1,647 acres of modeled aquatic habitat (vernal pool, swale, seasonal wetland, open water, stream/creek, and stream/creek [VPIH]) and approximately 22,061 acres of modeled upland habitat (blue oak savanna and valley grassland). The SSHCP will also re-establish and/or establish 1,022 acres of modeled aquatic habitat and 47 acres of modeled upland habitat within the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-60).

Table 7-59
Permanent Effects and Conservation for Western Spadefoot

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Upland Habitat					
Blue Oak Savanna	38	Qualitative	38	38[a]	38[b]
Blue Oak Woodland	9	Qualitative	9	9[a]	9[b]
Valley Grassland	21,996	Qualitative	21,996[c]	22,014	0
Total Upland Habitat	*22,043*	*Qualitative*	*22,043*	*22,061*	*47*
Aquatic Habitat					
Vernal Pool	389	94	483	966	389
Swale	234	44	278	278	256
Seasonal Wetland	105	Qualitative	105	105	105
Open Water	155	Qualitative	155	155	155[d]
Stream/Creek	117	Qualitative	117	117	117
Stream/Creek (VPIH)	22	4	26	26	0[e]
Total Aquatic Habitat	*1,022*	*142*	*1,164*	*1,647*	*1,022*
Total Plan-Wide Habitat	**23,065**	**142**	**23,207**	**23,708**	**1,069**

[a] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.

[b] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.

[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

[d] Re-establishment and/or establishment of Open Water can be achieved by re-establishing and/or establishing an aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[e] Re-establishment/establishment to mitigate effects to Stream/Creek (VPIH) will be in the form of Swale, which has been added to the 234 acres necessary to mitigate effects to Swale.

Table 7-60
Biological Goals and Measurable Objectives Applicable to Western Spadefoot

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established or during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W7. Ensure that when re-establishing/establishing vernal pools, swales, and freshwater marsh that a minimum of 50 acres of vernal pool, 30 acres of swale, and 50 acres of freshwater marsh re-establishment/establishment occur within the Morrison Creek Watershed.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1

Table 7-60
Biological Goals and Measurable Objectives Applicable to Western Spadefoot

Applicable Biological Goals	Related Biological Objectives
	mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective OW1. Preserve a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective SC1. Preserve a minimum of 117 acres of the Stream/Creek land cover. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SC2. Re-establish and/or establish a minimum of 117 acres of the Stream/Creek land cover. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species

Table 7-60
Biological Goals and Measurable Objectives Applicable to Western Spadefoot

Applicable Biological Goals	Related Biological Objectives
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective WS1.** During assembly of the SSHCP Preserve System, ensure that modeled aquatic and upland habitat for western spadefoot (*Spea hammondii*) is preserved. Minimum preservation will total: • 1,531 acres of aquatic habitat • 22,044 acres of upland habitat. Ensure that mitigation for modeled high-value habitat impacted within the Mather Core or Cosumnes/Rancho-Seco Core Recovery Areas occurs within the Core Recovery Areas (see Objectives BOW1, VP1, VP3, SW1, SC1, OW1, and VG1).
	Objective WS2. During assembly of the SSHCP Preserve System, ensure that modeled aquatic habitat for western spadefoot is re-established and/or established. Minimum re-establishment and/or establishment will total 906 acres of aquatic habitat. Ensure that mitigation for modeled high-value habitat impacted within the Mather Core or Cosumnes/Rancho-Seco Core Recovery Areas occurs within the Core Recovery Areas (see Objectives VP2, SW2, and OW2).

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link a minimum of 1,647 acres of modeled aquatic habitat in the Plan Area, including 1,534 acres of aquatic habitat in the Mather and Cosumnes/Rancho-Seco Core Recovery Areas, which will provide adequate aquatic habitat for western spadefoot in the Plan Area. In addition, through ensuring that a minimum of 22,061 acres of modeled upland habitat for western spadefoot is preserved in the Plan Area including 19,610 acres of upland habitat within the Mather and Cosumnes/Rancho-Seco Core Recovery Areas, western spadefoot will have adequate upland habitat in the Plan Area. Additionally, the preservation of Vernal Pool Ecosystem (including pools that provide modeled

breeding habitat for western spadefoot) will protect the hydrology and soil conditions necessary for persistence of preserved western spadefoot aquatic habitat.

Objective VP1b requires that impacts occurring within the Mather and Cosumnes/Rancho Seco Core Recovery Areas will be mitigated through preservation in these Core Recovery Areas, providing improved conservation for the species as compared to the existing project-by-project permitting.

As discussed in Section 7.5, the primary conservation focus for western spadefoot in the Plan Area is on the formation of a large landscape-scale Preserve (at least 10,500 acres) in the Cosumnes/Rancho-Seco Core Recovery Area that connects to and augments existing preserves that are not part of the SSHCP Preserve System. This Landscape Preserve will encompass a heterogeneous range of natural land covers and soil types associated with western spadefoot modeled habitat and the Vernal Pool Ecosystem in the Plan Area. To the extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, resulting in a larger-scale contiguous Preserve System.

The majority of the preservation will occur outside the UDA, and most of this preservation will occur in the Cosumnes/Rancho Seco Core Recovery Area (in PPU 7) and in a small portion of the Mather Core Recovery Area. The preserve design focus outside the UDA is primarily landscape-scale preservation of natural land covers, targeting Vernal Pool and Valley Grassland in areas that are adjacent, or in proximity, to existing preserves, including other mitigation sites and mitigation banks in the area. The SSHCP Preserve in PPU 7 will be consolidated with the 12,500-acre Chance Ranch, providing continuous aquatic and upland habitat that will meet the life history needs of the western spadefoot. Inside the UDA, a total of 6,380 acres will be preserved. Even though a large landscape-scale Preserve was not possible inside the UDA due to development and numerous additional constraints, large connected Preserves is still a primary goal.

The SSHCP Preserve System will link together SSHCP Preserves and existing preserves that have modeled western spadefoot habitat to help maintain dispersal between breeding sites and modeled upland habitat. For example, there are three known occurrences for western spadefoot in existing preservation outside the UDA in PPUs 5 and 7, and seven known occurrences in SSHCP Preserves in PPU 7. The SSHCP Preserves in PPU 7 will in most cases directly abut existing preserves, providing seamless continuity of modeled habitat. The Preserve System also includes a Linkage Preserve that will connect from the Landscape Preserve in PPU 7 to the Cosumnes River/Deer Creek Wildlife Movement Corridor located in PPU 5. Inside the UDA, there are two known occurrences of western spadefoot in existing preserves in PPUs 1 and 3, and two occurrences in SSHCP Preserves in PPUs 1 and 2. The Preserve System also includes a Linkage Preserve that will connect SSHCP Preserves and existing preserves in PPU 1. As a result, aquatic and upland habitat for western spadefoot will be preserved and maintained within the Plan Area, which would not

occur on a project-by-project basis. Improved management and monitoring under the SSHCP will also allow for expansion of western spadefoot into areas not currently used by the species.

To ensure that western spadefoot populations are protected and continue to expand within the Plan Area, two species-specific objectives (WS1 and WS2) will be implemented as part of the Conservation Strategy. Objective WS1 will benefit western spadefoot during assembly of the SSHCP Preserve System, by ensuring that modeled aquatic and upland habitat for western spadefoot is preserved. The conservation actions for this objective also identify minimum preservation acreages for both modeled aquatic and modeled upland habitats. By preserving a range of western spadefoot aquatic habitats in the Plan Area, the SSHCP will help western spadefoot persist during expected climate change effects on precipitation and temperature.

Objective WS2 will also benefit western spadefoot during assembly of the SSHCP Preserve System, by ensuring that modeled aquatic habitat for western spadefoot is re-established and/or established. The conservation action for this objective also identifies the minimum acreage for re-establishment and/or establishment of aquatic habitat. Additionally, this objective will ensure that any re-established or established aquatic habitat is located no more than 500 feet from preserved aquatic habitat. This requirement will increase the likelihood that the re-established or established aquatic habitat will be occupied by western spadefoot in the future, which will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. Re-establishing and/or establishing breeding pools will also ensure no net loss of western spadefoot aquatic habitat in the Plan Area.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries that would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for western spadefoot protected in the Preserve System will ensure that vernal pool and seasonal wetland hydrology, vegetation, and other vernal pool and seasonal wetland habitat characteristics within the SSHCP Preserve System are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit western spadefoot habitat from

the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, and HAB4) designed to maintain and enhance aquatic habitat, including early detection and eradication of invasive species such as American bullfrogs and crayfish in Preserves (Table 7-57). Additionally, Objective HAB7 will include monitoring of vegetation height, management of which will benefit western spadefoot since this species has difficulty moving through areas with tall or dense vegetation. Monitoring and managing grazing practices in grassland habitats can help to maintain movement pathways between upland sites and aquatic locations. These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population. Permanent indirect effects on aquatic habitats such as hydrologic alterations will be tracked through studies of edge effects at Preserve boundaries, as directed by Objective HAB5. This information will feed into adaptive management of vernal pools and will benefit western spadefoot using that habitat.

Further, effectiveness monitoring of the Conservation Strategy for western spadefoot will include a special study to investigate indirect effects of development on the Vernal Pool Ecosystem. The results of that study will inform adaptive management of SSHCP Condition 2 AMMs, as well as adaptive management of SSHCP Preserves. As Preserve Management Plans are implemented, grazing will be managed for the benefit of vernal pool Covered Species and western spadefoot by reducing the density of non-native grasses in the surrounding uplands, which will not only improve the ability of western spadefoot to move through upland habitat, but also reduce water consumption from the perched aquifer and pools and allow filling from surface flows if present.

Recovery Plans

To conserve this species, the Recovery Plan prioritizes preservation of Vernal Pool Ecosystem within several core areas, including the Mather Core Recovery Area and the Cosumnes/Rancho Seco Core Recovery Area in the Plan Area. SSHCP Covered Activities are anticipated to impact up to approximately 8,600 acres of western spadefoot modeled habitat in the Recovery Areas (Table 7-61).

The SSHCP Conservation Strategy will preserve and link approximately 21,144 acres of modeled habitat for western spadefoot in the Recovery Areas. The SSHCP especially focuses conservation for the western spadefoot on the large areas of intact habitat present in the Cosumnes/Rancho Seco Core Recovery Area. A total of 15,299 acres of Vernal Pool Ecosystem will be preserved there, including 897 acres of aquatic habitat and 14,402 acres of valley grassland in hydrologically connected uplands (Table 7-61). When combined with existing preserves, 83% of the modeled western spadefoot habitat in the Cosumnes/Rancho Seco Core Recovery Area will be preserved, consistent with the 80% target of the 2005 Recovery Plan.

Within the Mather Core Recovery Area, existing and planned development constrains the inventory of western spadefoot habitat that is available for preservation. Therefore, the SSHCP

preserves a total of 5,601 acres of Vernal Pool Ecosystem in the Mather Core Recovery Area, including 440 acres of aquatic habitat and 5,161 acres of valley grassland in hydrologically connected uplands. When combined with existing preserves, 46% of the modeled western spadefoot habitat in the Mather Core Recovery Area will be preserved.

Table 7-61
Habitat Impacts and Conservation in Core Recovery Areas for Western Spadefoot

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)
Mather Core Recovery Area				
Upland Habitat				
Blue Oak Savanna	9	Qualitative	9	15
Blue Oak Woodland	0	Qualitative	0	0
Valley Grassland	8,118	Qualitative	8,118	5,161
Total Upland Habitat	*8,127*	*Qualitative*	*8,127*	*5,176*
Aquatic Habitat				
Vernal Pool	144	72	216	288
Swale	112	38	150	126
Seasonal Wetland	6	Qualitative	6	1
Open Water	26	Qualitative	26	56
Stream/Creek	6	Qualitative	6	11
Stream/Creek (VPIH)	13	3	16	26
Total Aquatic Habitat	*307*	*113*	*420*	*508*
Total in Core Recovery Area	**8,434**	**113**	**8,547**	**5,684**
Cosumnes/Rancho-Seco Core Recovery Area				
Upland Habitat				
Blue Oak Savanna	0	Qualitative	0	33
Valley Grassland	46	Qualitative	46	14,402
Total Upland Habitat	*46*	*Qualitative*	*46*	*14,435*
Aquatic Habitat				
Vernal Pool	6	0	6	708
Swale	1	0	1	189
Seasonal Wetland	0	Qualitative	0	50
Open Water	0	Qualitative	0	4
Stream/Creek	0	Qualitative	0	62
Stream/Creek (VPIH)	0	0	0	0
Total Aquatic Habitat	*7*	*0*	*7*	*1,013*
Total in Core Recovery Area	**53**	**0**	**53**	**15,448**
Total Core Recovery Area				
Upland Habitat				
Blue Oak Savanna	9	Qualitative	9	47
Valley Grassland	8,164	Qualitative	8,164	19,563
Total Upland Habitat	*8,173*	*Qualitative*	*8,173*	*19,610*

Table 7-61
Habitat Impacts and Conservation in Core Recovery Areas for Western Spadefoot

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)
Aquatic Habitat				
Vernal Pool	150	72	222	996
Swale	113	38	151	315
Seasonal Wetland	6	Qualitative	6	51
Open Water	26	Qualitative	26	61
Streams/Creeks	6	Qualitative	6	73
Streams/Creeks (VPIH)	13	3	16	38
Total Aquatic Habitat	*314*	*113*	*427*	*1,534*
Total in Core Recovery Areas	**8,487**	**113**	**8,600**	**21,144**

The SSHCP Conservation Strategy is equivalent to implementation of the 2005 Recovery Plan for the Plan Area because it provides an alternative Conservation Strategy for conserving western spadefoot and contains the six elements of recovery. The manner in which the SSHCP achieves this consistency for western spadefoot is discussed in detail in Section 7.6.3.

7.6.2.16 Giant Gartersnake

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 2,358 acres of modeled habitat for giant gartersnake within the Plan Area (Table 7-62). The SSHCP will impact up to approximately 169 acres of modeled aquatic habitat (core and peripheral) and up to approximately 2,189 acres of modeled upland habitat within the Plan Area (Table 7-62). The majority of impacts to modeled habitat (89%) occur inside the UDA, including 144 acres of modeled aquatic habitat and 1,965 acres of modeled upland habitat. Covered Activities outside the UDA will directly impact approximately 25 acres of modeled aquatic habitat and 224 acres of modeled upland habitat.

To mitigate these impacts, the SSHCP will preserve a total of 5,524 acres of giant gartersnake modeled habitat within the Plan Area, including 406 acres of modeled aquatic habitat and 5,118 acres of modeled upland habitat (Table 7-58). Most of this preservation will occur outside the UDA in PPU 7. Of the preserved habitat, 996 acres will be in high-value habitat, including 325 acres of modeled aquatic habitat and 671 acres of modeled upland habitat (Table 6-63). High-value habitat is specifically limited to modeled habitat within the Badger Creek and Stone Lakes NWR areas where there are known subpopulations of giant gartersnake. The SSHCP will also re-establish and/or establish 303 acres of modeled habitat within the Plan Area, including 169 acres

of modeled aquatic habitat and 134 acres of modeled upland habitat. Approximately 232 acres of the 303 acres to be re-established and/or established will be in high-value habitat (Table 6-63). All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-64).

Table 7-62
Permanent Effects and Conservation for Giant Gartersnake

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Plan-Wide Habitat (includes High-Value Habitat[a])					
Seasonal Wetland	39	Qualitative	39	100	39
Freshwater Marsh	71	Qualitative	71	127	71
Open Water	25	Qualitative	25	62[b]	25[c]
Streams/Creeks	34	Qualitative	34	117	34
Total Aquatic Habitat	**169**	**Qualitative**	**169**	**406**	**169**
Mixed Riparian Scrub	135	Qualitative	135	105[d]	134[e]
Valley Grassland	2,054	Qualitative	2,054	5,013[f]	0
Total Upland Habitat	**2,189**	**Qualitative**	**2,189**	**5,118**	**134**
Total Plan-Wide Habitat	**2,358**	**Qualitative**	**2,358**	**5,524**	**303**

[a] High-value habitat is specifically limited to the Badger Creek and Stone Lakes NWR areas where there are known subpopulations of giant gartersnake. High-value habitat for giant gartersnake includes Freshwater Marsh, Stream/Creek, Open Water (excluding ski lakes), Seasonal Wetland, Mixed Riparian Scrub, and Valley Grassland land cover types in these areas.

[b] Preservation of Open Water can be achieved by preserving any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[c] Re-establishment and/or establishment of Open Water can be achieved by re-establishing and/or establishing any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[d] Impacts to Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[e] Impacts to Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub or any combination of the two.

[f] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-63
Permanent Effects and Conservation for Giant Gartersnake High-Value Habitat

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
High-Value Habitat[a]					
Seasonal Wetland	27	Qualitative	27	67	27
Freshwater Marsh	58	Qualitative	58	127	58
Open Water	2	Qualitative	2	31[b]	2[c]
Stream/Creek	17	Qualitative	17	100	17

Table 7-63
Permanent Effects and Conservation for Giant Gartersnake High-Value Habitat

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Total High-Value Aquatic Habitat	**104**	**Qualitative**	**104**	**325**	**104**
Mixed Riparian Scrub	127	Qualitative	127	47[d]	128[e]
Valley Grassland	375	Qualitative	375	624[f]	0
Total High-Value Upland Habitat	**502**	**Qualitative**	**502**	**671**	**128**
Total High-Value Habitat	**606**	**Qualitative**	**606**	**996**	**232**

[a] High-value habitat is specifically limited to the Badger Creek and Stone Lakes NWR areas where there are known subpopulations of giant gartersnake. High-value habitat for giant gartersnake includes Freshwater Marsh, Stream/Creek, Open Water (excluding ski lakes), Seasonal Wetland, Mixed Riparian Scrub, and Valley Grassland land cover types in these areas.

[b] Preservation of Open Water can be achieved by preserving any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[c] Re-establishment and/or establishment of Open Water can be achieved by re-establishing and/or establishing any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[d] Impacts to Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[e] Impacts to Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[f] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter

Table 7-64
Biological Goals and Measurable Objectives Applicable to Giant Gartersnake

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W1.** Ensure that during implementation of Objective L2 (establishing minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.
	Objective W2. Covered Activities shall implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs)

Table 7-64
Biological Goals and Measurable Objectives Applicable to Giant Gartersnake

Applicable Biological Goals	Related Biological Objectives
	• Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP1. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective OW1. Preserve a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-

Table 7-64
Biological Goals and Measurable Objectives Applicable to Giant Gartersnake

Applicable Biological Goals	Related Biological Objectives
	establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective SC1. Preserve a minimum of 117 acres of the Stream/Creek land cover. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SC2. Re-establish and/or establish a minimum of 117 acres of the Stream/Creek land cover. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective GGS1**. During assembly of the SSHCP Preserve System, ensure that modeled habitats for giant gartersnake are preserved along the following creeks (or other creeks that are determined by the TAC to provide similar giant gartersnake habitat value): • Lower Laguna Creek, mainly between Twin Cities Road (State Route 104) and Miess Road; • Skunk Creek, which flows into the Cosumnes River northwest of the City of Galt; • the short Willow Creek and tributaries of Badger Creek, which are to the north of the lower Laguna Creek and west of the Folsom South Canal; and • Badger Marsh. Mitigation for impacts to modeled habitats for giant gartersnake that occur along Badger Creek and Stone Lakes will occur along these drainages. Minimum preservation will total • 170 acres of giant gartersnake high-value aquatic habitat and • 2,323 acres of giant gartersnake high-value upland habitat. (See Objectives AG1, FWM1, SW1, SC1, OW1, RIP1, RIP3, and VG1.)
	Objective GGS2. During assembly of the SSHCP Preserve System, ensure that modeled habitats for giant gartersnake are re-established and/or established along the following creeks (or other creeks that are determined by the TAC to

Table 7-64
Biological Goals and Measurable Objectives Applicable to Giant Gartersnake

Applicable Biological Goals	Related Biological Objectives
	provide similar habitat value): • Lower Laguna Creek, mainly between Twin Cities Road (State Route 104) and Miess Road; • Skunk Creek: this creek flows into the Cosumnes River northwest of the City of Galt; • north of Lower Laguna Creek and west of the Folsom South Canal are several small creeks—the short Willow Creek and tributaries of Badger Creek; and • Badger Marsh. Mitigation for impacts to modeled habitats for giant gartersnake that occur along Badger Creek and Stone Lakes will occur along these drainages. Minimum re-establishment and/or establishment will total • 170 acres of high-value aquatic habitat and • 134 acres of high-value upland habitat. (See Objectives SW2, OW2, RIP2, and RIP4.)
	Objective GGS3. Plan Permittees will conduct a study to establish hydrologic baseline conditions along Badger Creek to identify what level of hydrology is necessary to support giant gartersnake and acquire a water source to maintain the minimum level of hydrology during the summer months when agricultural runoff may wane.

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link a minimum of 406 acres of modeled aquatic habitat in the Plan Area including 325 acres of high-value aquatic habitat in the Badger Creek and Stone Lakes NWR areas, which will provide adequate aquatic habitat for giant gartersnake in the Plan Area. In addition, through ensuring that a minimum of 5,118 acres of modeled upland habitat for giant gartersnake is preserved in the Plan Area, including 671 acres of high-value upland habitat within the Badger Creek and Stone Lakes NWR areas, giant gartersnake will have adequate upland habitat in the Plan Area. Plan Area streams and creeks will be protected from direct and indirect effects of urban development through Stream Setbacks, as described in AMM STREAM-1 and STREAM-2.

Objective VP1b requires that impacts occurring within or near the Badger Creek and Stone Lakes NWR high-value habitat areas will be mitigated through preservation in these core aquatic habitat areas, providing improved conservation for the species as compared to the existing project-by-project permitting.

A total of 5,524 acres of giant gartersnake modeled habitat will be preserved Plan-wide, including 406 acres of modeled aquatic habitat and 5,118 acres of modeled upland habitat. Most of this preservation will occur outside the UDA.

The Preserve System will link together SSHCP Preserves and existing preserves that have modeled giant gartersnake habitat to help maintain dispersal between breeding sites and modeled upland habitat. For example, there are two known occurrences for giant gartersnake in existing preservation and two known occurrences in SSHCP Preserves outside the UDA in PPU 6. Most of the occurrences (8 of 11 occurrences) of giant gartersnake within the Plan Area are in PPU 6 in the Badger Creek and Stone Lakes NWR areas. As a result, both occupied habitat and additional modeled aquatic and upland habitat for giant gartersnake will be preserved and maintained within the Plan Area, which would not occur on a project-by-project basis. Improved management and monitoring under the SSHCP will also allow for expansion of giant gartersnake into areas not currently used by the species.

To ensure that giant gartersnake populations are protected and continue to expand within the Plan Area, three species-specific objectives (GGS1 – GGS3) will be implemented as part of the Conservation Strategy (Table 7-64). Objective GGS1 will benefit giant gartersnake during Preserve Assembly by ensuring that modeled habitats for giant gartersnake are preserved along specified creeks that provide giant gartersnake habitat value as identified in the Conservation Actions for this objective. By preserving a range of giant gartersnake aquatic and upland habitats in the Plan Area and providing Stream Setbacks which minimize impacts of urban development, the SSHCP will help giant gartersnakes persist during expected climate change effects on precipitation and temperature.

Objective GGS2 will benefit giant gartersnake during Preserve Assembly by ensuring that modeled habitats for giant gartersnake are re-established and/or established along specified creeks that provide giant gartersnake habitat value as identified in the Conservation Actions for this objective. Objective GGS3 will also benefit giant gartersnake by establishing baseline hydrologic conditions along Badger Creek to identify the level of hydrology necessary to support giant gartersnake and by acquiring water sources to maintain the minimum level of hydrology during the summer months when agricultural runoff may diminish.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal

pool watersheds–SSHCP Preserve boundaries that would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for giant gartersnake protected in the Preserve System will ensure that freshwater marsh, seasonal wetland, open water, and stream/creek hydrology, vegetation, and other wetland habitat characteristics within the SSHCP Preserve System are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit giant gartersnake habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, and HAB4) designed to maintain and enhance aquatic habitat, including early detection and eradication of invasive species such as American bullfrogs in Preserves. These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population. Permanent indirect effects on aquatic habitats such as hydrologic alterations will be tracked through studies of edge effects at Preserve boundaries, as directed by Objective HAB5.

Recovery Plan

The overall objective of the *Revised Draft Recovery Plan for the Giant Garter Snake* (Thamnophis gigas) (USFWS 2015a) is to delist the giant gartersnake, with the interim goals being (1) stabilizing and protecting existing populations, and (2) conducting research necessary to further refine recovery criteria.

Recovery tasks emphasized in this plan are (1) habitat protection; (2) public participation, outreach, and education; (3) habitat management and restoration; (4) surveying and monitoring; and (5) research.

The Plan Area is located within the Cosumnes/Mokelumne Watershed Recovery Unit and the Delta Basin Recovery Unit of the Draft Recovery Plan. The Plan Area contains approximately 140,871 acres of the 235,002-acre Cosumnes-Mokelumne Watershed Recovery Unit, and 33,467 acres of the 699,859-acre Delta Basin Recovery Unit. SSHCP Covered Activities would impact up to 1,887 acres of modeled upland habitat and 131 acres of modeled aquatic habitat in the Cosumnes/Mokelumne Watershed Recovery Unit (Table 7-65). Covered Activities would also impact up to 60 acres of modeled upland habitat and 13 acres of modeled aquatic habitat in the Delta Basin Recovery Unit.

Table 7-65
Permanent Effects and Conservation in Recovery Area for Giant Gartersnake

Habitat Model Land Cover Types	Cosumnes-Mokelumne Watershed Recovery Unit		Delta Basin Recovery Unit		All Recovery Units	
	Total Effect	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*	*Total Effect*	*Total Habitat Preservation*
Aquatic Habitat						
Seasonal Wetland	38	94	2	5	40	99
Freshwater Marsh	66	127	3	26	69	153
Open Water	3	17	0	23	3	40
Stream/Creek	24	106	8	24	32	130
Total Aquatic Habitat	*131*	*344*	*13*	*78*	*144*	*422*
Upland Habitat						
Mixed Riparian Scrub	134	63	0	33	134	96
Valley Grassland	1,753	1,795	60	16	1,813	1,811
Total Upland Habitat	*1,887*	*1,858*	*60*	*49*	*1,947*	*1,907*
Total in Core Recovery Area	**2,018**	**2,202**	**73**	**127**	**2,091**	**2,329**

To offset these impacts, the SSHCP Conservation Strategy for giant gartersnake will preserve 49 acres of modeled upland habitat and 78 acres of modeled aquatic habitat in the Delta Basin Recovery Unit and will preserve 1,858 acres of modeled upland habitat and 344 acres of modeled aquatic habitat in the Cosumnes-Mokelumne Watershed Recovery Unit. The total impacts to giant gartersnake modeled habitat that is within recovery units that are within the SSHCP Plan Area will be 2,901 acres. These impacts will be offset by preserving a total of 2,329 acres of giant gartersnake modeled habitat within recovery units that are within the SSHCP Plan Area.

The SSHCP Conservation Strategy will also help fulfill the objectives in the draft recovery plan by preserving and protecting the existing Cosumnes-Mokelumne Recovery Unit subpopulation in the Badger Creek/Willow Creek area and in the Delta Basin Recovery Unit, as well as monitoring and managing these habitats in perpetuity. By preserving habitat in these areas, the SSHCP will ensure that ample movement and dispersal habitat for giant gartersnake remains in these Recovery Units. The Preserve System will also include connections to adjacent large blocks of existing preserved habitat associated with the Stone Lakes NWR and the Cosumnes River Preserve that also provides habitat for giant gartersnake that is within giant gartersnake Recovery Units.

7.6.2.17 Western Pond Turtle

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 10,972 acres of modeled habitat for western pond turtle within the Plan Area (Table 7-66). The SSHCP will impact up to approximately 316 acres of modeled aquatic habitat, consisting of freshwater marsh, open water, and stream/creek and up to approximately 10,656 acres of modeled upland habitat which includes blue oak woodland, blue oak savanna, valley grassland, mine tailing riparian woodland, mixed riparian woodland, and mixed riparian scrub within the Plan Area. The majority of impacts to modeled habitat (94%) occur inside the UDA, including 282 acres of modeled aquatic habitat and 10,064 acres of modeled upland habitat. Covered Activities outside the UDA will directly impact approximately 34 acres of modeled aquatic habitat and 592 acres of modeled upland habitat.

To mitigate these impacts, the SSHCP will preserve a total of 13,102 acres of western pond turtle modeled habitat within the Plan Area, including 330 acres of modeled aquatic habitat and 12,772 acres of modeled upland habitat (Table 7-66). Most of this preservation will occur outside the UDA in PPU 7. The SSHCP will also re-establish and/or establish 716 acres of modeled habitat within the Plan Area, including 316 acres of modeled aquatic habitat and 400 acres of modeled upland habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-67).

Table 7-66
Permanent Effects and Conservation for Western Pond Turtle

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/ or Establishment (acres)
Upland Habitat					
Blue Oak Woodland	9	Qualitative	9	0[a]	9[b]
Blue Oak Savanna	35	Qualitative	35	34[a]	35[b]
Valley Grassland	10,256	Qualitative	10,256	12,319[c]	0
Mine Tailing Riparian Woodland	41	Qualitative	41	37[d]	41[e]
Mixed Riparian Woodland	170	Qualitative	170	368[f]	170[g]
Mixed Riparian Scrub	145	Qualitative	145	14[f]	145[g]
Total Upland Habitat	*10,656*	*Qualitative*	*10,656*	*12,772*	*400*
Aquatic Habitat					
Freshwater Marsh	95	Qualitative	95	127	95
Open Water	104	Qualitative	104	86[h]	104[i]

Table 7-66
Permanent Effects and Conservation for Western Pond Turtle

Land Cover Types	Direct Effects (acres)	Indirect Effects (Acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/ or Establishment (acres)
Stream/Creeks	117	Qualitative	117	117	117
Total Aquatic Habitat	*316*	*Qualitative*	*316*	*330*	*316*
Total Plan-Wide Habitat	**10,972**	**Qualitative**	**10,972**	**13,102**	**716**

[a] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.

[b] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.

[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

[d] Impacts to Mine Tailing Riparian Woodland will be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian.

[e] Impacts to Mine Tailing Riparian Woodland will be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[f] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[g] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[h] Preservation of Open Water can be achieved by preserving any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[i] Re-establishment and/or establishment of Open Water can be achieved by re-establishing and/or establishing any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

Table 7-67
Biological Goals and Measurable Objectives Applicable to Western Pond Turtle

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W1.** Ensure that during implementation of Objective L2 (establishing minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.
	Objective W2. Covered Activities shall implement the following, as outlined in Section 5.4.2:

Table 7-67
Biological Goals and Measurable Objectives Applicable to Western Pond Turtle

Applicable Biological Goals	Related Biological Objectives
	• Incorporate the SSHCP Design Avoidance and Minimization Measures (low-impact development (LID) and ROAD AMMs) • Ground disturbance Avoidance and Minimization Measures (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities shall implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities shall implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
	Objective W6. Covered Activities will avoid a minimum of 20% of first and second order tributaries to Elder Creek, Frye Creek, Gerber Creek, Morrison Creek, Paseo Central, and Sun Creek in the UDA.
Goal 3. Preserve, re-establish, or establish, natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective RIP1. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective OW1. Preserve a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.

Table 7-67
Biological Goals and Measurable Objectives Applicable to Western Pond Turtle

Applicable Biological Goals	Related Biological Objectives
	Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective SC1. Preserve a minimum of 117 acres of the Stream/Creek land cover. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SC2. Re-establish and/or establish a minimum of 117 acres of the Stream/Creek land cover. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether preserves are being managed and maintained for the benefit of Covered Species
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the County to assist in developing status and trends, track climate change, etc.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective WPT1**. During assembly of the SSHCP Preserve System, ensure that modeled aquatic and upland habitat for western pond turtle (*Actinemys marmorata*) is preserved. Minimum preservation will total • 315.35 acres of aquatic habitat and • 10,971 acres of upland habitat. (See Objectives FWM1, OW1, RIP1, RIP3, VG1, BOW1, and SC1.)
	Objective WPT2. During assembly of the SSHCP Preserve System, ensure that modeled aquatic habitat for western pond turtle is re-established and/or established. Minimum re-establishment and/or establishment will total 315 acres of aquatic habitat. (See Objectives RIP2, FWM2, and OW2.)

Analysis of Western Pond Turtle Conservation

The SSHCP Conservation Strategy will preserve and link a minimum of 330 acres of modeled aquatic habitat in the Plan Area, which will provide adequate aquatic habitat for western pond turtle in the Plan Area. In addition, through ensuring that a minimum of 12,772 acres of modeled upland habitat for western pond turtle is preserved in the Plan Area, western pond turtle will have adequate upland habitat in the Plan Area. Plan Area streams and creeks will be protected from direct and indirect effects of urban development through Stream Setbacks, as described in AMMs STREAM-1 and STREAM-2.

Objective VP1b requires that impacts occurring within or near the Cosumnes/Rancho-Seco Core Recovery Area will be mitigated through preservation in this Core Recovery Area, providing improved conservation for the species as compared to the existing project-by-project permitting.

As discussed in Section 7.5, the primary conservation focus for western pond turtle in the Plan Area is on the formation of a large landscape-scale Preserve (at least 10,500 acres) outside the UDA that connects to and augments existing preserves that are not part of the SSHCP Preserve System. This Landscape Preserve will encompass a heterogeneous range of natural land covers and soil types associated with western pond turtle modeled habitat in the Plan Area. Additionally, conservation is also focused on preservation of modeled habitat in the Cosumnes River/Deer Creek Corridor and the Laguna Creek Wildlife Movement Corridor. To the extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, resulting in a larger-scale contiguous Preserve System.

A total of 13,102 acres of western pond turtle modeled habitat will be preserved Plan-wide, including 330 acres of modeled aquatic habitat and 12,772 acres of modeled upland habitat (Table 7-66). Most of this preservation will occur outside the UDA, and the majority of this preservation will occur in PPU 7. The Preserve System in PPU 7 includes approximately 101 acres of modeled aquatic habitat and 8,879 acres of modeled upland habitat. The SSHCP Preserves in PPU 7 will be consolidated with the 12,500-acre Chance Ranch, providing continuous aquatic and upland habitat that will meet the life history needs of the western pond turtle.

The Preserve System links together SSHCP Preserves and existing preserves that have modeled western pond turtle habitat to help maintain dispersal between breeding sites and modeled upland habitat. For example, there are four known occurrences for western pond turtle in existing preserves outside the UDA in PPU 6, and five known occurrences in SSHCP Preserves in PPU 7. Most of the occurrences of western pond turtle within the Plan Area (13 of 16) are outside the UDA in PPU 6 and in PPU 7 in the Cosumnes/Rancho-Seco Core Area. As a result, both occupied habitat and additional modeled aquatic and upland habitat for western pond turtle will

be preserved and maintained within the Plan Area, which would not occur on a project-by-project basis. Improved management and monitoring under the SSHCP will also allow for expansion of western pond turtle into areas not currently used by the species.

To ensure that western pond turtle populations are protected and continue to expand within the Plan Area, two species-specific objectives (WPT1 and WPT2) will be implemented as part of the Conservation Strategy (Table 7-67). Objective WPT1 will benefit western pond turtle during assembly of the SSHCP Preserve System, by ensuring that modeled aquatic and upland habitat for western pond turtle is preserved. The conservation actions for this objective also identify minimum preservation acreages for both modeled aquatic and modeled upland habitats. By preserving a range of western pond turtle aquatic habitats in the Plan Area, the SSHCP will help western pond turtles persist during expected climate change effects on precipitation and temperature.

Objective WPT2 will also benefit western pond turtles during Preserve Assembly, by ensuring that modeled aquatic habitat for western pond turtle is re-established and/or established. The conservation action for this objective also identifies the minimum acreage for re-establishment and/or establishment of aquatic habitat. Additionally, this objective will ensure that any re-established and/or established aquatic habitat is located no more than 500 feet from preserved aquatic habitat. This requirement will increase the likelihood that the re-established or established aquatic habitat will be occupied by western pond turtle in the future, which will assist in maintaining or re-establishing the historical distribution of the species in the Plan Area. Re-establishing and/or establishing aquatic habitat will also ensure no net loss of western pond turtle aquatic habitat in the Plan Area.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. As discussed in Chapter 8, preserve land management techniques, monitoring, and adaptive management of habitat for western pond turtle protected in the Preserve System will ensure that freshwater marsh, open water, and stream/creek hydrology, vegetation, and other wetland habitat characteristics within the SSHCP Preserve

System are not degraded, and will improve under SSHCP management as compared to existing habitat conditions. Goal 4 objectives will directly benefit western pond turtle habitat from the preparation and implementation of Preserve Management Plans (Objectives HAB1, HAB2, and HAB4) designed to maintain and enhance aquatic habitat, including early detection and eradication of invasive species such as American bullfrogs and introduced bass species (*Micropterus* spp. and *Morone saxatilis*) in Preserves. These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population. Permanent indirect effects on aquatic habitats such as hydrologic alterations will be tracked through studies of edge effects at Preserve boundaries, as directed by Objective HAB5.

7.6.2.18 Cooper's Hawk

Estimated Levels of Impact, Preservation, Re-Establishment and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 638 acres of modeled nesting/foraging habitat and modeled foraging habitat for Cooper's hawk (*Accipiter cooperii*) (Table 7-68). These impacts include direct effects to 600 acres of nesting/foraging habitat (including Blue Oak Woodland, Mixed Riparian Woodland, Mixed Riparian Scrub, and Mine Tailing Riparian Woodland) and 38 acres of foraging habitat (Blue Oak Savanna). The majority of impacts to Cooper's hawk nesting and foraging habitat (76%) will be inside the UDA.

To mitigate impacts to Cooper's hawk, the SSHCP will preserve approximately 1,011 acres of modeled habitat, including 964 acres of modeled nesting/foraging habitat and 47 acres of modeled foraging habitat throughout the Plan Area.

Additionally, the SSHCP will re-establish or establish 638 acres of modeled habitat, most of which will be Mixed Riparian Woodland and Mixed Riparian Scrub nesting/foraging habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-69).

Table 7-68
Permanent Effects and Conservation for Cooper's Hawk

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Nesting/Foraging Habitat					
Blue Oak Woodland	9	Qualitative	9	0	9[a]
Mixed Riparian Woodland	184	Qualitative	184	368[b]	184[c]
Mixed Riparian Scrub	189	Qualitative	189	378[b]	189[c]

Table 7-68
Permanent Effects and Conservation for Cooper's Hawk

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Mine Tailing Riparian Woodland	218	Qualitative	218	218[d]	218[e]
Total Nesting/Foraging Habitat	*600*	*Qualitative*	*600*	*964*	*600*
Foraging Habitat					
Blue Oak Savanna	38	Qualitative	38	47[f]	38[a]
Total Foraging Habitat	*38*	*Qualitative*	*38*	*47*	*38*
Grand Total	**638**	Qualitative	**638**	**1,011**	**638**

[a] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.

[b] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[c] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[d] Impacts to Mine Tailing Riparian Woodland will be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[e] Impacts to Mine Tailing Riparian Woodland will be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[f] Impacts to Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.

Table 7-69
Biological Goals and Measurable Objectives Applicable to Cooper's Hawk

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs) • Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2,

Table 7-69
Biological Goals and Measurable Objectives Applicable to Cooper's Hawk

Applicable Biological Goals	Related Biological Objectives
	and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective RIP1**. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within	**Objective CH1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 974 acres of modeled foraging and nesting habitat for Cooper's hawk

Table 7-69
Biological Goals and Measurable Objectives Applicable to Cooper's Hawk

Applicable Biological Goals	Related Biological Objectives
the Plan Area.	(*Accipiter cooperii*) is preserved in accordance with the Conservation Actions described Table 7-1 (see Objectives RIP1, RIP3, and BOW1).
	Objective CH2. During assembly of the SSHCP Preserve System, ensure that a minimum of 601 acres of modeled foraging and nesting habitat for Cooper's hawk is re-established and/or established (see Objectives RIP2 and RIP4).
	Objective CH3. During assembly of the SSHCP Preserve System, ensure that a minimum of 38 acres of modeled foraging habitat for Cooper's hawk is preserved, in accordance with the Conservation Actions described in Table 7-1 (see Objectives RIP1, RIP3, and BOW1).

Analysis of Species Conservation

The SSHCP will preserve 1,011 acres of modeled nesting/foraging and foraging habitat for Cooper's hawk, which will ensure that the species has adequate nesting and foraging habitat in the Plan Area. In addition, the SSHCP will re-establish/establish 638 acres of modeled nesting/foraging habitat for Cooper's hawk in the Preserve System. Conservation of modeled nesting/foraging habitat will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized, and in combination with implementation of a comprehensive Monitoring and Management Program within the Preserve System, will continue to support Cooper's hawk.

Sites selected for preservation of nesting and foraging habitat will include Mixed Riparian Woodland, Mixed Riparian Scrub, and Blue Oak Woodland/Savanna. Pursuant to Conservation Action CH1.1, selection of Preserve sites supporting nesting and foraging habitat will be prioritized based on the availability of dense Blue Oak Woodland with trees approximately 26 to 49 feet high and in close proximity to foraging habitat with dense prey populations, all of which are located outside the UDA. The SSHCP will provide a well-designed system of large, interconnected Preserves to minimize the effects of habitat fragmentation. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to Cooper's hawk.

Establishment or re-establishment of areas for Cooper's hawk nesting and foraging habitat will be prioritized pursuant to Conservation Action CH2.1, which means they will be located near known nesting territories, connect disjunct segments or riparian habitat, and provide close proximity to modeled foraging areas with abundant prey populations. Cooper's hawk Mixed Riparian Woodland and Mixed Riparian Scrub habitat establishment and re-establishment will occur only where a non-modeled land cover is converted to Mixed Riparian Woodland and

Mixed Riparian Scrub. In addition, trees will be planted to encourage dense canopy closure of the mature stand, and survivorship of at least six trees pursuant to a stand is a success criterion.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Using a Stream Setback strategy in conjunction with low-impact and compatible uses in land planning, the Preserve System will maintain existing functions and values of Blue Oak Woodland and riparian nesting and foraging habitat in the Preserve System and minimize edge-effect disturbances to nesting Cooper's hawk (e.g., lighting, noise, human activity). Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

Additionally, improvements in nesting and foraging habitat quantity and quality with management and monitoring will support expansion of nesting and foraging activities into areas not currently used by Cooper's hawk. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Through proper land management techniques and continued monitoring of nesting and foraging habitat for Cooper's hawk preserved in the Preserve System, the SSHCP will ensure that habitat functions and values remain the same as the time of acquisition or improve with proper management. Management objectives that will, in particular, benefit Cooper's hawk are those designed to maintain and enhance nesting and foraging habitat, include monitoring the groundwater table as it relates to the health of riparian habitat (Objective RIP5) and ensuring that adverse edge effects, such as weeds, noise, hydrologic effects, trash, and litter, are avoided and minimized (Objectives HAB4 and HAB5). This careful management and monitoring, coupled with the extensive preservation of modeled habitat in large Preserves, ensures that the Conservation Strategy is consistent with Guiding Principle 7 to maintain or increase the number of Cooper's hawk present in the Plan Area. Similarly, the establishment of SSHCP Preserves in modeled Cooper's hawk habitat throughout the Plan Area means the Conservation Strategy is consistent with Guiding Principle 8, ensuring that Cooper's hawk are distributed throughout the Plan Area to limit the effects of stochastic disturbances to local subpopulations.

7.6.2.19 Ferruginous Hawk

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 25,491 acres of modeled foraging habitat for ferruginous hawk (*Buteo regalis*) (Table 7-70). These impacts include

direct effects to 22,014 acres of Valley Grassland, 389 acres of Vernal Pool, 105 acres of Seasonal Wetland, 234 acres of Swale, and 2,749 acres of Irrigated Pasture Grassland. The majority of impacts to ferruginous hawk nesting and foraging habitat (70%) will be inside the UDA.

To mitigate impacts to ferruginous hawk, the SSHCP will preserve 26,112 acres of modeled foraging habitat, including 22, 014 acres of modeled Valley Grassland, 966 acres of Vernal Pool, 105 acres of Seasonal Wetland, 234 acres of Swale, and 2,749 acres of Irrigated Pasture-Grassland in the Plan Area. Most preservation will occur outside the UDA, largely in PPU 7.

Additionally, the SSHCP will re-establish or establish 728 acres of modeled habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-71).

Table 7-70
Permanent Effects and Conservation for Ferruginous Hawk

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Valley Grassland	22,014	Qualitative	22,014 [a]	22,014	0
Vernal Pool	389	0	389	966	389
Seasonal Wetland	105	Qualitative	105	105	105
Swale	234	0	234	278	234
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	2,749[b]	0
GRAND TOTAL	**25,491**	**0**	**25,491**	**26,112**	**728**

[a] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[b] Impacts to Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.

Table 7-71
Biological Goals and Measurable Objectives Applicable to Ferruginous Hawk

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic	**Objective W2.** Covered Activities will implement the following, as outlined in Section 5.4.2:

Table 7-71
Biological Goals and Measurable Objectives Applicable to Ferruginous Hawk

Applicable Biological Goals	Related Biological Objectives
resources within the Plan Area.	• Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs) • Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams, as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA, as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in

Table 7-71
Biological Goals and Measurable Objectives Applicable to Ferruginous Hawk

Applicable Biological Goals	Related Biological Objectives
	accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective FH1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 25,881 acres of modeled foraging habitat for ferruginous hawk is preserved, including 19,625 acres in PPUs 5 and/or 7 (see Objectives AG1, VG1, VP1, VP3, and SW1).
	Objective FH2. During assembly of the SSHCP Preserve System, ensure that a minimum of 729 acres of modeled foraging habitat for ferruginous hawk is re-established and/or established (see Objectives VP2 and SW2).

Analysis of Species Conservation

The SSHCP will preserve 26,112 acres of modeled foraging habitat for ferruginous hawk, which will ensure that the species has adequate foraging habitat in the Plan Area. In addition, the SSHCP will re-establish/establish 728 acres of modeled foraging habitat for ferruginous hawk in the Preserve System. Conservation of modeled foraging habitat will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized, and in combination with implementation of a comprehensive Monitoring and Management Program within the Preserve System, will continue to support ferruginous hawk.

Sites selected for preservation of foraging habitat or re-establishment and/or establishment will be prioritized, pursuant to Conservation Action FH1.1, and will include sites that have moderate to dense short vegetative cover with topographic variation, and are known to already support populations of prey species. The SSHCP will provide a well-designed system

of large-scale landscape-level Preserves to minimize the effects of habitat fragmentation. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to ferruginous hawk.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Using a Stream Setback strategy in conjunction with low-impact and compatible uses in land planning, the Preserves will maintain existing functions and values of Vernal Pool, Irrigated Pasture-Grassland, and Valley Grassland foraging habitat in the Preserve System and minimize edge-effect disturbances to foraging ferruginous hawk (e.g., lighting, noise, human activity). Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

Additionally, improvements in foraging habitat quantity and quality with management and monitoring will possibly contribute to expansion of foraging activities into areas not currently used by ferruginous hawk. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Through proper land management techniques and continued monitoring of foraging habitat for ferruginous hawk preserved in the Preserve System, the SSHCP will ensure that habitat functions and values remain the same as the time of acquisition or improve with proper management. Management objectives that will, in particular, benefit ferruginous hawk are those designed to maintain and enhance foraging habitat, including monitoring the vegetation biomass within grassland land covers (HAB 7) and ensuring that adverse edge effects, such as weeds, noise, hydrologic effects, trash, and litter, are avoided and minimized (Objectives HAB4 and HAB5). This careful management and monitoring, coupled with the extensive preservation of modeled habitat in large Preserves, ensures that the Conservation Strategy is consistent with Guiding Principle 7 to maintain or increase the number of ferruginous hawk present in Plan Area. Similarly, the establishment of SSHCP Preserves in modeled ferruginous hawk habitat throughout the Plan Area means the Conservation Strategy is consistent with Guiding Principle 8, ensuring that ferruginous hawks are distributed throughout the Plan Area to limit the effects of stochastic disturbances to local subpopulations.

7.6.2.20 Swainson's Hawk

Estimated Levels of Impact, Preservation, Re-Establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 31,112 acres of modeled nesting and modeled foraging habitat for Swainson's hawk (*Buteo swainsoni*) (Table 7-72). These impacts include direct effects to 373 acres of modeled nesting habitat (including Mixed Riparian Woodland and Mixed Riparian Scrub) and 30,739 acres of modeled foraging habitat (Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale). Of the 31,112 acres of impacts to modeled habitat, 7,413 acres are within an area designated as high-value habitat for Swainson's hawk (Table 7-73). The majority of impacts to Swainson's hawk nesting and foraging habitat (73%) will be inside the UDA.

To mitigate impacts to Swainson's hawk, the SSHCP will preserve 33,805 acres of modeled nesting and foraging habitat that includes 8,158 acres of modeled high-value habitat. A majority of Swainson's hawk modeled habitat will be preserved outside the UDA, within PPUs 5 and 7.

Additionally, the SSHCP will re-establish or establish 1, 101 acres of modeled nesting and foraging habitat, including 118 acres of modeled high-value habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-74).

Table 7-72
Permanent Effects and Conservation for Swainson's Hawk

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Nesting Habitat					
Mixed Riparian Woodland	184	Qualitative	184	368[a]	184[b]
Mixed Riparian Scrub	189	Qualitative	189	378[a]	189[b]
Total Nesting Habitat	*373*	*Qualitative*	*373*	*746*	*373*
Foraging Habitat					
Cropland	5,285	Qualitative	5,285	6,947[c]	0
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	2,749[c]	0
Valley Grassland	21,977	Qualitative	21,977[d]	22,014	0
Vernal Pool	389	0	389	966	389
Seasonal Wetland	105	Qualitative	105	105	105
Swale	234	0	234	278	234
Total Foraging Habitat	*30,739*	*0*	*30,739*	*33,059*	*728*
Total Plan Habitat	**31,112**	**0**	**31,112**	**33,805**	**1,101**

[a] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[b] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.
[c] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.
[d] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-73
Permanent Effects and Conservation for Swainson's Hawk High-Value Habitat

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
High-Value Habitat[a](Foraging)					
Cropland	3,648	Qualitative	3,648	5,285[b]	0
Irrigated Pasture-Grassland	1,378	Qualitative	1,378	1,571[b]	0
Valley Grassland	2,269	Qualitative	2,269	1,143[c]	0
Vernal Pool	56	0	56	37	56
Seasonal Wetland	51	Qualitative	51	105	51
Swale	11	0	11	17	11
Total High-Value Habitat	**7,413**	**0**	**7,413**	**8,158**	**118**

[a] High-value habitat for Swainson's hawk is modeled foraging habitat occurring in the western portion of the Plan Area (within PPUs 4, 6, and 8). Acreages presented for high-value habitat are a subset of modeled nesting and foraging habitat and are not in addition to modeled nesting and foraging habitat.
[b] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.
[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-74
Biological Goals and Measurable Objectives Applicable to Swainson's Hawk

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W1.** Ensure that during implementation of Objective L2 (establishing minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.
	Objective W2. Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs)

Table 7-74
Biological Goals and Measurable Objectives Applicable to Swainson's Hawk

Applicable Biological Goals	Related Biological Objectives
	• Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams, as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA, as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective RIP1**. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VG1. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.

Table 7-74
Biological Goals and Measurable Objectives Applicable to Swainson's Hawk

Applicable Biological Goals	Related Biological Objectives
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective SH1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 31,033 acres of modeled foraging habitat for Swainson's hawk is preserved (see Objectives AG1, AG2, SW1, VP1, VP3, and VG1). Ensure that mitigation for high-value modeled habitat impacted within PPUs 4, 6, or 8 occurs within PPUs 4, 6, or 8.
	Objective SH2. At least 2,000 acres of Cropland habitat within high-value habitat within PPUs 4, 6, and 8 will be preserved in fee title to ensure that intensive management actions can be taken. Land held in fee title will be restricted to growing field or row crops. Fee title lands must maintain, at a minimum, an average of 50% of their crop cover-type in alfalfa (*Medicago sativa*). Other crop types or land covers may be substituted for alfalfa if the TAC determines that such other crop types or land cover types are of the same or better quality foraging habitat as alfalfa.
	Objective SH3. During assembly of the SSHCP Preserve System, ensure a minimum of 746 acres of modeled nesting habitat for Swainson's hawk is preserved (see Objectives RIP1 and RIP3).
	Objective SH4. During assembly of the SSHCP Preserve System, ensure that a minimum of 373 acres of modeled riparian nesting habitat for Swainson's hawk is re-established and/or established. Ensure that mitigation for modeled nesting

Table 7-74
Biological Goals and Measurable Objectives Applicable to Swainson's Hawk

Applicable Biological Goals	Related Biological Objectives
	habitat impacted within PPUs 4, 6, or 8 occurs within PPUs 4, 6, or 8 (see Objectives RIP2 and RIP4).
	Objective SH5. For each of the 36 known nesting trees within the UDA, plant 10 trees that are modeled for Swainson's hawk nesting within SSHCP Preserves. Plant nesting trees on properties preserved by the SSHCP within PPUs 4, 6, and 8, and near preserved foraging habitat. Tree species will be selected based on known suitability as nesting habitat for Swainson's hawk, and the planted trees must be maintained and/or replaced in perpetuity.
	Objective SH6. During assembly of the SSHCP Preserve System, ensure that a minimum of 729 acres of modeled foraging habitat for Swainson's hawk is re-established and/or established (see Objectives RIP2 and RIP4).

Analysis of Species Conservation

The SSHCP will preserve 33,805 acres of modeled nesting and modeled foraging habitat that includes 8,158 acres of modeled high-value habitat for Swainson's hawk, which will ensure that the species has adequate nesting, foraging, and high value habitat in the Plan Area. In addition, the SSHCP will re-establish/establish 1,101 acres of modeled foraging habitat that includes 118 acres of high-value habitat for Swainson's hawk in the Preserve System (SH4 through SH6).

Sites selected for preservation of nesting, foraging, and high-value habitat will include sites that are set up for alfalfa or other suitable agricultural production within 3 miles of active nest sites that are in close proximity to large areas of open space to provide foraging habitat and with existing large mature trees that will provide nesting habitat. Re-establishment and/or establishment will focus on similar criteria but will establish riparian habitat along streams or river channels within known nesting territories and plant suitable nesting trees on SSHCP Preserves near preserved foraging habitat. The SSHCP will be consistent with Guiding Principle 1 (Section 7.1) by providing a well-designed system of large-scale landscape-level Preserves to minimize the effects of habitat fragmentation. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to Swainson's hawk.

Implementation of Goal 3 and its related measurable objectives for modeled nesting and foraging habitat (Objectives RIP1 through RIP4, VG1, VP1 through VP5, SW1 and SW2, and AG1) will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized and, in combination with implementation of a comprehensive Preserve System Monitoring and Management Program, will continue to support Swainson's hawk.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Using a Stream Setback strategy in conjunction with low-impact and compatible uses in land planning, the Preserves will maintain existing functions and values of Riparian, Vernal Pool, Irrigated Pasture-Grassland, Valley Grassland, and other modeled nesting and foraging habitat in the Preserve System, and minimize edge-effect disturbances to nesting and foraging Swainson's hawk (e.g., lighting, noise, human activity). Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

Additionally, improvements in nesting and foraging habitat quantity and quality with management and monitoring will possibly contribute to expansion of nesting and foraging activities into areas not currently used by Swainson's hawk. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Through proper land management techniques and continued monitoring of foraging habitat for Swainson's hawk preserved in the Preserve System, the SSHCP will ensure that habitat functions and values remain the same as the time of acquisition or improve with proper management. Management objectives that will, in particular, directly benefit Swainson's hawk are those designed to maintain and enhance foraging habitat. The Conservation Strategy for Swainson's hawk requires cultivation of alfalfa, rice, and dryland grains close to known Swainson's hawk nest sites and modeled nesting habitat; planting of trees in agricultural settings; and planting of hedgerows along the borders of agricultural fields. Alfalfa, rice, and dryland grains are modeled habitats for Swainson's hawk prey and provide high productivity foraging habitats. Cultivating these crops and managing them for the benefit of Swainson's hawk will increase prey availability and should improve foraging success for the hawk. Similarly, planting trees in agricultural settings should increase the number of suitable nest sites in Swainson's hawk preferred foraging habitats, and planting hedgerows should increase habitat for prey species and prey availability. Monitoring vegetation height in grasslands (Objective HAB7) should help maintain foraging habitat quality by improving habitat suitability for prey and increasing prey detectability (i.e., by controlling dense thatch). This careful management and monitoring, coupled with the extensive preservation of modeled habitat in large Preserves, ensure that the Conservation Strategy is consistent with Guiding Principle 7 to maintain or increase the number of Swainson's hawk present in Plan Area. Similarly, the establishment of SSHCP Preserves in modeled Swainson's hawk habitat throughout the Plan Area means the Conservation Strategy is consistent with Guiding Principle 8, ensuring that Swainson's hawks are distributed throughout the Plan Area to limit the effects of stochastic disturbances to local subpopulations.

7.6.2.21 White-Tailed Kite

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 31,319 acres of modeled nesting, nesting/foraging and foraging habitat for white-tailed kite (*Elanus leucurus*) (Table 7-75). These impacts include direct effects to 376 acres of nesting habitat (including Blue Oak Woodland, Mixed Riparian Woodland, and Mine Tailing Riparian Woodland), 189 acres of nesting/foraging habitat (Mixed Riparian Scrub), and 31,319 acres of foraging habitat (Blue Oak Savanna, Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, and Swale). The majority of impacts to white-tailed kite nesting and foraging habitat (73%) will be inside the UDA.

To mitigate impacts to white-tailed kite, the SSHCP will preserve 32,175 acres of modeled habitat, including 586 acres of modeled nesting habitat, 189 acres of modeled nesting/foraging habitat, and 31,400 acres of modeled foraging habitat throughout the Plan Area. Most preservation will occur outside the UDA, with most of this preservation occurring in Valley Grassland habitat in PPU7.

Additionally, the SSHCP will re-establish or establish 1,365 acres of modeled habitat, of which approximately half will be foraging habitat and half will be nesting and nesting/foraging habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-76).

Table 7-75
Permanent Effects and Conservation for White-Tailed Kite

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Nesting Habitat					
Blue Oak Woodland	9	Qualitative	9	0	9[a]
Mixed Riparian Woodland	149	Qualitative	149	368[b]	184[c]
Mine Tailing Riparian Woodland	218	Qualitative	218	218[d]	218[e]
Total Nesting Habitat	*376*	*Qualitative*	*376*	*586*	*411*
Nesting/Foraging Habitat					
Mixed Riparian Scrub	189	Qualitative	189	169[b]	189[c]
Total Nesting/Foraging Habitat	*189*	*Qualitative*	*189*	*169*	*189*

Table 7-75
Permanent Effects and Conservation for White-Tailed Kite

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-establishment and/or Establishment (acres)
Foraging Habitat					
Blue Oak Savanna	38	Qualitative	38	47[f]	37[a]
Cropland	5,285	Qualitative	5,285	5,285[g]	0
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	2,749[g]	0
Valley Grassland	21,954	Qualitative	21,954	22,014[h]	0
Vernal Pool	389	0	389	966	389
Seasonal Wetland	105	Qualitative	105	105	105
Swale	234	0	234	278	234
Total Foraging Habitat	*30,754*	*0*	*30,754*	*31,444*	*765*
Grand Total	**31,319**	**0**	**31,319**	**32,199**	**1,365**

[a] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.

[b] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[c] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[d] Impacts to Mine Tailing Riparian Woodland will be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[e] Impacts to Mine Tailing Riparian Woodland will be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[f] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.

[g] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.

[h] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-76
Biological Goals and Measurable Objectives Applicable to White-Tailed Kite

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).

Table 7-76
Biological Goals and Measurable Objectives Applicable to White-Tailed Kite

Applicable Biological Goals	Related Biological Objectives
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W1**. Ensure that during implementation of Objective L2 (establishing minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.
	Objective W2. Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs) • Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams, as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA, as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective RIP1**. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VG1. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.

Table 7-76
Biological Goals and Measurable Objectives Applicable to White-Tailed Kite

Applicable Biological Goals	Related Biological Objectives
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective WK1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 31,205 acres of modeled foraging habitat for white-tailed kite is preserved (see Objectives VG1, AG1, RIP1, RIP3, SW1, VP1, VP3, and BOW1).

Table 7-76
Biological Goals and Measurable Objectives Applicable to White-Tailed Kite

Applicable Biological Goals	Related Biological Objectives
	Objective WK2. During assembly of the SSHCP Preserve System, ensure that a minimum of 974 acres of modeled nesting or nesting/foraging habitat for white-tailed kite is preserved (see Objectives RIP1, RIP3, and BOW1).
	Objective WK3. During assembly of the SSHCP Preserve System, ensure a minimum of 767 acres of modeled foraging habitat for white-tailed kite is re-established and/or established (see Objectives VP2, RIP2, RIP4, and SW2).
	Objective WK4. During assembly of the SSHCP Preserve System, ensure that a minimum of 601 acres of modeled nesting or nesting/foraging habitat for white-tailed kite is re-established and/or established (see Objectives RIP2 and RIP4).

Analysis of Species Conservation

The SSHCP will preserve 32,175 acres of modeled nesting, modeled nesting/foraging and modeled foraging habitat for white-tailed kite, which will ensure that the species has adequate nesting, nesting/foraging, and foraging habitat in the Plan Area. In addition, the SSHCP will re-establish/establish 1, 365 acres of modeled nesting, nesting/foraging and foraging habitat for white-tailed kite in the Preserve System.

Sites selected for preservation of nesting, nesting/foraging, and foraging habitat will include sites that are set up for agriculture that support perennial crops, that are known to be used by white-tailed kite for foraging, and that occur in larger open space areas. They will include large, unfragmented patches of land with dense canopy cover for nesting that are connected to grasslands and agricultural areas known to support high prey densities. Re-establishment and/or establishment will include sites located along existing riparian corridors where nesting habitat likely existed in the past and sites within a new or existing preserve or habitat corridor in areas within at least 0.5 mile of modeled foraging habitat at least 500 feet from urban land uses. Areas that did not historically support riparian woodlands or that are within the existing Vernal Pool Ecosystem will be avoided. The SSHCP will be consistent with Guiding Principles 1 and 4 (Section 7.1) by providing a well-designed system of large landscape-level Preserves to minimize the effects of habitat fragmentation and edge effects. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to white-tailed kite.

Implementation of Goal 3 and its related measurable objectives for modeled nesting and foraging habitat (Objectives RIP1 through RIP4, VG1, VP1 through VP5, SW1 and SW2, AG1, and BOW1 and BOW2) will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized, and in combination with implementation of a comprehensive Monitoring and

Management Program within the Preserve System, will continue to support white-tailed kite. Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Using a Stream Setback strategy in conjunction with low-impact and compatible uses in land planning, the Preserves will maintain existing functions and values of Blue Oak Woodland, Mixed Riparian Woodland, Mine Tailing Riparian Woodland, Vernal Pool, Irrigated Pasture-Grassland, Cropland, Seasonal Wetland, Valley Grassland, and other modeled nesting and foraging habitat in the Preserve System, and minimize edge-effect disturbances to nesting and foraging white-tailed kite (e.g., lighting, noise, human activity). Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

Additionally, improvements in nesting and foraging habitat quantity and quality with management and monitoring will contribute to expansion of nesting and foraging activities into areas not currently used by white-tailed kite. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Through proper land management techniques and continued monitoring of foraging habitat for white-tailed kite preserved in the Preserve System, the SSHCP will ensure that habitat functions and values remain the same as the time of acquisition or improve with proper management. Management objectives that will, in particular, directly benefit white-tailed kite are those designed to maintain and enhance foraging habitat, including ensuring Cropland and Irrigated Pasture-Grassland (Objective AG1). The Conservation Strategy for white-tailed kite requires cultivation of alfalfa, rice, and dryland grains close to modeled nesting habitat; planting of trees in agricultural settings; and planting of hedgerows along the borders of agricultural fields. Alfalfa, rice, and dryland grains are modeled habitats for white-tailed kite prey and provide high-productivity foraging habitats. Cultivating these crops and managing them for the benefit of white-tailed kite will increase prey availability and should improve foraging success for the white-tailed kite. Similarly, planting trees in agricultural settings should increase the number of suitable nest and perching sites near foraging habitats, and planting hedgerows should increase habitat for prey species and prey availability. Additionally, if large trees are planted in hedgerows, they will provide white-tailed kite nesting habitat in addition to increased prey habitat values. Monitoring vegetation height in grasslands (Objective HAB7) should help maintain foraging habitat quality by improving habitat suitability for prey and increasing prey detectability (e.g., by controlling dense thatch). These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population. This careful management and monitoring, coupled with the extensive preservation of modeled habitat in large Preserves, ensures that the Conservation Strategy is consistent with Guiding

Principle 7 to maintain or increase the number of white-tailed kites present in Plan Area. Similarly, the establishment of SSHCP Preserves in modeled white-tailed kite habitat throughout the Plan Area means the Conservation Strategy is consistent with Guiding Principle 8, ensuring that white-tailed kites are distributed throughout the Plan Area to limit the effects of stochastic disturbances to local subpopulations.

7.6.2.22 Northern Harrier

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 30,903 acres of modeled nesting/foraging habitat and foraging habitat for northern harrier (*Circus cyaneus*) (Table 7-77). These impacts include direct effects to 30,048 acres of nesting/foraging habitat (including Cropland, Irrigated Pasture-Grassland, and Valley Grassland) and 855 acres of foraging habitat (including Vernal Pool, Seasonal Wetland, Swale, and Freshwater Marsh). The majority of impacts to northern harrier nesting and foraging habitat (72%) will be inside the UDA.

To mitigate impacts to northern harrier, the SSHCP will preserve 33,186 acres of modeled habitat, including 31,710 acres of modeled nesting/foraging habitat and 1,476 acres of modeled foraging habitat throughout the Plan Area. A majority of preservation will occur outside the UDA, with most of this preservation split between PPUs 6 and 7.

Additionally, the SSHCP will re-establish or establish 855 acres of modeled foraging habitat, most of which will be Vernal Pool habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-78).

Table 7-77
Permanent Effects and Conservation for Northern Harrier

Land Cover Types	Direct Effects (acres)	Indirect Effects	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Nesting/Foraging Habitat					
Cropland	5,285	Qualitative	5,285	6,947[a]	0
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	2,749[a]	0
Valley Grassland	22,014	Qualitative	22,014[b]	22,014	0
Total Nesting/ Foraging Habitat	*30,048*	*Qualitative*	*30,048*	*31,710*	*0*
Foraging Habitat					
Vernal Pool	389	0	389	966	389
Seasonal Wetland	105	Qualitative	105	105	105

Table 7-77
Permanent Effects and Conservation for Northern Harrier

Land Cover Types	Direct Effects (acres)	Indirect Effects	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Swale	234	0	234	278	234
Freshwater Marsh	127	Qualitative	127	127	127
Total Foraging Habitat	*855*	*0*	*855*	*1,476*	*855*
Grand Total	**30,903**	**0**	**30,903**	**33,186**	**855**

[a] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.
[b] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-78
Biological Goals and Measurable Objectives Applicable to Northern Harrier

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs) • Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in

Table 7-78
Biological Goals and Measurable Objectives Applicable to Northern Harrier

Applicable Biological Goals	Related Biological Objectives
Irrigated Pasture-Grassland) that provide habitat for Covered Species.	accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).

Table 7-78
Biological Goals and Measurable Objectives Applicable to Northern Harrier

Applicable Biological Goals	Related Biological Objectives
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective NH1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 1,245 acres of modeled foraging habitat for northern harrier (*Circus cyaneus*) is preserved (see Objectives VG1, AG1, VP1, VP3, FWM1, and SW1).
	Objective NH2. During assembly of the SSHCP Preserve System, ensure that a minimum of 30,048 acres of modeled nesting/foraging habitat for northern harrier is preserved (see Objectives VG1 and AG1).
	Objective NH3. During assembly of the SSHCP Preserve System, ensure that a minimum of 856 acres of modeled foraging habitat for northern harrier is re-established and/or established (see Objectives VP2, FWM2, and SW2).

Analysis of Species Conservation

The SSHCP will preserve 33,186 acres of modeled nesting/foraging and modeled foraging habitat for northern harrier (NH1 and NH2), which will ensure that the species has adequate nesting/foraging and foraging habitat in the Plan Area. In addition, the SSHCP will re-establish/establish 855 acres of modeled nesting/foraging and foraging habitat for northern harrier in the Preserve System (NH3).

Sites selected for preservation of nesting/foraging and foraging habitat will include large, open sites with dense, tall vegetation known to support high prey densities linked or adjacent to currently preserved lands. Preserved sites will include wet or moist sites for nesting, in large open space areas that potentially support other Covered Species. Re-establishment and/or establishment will include sites with historically contained intact foraging habitat in large, open space areas where management can be used to enhance or re-establish natural ecosystem processes and attract other Covered Species. The SSHCP will be consistent with Guiding Principles 1 and 4 (Section 7.1) by providing a well-designed system of large-scale landscape-level Preserves to minimize the effects of habitat fragmentation and edge effects. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be

adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to northern harrier.

Implementation of Goal 3 and its related measurable objectives for modeled nesting and foraging habitat (Objectives VG1, VP1 through VP5, SW1 and SW2, FWM1 and FWM2, and AG1) will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized, and in combination with implementation of a comprehensive Monitoring and Management Program within the Preserve System, will continue to support northern harrier.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Using a Stream Setback strategy in conjunction with low-impact and compatible uses in land planning, the Preserves will maintain existing functions and values of Cropland, Irrigated Pasture-Grassland, Valley Grassland, Vernal Pool, Seasonal Wetland, Freshwater Marsh, and other modeled nesting and foraging habitat in the Preserve System, and minimize edge-effect disturbances to nesting and foraging northern harrier (e.g., lighting, noise, human activity). Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

Additionally, improvements in nesting and foraging habitat quantity and quality with management and monitoring will possibly contribute to expansion of nesting and foraging activities into areas not currently used by northern harrier. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Through proper land management techniques and continued monitoring of foraging habitat for northern harrier preserved in the Preserve System, the SSHCP will ensure that habitat functions and values remain the same as the time of acquisition or improve with proper management. Management objectives that will, in particular, directly benefit northern harrier are those designed to maintain and enhance foraging habitat, including ensuring Cropland and Irrigated Pasture-Grassland are available for foraging (Objective AG1). The Conservation Strategy for northern harrier includes cultivation of alfalfa, rice, and dryland grains close to modeled nesting habitat; planting of trees in agricultural settings; and planting of hedgerows along the borders of agricultural fields. Monitoring vegetation height in grasslands (Objective HAB7) should help maintain foraging habitat quality by improving habitat suitability for prey and increasing prey detectability (e.g., by controlling dense thatch). These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population. This careful management and monitoring, coupled with the extensive preservation of modeled habitat in large Preserves, ensures that the Conservation

Strategy is consistent with Guiding Principle 7 to maintain or increase the number of northern harriers present in Plan Area. Similarly, the establishment of SSHCP Preserves in modeled northern harrier habitat throughout the Plan Area means the Conservation Strategy is consistent with Guiding Principle 8, ensuring that northern harrier are distributed throughout the Plan Area to limit the effects of stochastic disturbances to local subpopulations.

7.6.2.23 Western Burrowing Owl

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 30,836 acres of modeled wintering/nesting habitat for western burrowing owl (*Athene cunicularia*) (Table 7-79). These impacts include direct effects to 22,014 acres of Valley Grassland, 5,285 acres of Cropland, 2,749 acres of Irrigated Pasture-Grassland, 38 acres of Blue Oak Savanna, 389 acres of Vernal Pool, 105 acres of Seasonal Wetlands, 234 acres of Swale, and 22 acres of Stream/Creek (VPIH). The majority of impacts to western burrowing owl nesting/foraging habitat (74%) will be inside the UDA.

To mitigate impacts to western burrowing owl, the SSHCP will preserve approximately 33,132 acres of modeled wintering/nesting habitat, including 22,014 acres of Valley Grassland, 6,947 acres of Cropland, 2,749 acres of Irrigated Pasture-Grassland, 47 acres of Blue Oak Savanna, 966 acres of Vernal Pool, 105 acres of Seasonal Wetlands, 278 acres of Swale, and 26 acres of Stream/Creek (VPIH) throughout the Plan Area. A majority of this preservation will occur outside the UDA.

Additionally, the SSHCP will re-establish or establish 38 acres of modeled Blue Oak Savanna wintering nesting habitat, which is the only re-establishment or establishment planned for western burrowing owl. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-80).

Table 7-79
Permanent Effects and Conservation for Western Burrowing Owl

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Wintering Habitat					
Vernal Pool	389	Qualitative	389	966	0
Seasonal Wetland	105	Qualitative	105	105	0
Swale	234	Qualitative	234	278	0

Table 7-79
Permanent Effects and Conservation for Western Burrowing Owl

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Stream/Creek (VPIH)	22	Qualitative	22	26	0
Total Nesting/Foraging Habitat	*750*	*Qualitative*	*750*	*1,375*	*0*
Wintering/Nesting Habitat					
Blue Oak Savanna	38	Qualitative	38	47[a]	38[b]
Valley Grassland	22,014	Qualitative	22,014[c]	22,014	0
Cropland	5,285	Qualitative	5,285	6,947[d]	0
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	2,749[d]	0
Total Nesting/Foraging Habitat	*30,086*	*Qualitative*	*30,086*	*31,757*	*38*
Grand Total	**30,836**	**Qualitative**	**30,836**	**33,132**	**38**

[a] Impacts to Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.
[b] Impacts to Blue Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.
[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[d] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.

Table 7-80
Biological Goals and Measurable Objectives Applicable to Western Burrowing Owl

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs) • Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of

Table 7-80
Biological Goals and Measurable Objectives Applicable to Western Burrowing Owl

Applicable Biological Goals	Related Biological Objectives
	the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective BO1.** Preserve seven occupied western burrowing owl (*Athene cunicularia*) sites (commensurate with 20% of the estimated number of sites within the UDA as of 2014), preserve at least 200 acres of land surrounding each occupied burrow site, and maintain modeled habitat for western burrowing owl within 0.4 mile of breeding sites.
	Objective BO2. For each western burrowing owl or western burrowing owl pair passively excluded, preserve 200 acres of modeled habitat for western burrowing owl, and establish a California ground squirrel (*Spermophilus (Otospermophilus)*

Table 7-80
Biological Goals and Measurable Objectives Applicable to Western Burrowing Owl

Applicable Biological Goals	Related Biological Objectives
	beecheyi) colony, and augment with artificial burrows as appropriate (determined by TAC). Artificial burrows will be established at appropriate locations throughout the Preserve System pursuant to CDFW (CDFG 2012 guidelines) or as otherwise determined by the TAC.

Analysis of Species Conservation

The SSHCP will preserve 33,132 acres of modeled nesting/foraging habitat for western burrowing owl. Additionally, 7 occupied western burrowing owl sites and at least 200 acres of land surrounding each burrow site will be preserved under the SSHCP. Modeled habitat within 0.4 miles of breeding sites will be maintained under this objective and will ensure that the species has adequate nesting/foraging habitat in the Plan Area. Furthermore, the SSHCP will preserve 200 acres of modeled habitat for every western burrowing owl or western burrowing owl pair passively relocated, and establish a ground squirrel colony and augment with artificial burrows as appropriate.

Sites selected for preservation of nesting/foraging habitat and occupied western burrowing owl sites will include sites known to support breeding western burrowing owls, located within 3 miles of a known nesting site or modeled nesting habitat, that support high rodent populations during the breeding season and expand upon or link already preserved lands that will not be bisected by new roadways or incur impacts from any other infrastructure developments. Sites selected for preservation will include large (over 20 acres) sites that are open, with well-drained terrain and a low risk of flooding that has short, sparse vegetation with underground burrows that have modeled foraging habitat within 0.4 mile of breeding sites. Foraging habitat will be enhanced by promoting fossorial mammal populations in areas that are modeled foraging habitat and provide sentinel posts or mounds near burrows. The SSHCP will provide a well-designed system of large-scale landscape-level Preserves to minimize the effects of habitat fragmentation and edge effects. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to western burrowing owl.

Conservation of modeled nesting/foraging habitat will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized, and in combination with implementation of a comprehensive Preserve System Monitoring and Management Program, will continue to support western burrowing owl. Using a Stream Setback strategy in conjunction with low-impact and compatible uses in land planning, the Preserves will maintain existing functions and values of Cropland, Irrigated Pasture-Grassland, Valley Grassland, and Blue Oak Savanna in the

Preserve System, and minimize edge-effect disturbances to nesting/foraging western burrowing owl (e.g., lighting, noise, human activity).

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

Additionally, improvements in nesting and foraging habitat quantity and quality with management and monitoring will possibly contribute to expansion of nesting and foraging activities into areas not currently used by western burrowing owl. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Through proper land management techniques and continued monitoring of foraging habitat for western burrowing owl preserved in the Preserve System, the SSHCP will ensure that habitat functions and values remain the same as the time of acquisition or improve with proper management. Management objectives that will, in particular, directly benefit western burrowing owl are those designed to maintain and enhance foraging habitat, include ensuring Cropland and Irrigated Pasture-Grassland is available for foraging. The Conservation Strategy that will benefit western burrowing owl includes managing large, open Preserves that contain small mammal burrows (such as California ground squirrel) with an active small mammal population. Areas with sentinel posts and/or mounds that are located within 0.4 mile of active breeding sites with well-drained soils will be prioritized for the benefit of western burrowing owl. These sites will increase prey availability and should improve nesting and foraging success for the owl. Monitoring vegetation height in grasslands (Objective HAB7) should help maintain foraging habitat quality by improving habitat suitability for prey and increasing prey detectability (e.g., by controlling dense thatch). These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population. Similarly, the establishment of SSHCP Preserves in modeled western burrowing owl habitat throughout the Plan Area means the Conservation Strategy is consistent with Guiding Principle 8, ensuring that western burrowing owls are distributed throughout the Plan Area to limit the effects of stochastic disturbances to local subpopulations.

7.6.2.24 Loggerhead Shrike

Estimated Levels of Impact, Preservation, Re-Establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 31,367 acres of modeled habitat for loggerhead shrike (*Lanius ludovicianus*) in the

Plan Area (Table 7-81). This would include approximately 591 acres of nesting habitat (Mixed Riparian Woodland, Mixed Riparian Scrub, and Mine Tailing Riparian Woodland), 22,014 acres of modeled nesting/foraging habitat (Valley Grassland), and 8,762 acres of modeled foraging habitat (Cropland, Irrigated Pasture-Grassland, Vernal Pool, Seasonal Wetland, Swale). (Table 7-81). The majority of the direct and indirect effects to loggerhead shrike nesting and foraging habitat will occur inside the UDA, although permanent effects on specific nest sites are not analyzed in Chapter 6 because the SSHCP database does not contain any confirmed loggerhead shrike nest sites for the Plan Area (Section 3.3.3).

To mitigate impacts to loggerhead shrike, the SSHCP will preserve approximately 34,023 acres of modeled habitat, including 964 acres of modeled nesting habitat, 22,014 acres of modeled nesting/foraging habitat and 11,045 acres of modeled foraging habitat throughout the Plan Area. A majority of preservation will occur outside the UDA, with most of this preservation occurring in PPUs 6 and 7 in Valley Grassland habitat.

Additionally, the SSHCP will re-establish or establish approximately 1,319 acres of modeled habitat, including 591 acres of modeled nesting habitat and 728 acres of modeled foraging habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-82).

Table 7-81
Permanent Effects and Conservation for Loggerhead Shrike

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Nesting Habitat					
Mixed Riparian Woodland	184	Qualitative	184	368[a]	184[b]
Mixed Riparian Scrub	189	Qualitative	189	378[a]	189[b]
Mine Tailing Riparian Woodland	218	Qualitative	218	218[c]	218[d]
Total Nesting Habitat	*591*	*Qualitative*	*591*	*964*	*591*
Nesting/Foraging Habitat					
Valley Grassland	22,014	Qualitative	22,014[e]	22,014	0
Total Nesting/ Foraging Habitat	*22,014*	*Qualitative*	*22,014*	*22,014*	*0*
Foraging Habitat					
Cropland	5,285	Qualitative	5,285	6,947[f]	0
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	2,749[f]	0

Table 7-81
Permanent Effects and Conservation for Loggerhead Shrike

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Vernal Pool	389	0	389	966	389
Seasonal Wetland	105	Qualitative	105	105	105
Swale	234	0	234	278	234
Total Foraging Habitat	*8,762*	*0*	*8,762*	*11,045*	*728*
Grand Total	**31,367**	**0**	**31,367**	**34,023**	**1,319**

[a] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[b] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[c] Impacts to Mine Tailing Riparian Woodland will be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[d] Impacts to Mine Tailing Riparian Woodland will be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[e] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

[f] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.

Table 7-82
Biological Goals and Measurable Objectives Applicable to Loggerhead Shrike

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W1**. Ensure that during implementation of Objective L2 (establishing minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.
	Objective W2. Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs) • Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)

Table 7-82
Biological Goals and Measurable Objectives Applicable to Loggerhead Shrike

Applicable Biological Goals	Related Biological Objectives
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish Irrigated Pasture-Grassland that provide habitat for Covered Species.	**Objective RIP1**. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VG1. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.

Table 7-82
Biological Goals and Measurable Objectives Applicable to Loggerhead Shrike

Applicable Biological Goals	Related Biological Objectives
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends, and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
	Objective AG2. Of the 10,3779,696 acres preserved under Objective AG1, maintain at least 2,000 of those acres of high-quality foraging crops (such as corn (*Zea mays*), alfalfa, or wheat (*Triticum*)) preferred by tricolored blackbird, greater sandhill crane, and the covered raptor species. The 2,000 acres will be distributed in strategic locations throughout PPUs 4, 5, or 6 in plots of 20 acres or more. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective LS1**. During assembly of the SSHCP Preserve System, ensure that a minimum of 9,152 acres of modeled foraging habitat for loggerhead shrike (*Lanius ludovicianus*) is preserved (see Objectives VG1, AG1, SW1, VP1, and VP3).
	Objective LS2. During assembly of the SSHCP Preserve System, ensure that a minimum of 22,014 acres of modeled nesting/foraging habitat for loggerhead shrike is preserved (see Objectives VG1, RIP1, and RIP3).
	Objective LS3. During assembly of the SSHCP Preserve System, ensure that a minimum of 592 acres of modeled nesting habitat for loggerhead shrike is re-established and/or established (see Objectives RIP2 and RIP4).
	Objective LS4. During assembly of the SSHCP Preserve System, ensure that a minimum of 965 acres of modeled nesting habitat for loggerhead shrike is preserved (see Objectives RIP2 and RIP4).
	Objective LS5. During assembly of the SSHCP Preserve System, ensure that a minimum of 729 acres of modeled foraging habitat for loggerhead shrike is re-established and/or established (see Objective SW2).

Analysis of Species Conservation

The SSHCP will preserve approximately 34,023 acres of modeled habitat, including 964 acres of modeled nesting habitat, 22,014 acres of modeled nesting/foraging habitat, and 11,045 acres of modeled foraging habitat, throughout the Plan Area (Objectives LS1, LS2, and LS4). In addition, the SSHCP will re-establish or establish approximately 1,319 acres of modeled habitat for the loggerhead shrike in the Preserve System.

Sites selected for preservation of nesting, nesting/foraging, and foraging habitat will be prioritized pursuant to Conservation Actions LS1.1 and LS2.1, and will include sites that are Cropland, Irrigated Pasture-Grassland, Vernal Pool, Seasonal Wetland, Swale, Valley Grassland, Mixed Riparian Scrub, and Mine Tailing Riparian Woodland. The sites will include parcels that are greater than 20 acres in size and that are open with sparse vegetation for foraging, as these areas are known to support high prey densities. The sites would also be interspersed with scattered or isolated low trees or large shrubs that would be suitable for loggerhead shrike nest sites to enhance reproduction opportunities for this species. The areas would provide hunting perches with an open view to provide better foraging opportunities, and the areas would be either linked or adjacent to currently preserved lands to maintain and/or enhance connectivity between habitat patches. They would be in areas known to support loggerhead shrike and other Covered Species, and would be able to be used to enhance or re-establish natural ecosystem processes and attract Covered Species.

Pursuant to Conservation Action LS3.1 and LS5.1, re-establishment and/or establishment will be prioritized on parcels that are 20 acres or greater in size and/or occur in larger, open space areas and that possess or can be planted with scattered or isolated low trees or large shrubs for nest sites. These sites would need to have the potential to support loggerhead shrike and other Covered Species after re-establishment and/or establishment, and would be linked or adjacent to currently preserved lands to increase and ensure connectivity between Preserves and habitat patches. They would be located where management can be used to enhance or re-establish natural ecosystem processes and attract Covered Species. Loggerhead shrike habitat re-establishment will only occur where habitat historically occurred but no longer exists due to loss of or changes in ecological factors.

The SSHCP will provide a well-designed system of large Preserves that are linked and designed to minimize the effects of habitat fragmentation and edge effects. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to loggerhead shrike.

Conservation of modeled nesting/foraging habitat will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized, and in combination with implementation

of a comprehensive Preserve System Monitoring and Management Program within the Preserve System, will continue to support loggerhead shrike nesting and foraging habitat. Although Goal 2 addresses aquatic resources, some of the land covers included in the objectives for this goal are modeled nesting habitat (i.e., Mixed Riparian Scrub) and modeled foraging habitat (Vernal Pool, Seasonal Wetland, and Swale) for loggerhead shrike.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Using a Stream Setback strategy in conjunction with low impact and compatible uses in land planning the Preserve System will maintain existing functions and values of nesting habitat and minimize edge-effect disturbances to nesting loggerhead shrike (e.g., lighting, noise, human activity) and functions and values of foraging habitat. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Additionally, improvements in nesting and foraging habitat quantity and quality with management and monitoring will possibly contribute to expansion of nesting and foraging activities into areas not currently used by loggerhead shrike. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Implementation of Goal 3 and Goal 4 will directly benefit loggerhead shrike by maintaining and enhancing foraging habitat. Measurable Objectives under Goals 3 and 4 will ensure planting of Croplands (Objective AG1 and AG2) and provide cover and refugia to attract prey species (Objective HAB1, HAB2 and HAB 7). The Conservation Strategy for loggerhead shrike includes cultivation of alfalfa, rice, and dryland grains close to modeled nesting and perching habitat; planting of trees in agricultural settings; and planting of hedgerows along the borders of agricultural fields. Alfalfa, rice, and dryland grains are modeled habitats for loggerhead shrike prey and provide high productivity foraging habitats. Cultivating these crops and managing them for the benefit of loggerhead shrike will increase prey availability and should improve foraging success for the shrike. Similarly, planting trees in agricultural settings should increase the number of suitable hunting perches and potentially nesting sites near foraging habitats. Planting hedgerows should increase habitat for prey species and prey availability. Additionally, if large trees are planted in hedgerows, they can provide loggerhead shrike hunting perches and potentially nesting habitat, in addition to increased prey habitat values. Monitoring vegetation height in grasslands (Objective HAB7) should help maintain foraging habitat quality by improving habitat suitability for prey and increasing prey detectability (e.g., by controlling dense thatch). These actions should result in higher overall reproductive success and productivity of the Plan Area breeding population, and ensure that the Conservation Strategy is consistent with Guiding Principle 7 to maintain or increase the number of loggerhead shrike present in Plan Area. Similarly, the establishment of SSHCP Preserves in modeled

loggerhead shrike foraging and nesting habitat throughout the Plan Area means the Conservation Strategy is consistent with Guiding Principle 8 by ensuring that, should a localized population become extirpated from a particular habitat patch, individual loggerhead shrikes from nearby modeled habitat in other preserves would repopulate vacant habitat and thus limit the effects of stochastic disturbances to local subpopulations.

7.6.2.25 Greater Sandhill Crane

Estimated Levels of Impact, Preservation, Re-establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact approximately 7,942 acres of modeled greater sandhill crane (*Grus canadensis*) roosting and foraging habitat of the Plan, including 124 acres of modeled roosting/foraging habitat (Seasonal Wetland and Freshwater Marsh), 66 acres of modeled roosting habitat (Vernal Pool), and 7,752 acres of modeled foraging habitat (Cropland, Irrigated Pasture-Grassland, and Valley Grassland) (Table 7-83). This includes 820 acres of impact to modeled high-value habitat Seasonal Wetland, Freshwater Marsh, Vernal Pool, Cropland, Irrigated Pasture-Grassland, and Valley Grassland). The majority of the direct effects for greater sandhill crane will occur inside the UDA.

To mitigate impacts to greater sandhill crane, the SSHCP will preserve approximately 10,320 acres of modeled habitat, that includes 232 acres of modeled roosting/foraging habitat, 37 acres of modeled roosting habitat, and 10,051 acres of modeled foraging habitat throughout the Plan Area (Table 7-83). Of the preserved modeled habitat, 9,399 acres of high-value habitat will be preserved (Table 7-84). A majority of preserved modeled habitat will occur outside the UDA, most of which will be in PPU 6.

Additionally, the SSHCP will re-establish or establish 184 acres of modeled habitat of the Plan, including 125 acres of modeled roosting/foraging habitat and 59 acres of modeled roosting habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-85).

Table 7-83
Permanent Effects and Conservation for Greater Sandhill Crane

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Roosting/Foraging Habitat[a]					
Seasonal Wetland	51	Qualitative	51	105	52
Freshwater Marsh	73	Qualitative	73	127	73
Total Roosting/ Foraging Habitat	*124*	*Qualitative*	*124*	*232*	*125*

Table 7-83
Permanent Effects and Conservation for Greater Sandhill Crane

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
Roosting Habitat					
Vernal Pool	59	7	66	37	59
Total Roosting Habitat	*59*	*7*	*66*	*37*	*59*
Foraging Habitat[b]					
Cropland	3,764	Qualitative	3,764	6,700[c]	0
Irrigated Pasture-Grassland	1,519	Qualitative	1,519	1,671[c]	0
Valley Grassland	2,469	Qualitative	2,469[d]	1,680	0
Total Foraging Habitat	*7,752*	*Qualitative*	*7,752*	*10,051*	*0*
GRAND TOTAL	**7,935**	**7**	**7,942**	**10,320**	**184**

[a] Modeled roosting habitat includes Seasonal Wetlands and Freshwater Marsh within 2 miles of greater sandhill crane occurrences in the Plan Area.
[b] Modeled foraging habitat includes Cropland, Irrigated Pasture-Grassland and Valley Grassland within 1.75 miles of modeled roosting habitat.
[c] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.
[d] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-84
Permanent Effects and Conservation for Greater Sandhill Crane High-Value Habitat

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Re-Establishment and/or Establishment (acres)
High-Value Habitat[a]					
Seasonal Wetland	1	Qualitative	1	74	0
Freshwater Marsh	1	Qualitative	1	96	1
Vernal Pool	18	1	19	28	18
Cropland	343	Qualitative	343	6,522[b]	0
Irrigated Pasture-Grassland	138	Qualitative	138	1,518[b]	0
Valley Grassland	318	Qualitative	318[c]	1,161	0
Total High-Value Habitat	**819**	**1**	**820**	**9,399**	**19**

[a] High-value habitat is all modeled roosting and foraging habitat above sea level and outside the floodplain and outside the UDA.
[b] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.
[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-85
Biological Goals and Measurable Objectives Applicable to Greater Sandhill Crane

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs) • Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.

Table 7-85
Biological Goals and Measurable Objectives Applicable to Greater Sandhill Crane

Applicable Biological Goals	Related Biological Objectives
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
	Objective AG2. Of the 10,3779,696 acres preserved under Objective AG1, maintain at least 2,000 of those acres of high-quality foraging crops (such as corn, alfalfa, or wheat) preferred by tricolored blackbird, greater sandhill crane, and the covered raptor species. The 2,000 acres will be distributed in strategic locations throughout PPUs 4, 5, or 6 in plots of 20 acres or more. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.

Table 7-85
Biological Goals and Measurable Objectives Applicable to Greater Sandhill Crane

Applicable Biological Goals	Related Biological Objectives
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective GS1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 257 acres of modeled roosting or roosting/foraging habitat for greater sandhill crane is preserved. Roosting habitat will be preserved and maintained within PPUs 4, 6, and 8, with a minimum of 75% within PPU 6 (see Objectives VP1, SW1, and FWM1).
	Objective GS2. During assembly of the SSHCP Preserve System, ensure that a minimum of 7,751 acres of modeled foraging habitat for greater sandhill crane is preserved (see Objectives AG1, AG2, and VG1).
	Objective GS3. During assembly of the SSHCP Preserve System, ensure that a minimum of 184 acres of modeled roosting habitat or roosting/foraging habitat for greater sandhill crane is established and/or re-established. Re-establish two new roost sites (minimum of 90 acres of Freshwater Marsh/Seasonal Wetland complex each) every 2 miles in the gap between the Cosumnes population and the Stone Lakes' population or other strategic locations if that gap is closed by another HCP or conservation project (see Objectives VP2, SW2, and FWM2).
	Objective GS4. Create a visual screen of woody vegetation near human disturbances such as buildings, bridges, and paved roads from permanent roosting habitat within PPU 6. Screens should be located as appropriate to not interfere with habitat usage by greater sandhill cranes.
	Objective GS5. As part of the 2,000 acres preserved under Objective AG2, establish and maintain 10 food plots in strategic locations totaling a minimum of 200 acres within an agricultural setting for greater sandhill crane foraging habitat within PPU 6. Maintain the 200 acres among the 10 food plots as irrigated pasture or planted with crops preferred by greater sandhill crane as foraging habitat. Crops may include alfalfa, corn, wheat, or rice. Strategic placement of food plots will include locations for food plots in upland areas above the floodplain.
	Objective GS6. During assembly of the SSHCP Preserve System, ensure that a minimum of 1,000 acres of high-value modeled foraging habitat for greater sandhill crane outside the 100-year floodplain is preserved (see Objectives VP1, SW1, and FWM1).

Analysis of Species Conservation

The SSHCP will preserve approximately 10,320 acres of modeled roosting and foraging habitat, including 232 acres of modeled roosting/foraging habitat, 37 acres of modeled roosting habitat, and 10,051 acres of modeled foraging habitat throughout the Plan Area. In addition, the SSHCP will re-establish two new roost sites (minimum of 90 acres of Freshwater Marsh/Seasonal Wetland complex each) every 2 miles in the gap between the Cosumnes population and the Stone Lakes' population.

The SSHCP provides a well-designed system of large Preserves that are linked and designed to minimize the effects of habitat fragmentation and edge effects. To the maximum extent possible,

newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to greater sandhill crane. By preserving 10,051 acres of modeled foraging habitat, the SSHCP will ensure that greater sandhill crane will have adequate foraging habitat in the Plan Area. In addition, the SSHCP will establish and maintain 10 food plots in strategic locations totaling a minimum of 200 acres within an agricultural setting that will ensure that foraging habitat is provided near important roosting areas in the Cosumnes River floodplain. Further, providing visual screens between roosting sites and human disturbances in PPU 6 will increase the chance that viable roosting sites will be maintained in the Preserve System.

Sites selected for preservation of roosting/foraging and roosting habitat will be prioritized pursuant to Conservation Action GS1.1 and will include sites that are known roost sites that are 20 acres or greater in size and/or that occur in larger, open space areas. They would be open space areas that are free of fences and powerlines, located within 2 miles of modeled foraging habitat outside the UDA, and linked or adjacent to currently preserved lands that are least 1,000 feet from disturbances, such as roads or other operations that may disturb roosting. The areas would support natural drainage inflows or water delivery that mimics natural hydrologic cycles and have Seasonal Wetland present from September to mid-March. Lastly, they potentially support other Covered Species or where management will be used to enhance or re-establish natural ecosystem processes and attract other Covered Species.

Sites selected for preservation of foraging habitat will be prioritized pursuant to Conservation Action GS2.1 and will include sites that are known roost sites that are 20 acres or greater in size and/or that occur in larger, open space areas. They would be modeled foraging habitat that are free of fences and powerlines, located within 2 miles of known roost sites or modeled roosting habitat outside the UDA. The areas would be linked or adjacent to currently preserved lands, contain available sources of “grit,” including gravel and dirt roads or rocky uplands, and potentially support other Covered Species or where management will be used to enhance or re-establish natural ecosystem processes and attract other Covered Species.

Re-establishment and/or establishment will be prioritized pursuant to Conservation Action GS3.1 in that it would select re-establishment or establishment sites outside the UDA, based on the same criteria used for preservation sites in GS1.1 and GS2.1, and will only occur where it replaces low-quality foraging or roosting habitat. Specifically, it will replace unmodeled agriculture uses, such as orchards and vineyards, with habitats supporting high prey abundance (e.g., invertebrates), removal of physical structures that can cause collisions during takeoff and flying, removal of human disturbances from otherwise modeled foraging and roosting habitat, and establishment of suitable hydrologic regimes at roosting sites. Also, it would contain grit sources near foraging areas.

The impacts on modeled roosting and foraging habitat loss and conversion and lack of habitat management may be significantly affecting the greater sandhill crane in the Plan Area. Conservation of modeled roosting and foraging habitat will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized. Although Goal 2 addresses aquatic resources, some of the land covers included in the objectives for this goal are modeled roosting/foraging habitat (i.e., Seasonal Wetland and Freshwater Marsh) and modeled roosting habitat (Vernal Pool) for greater sandhill crane. Using a Stream Setback strategy in conjunction with low impact and compatible uses in land planning the Preserve System will maintain existing functions and values of roosting and foraging habitat and minimize edge-effect disturbances to nesting greater sandhill crane (e.g., lighting, noise, human activity). Implementation of Goal 2 and its related measurable objectives for roosting/foraging habitat and roosting habitat will help ensure that the adverse effects of Covered Activities on these habitats will be minimized, and in combination with implementation of a comprehensive management and monitoring program within the Preserve System, will continue to support greater sandhill crane. Additionally, improvements in roosting and foraging habitat quantity and quality with management and monitoring will possibly contribute to expansion of roosting and foraging activities into areas not currently used by greater sandhill crane.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

Improvements in roosting and foraging habitat quantity and quality with management and monitoring will possibly contribute to expansion of roosting and foraging activities into areas not currently used by greater sandhill crane. Continued monitoring (Chapter 8) will track the amount of habitat lost and the amount preserved, and ensure the Plan is in overall compliance with get-ahead, stay-ahead requirements. Implementation of Goal 3 and Goal 4 will directly benefit greater sandhill crane by maintaining and enhancing foraging habitat. Measurable Objectives under Goals 3 and 4 will ensure planting of Croplands (Objectives AG1 and AG2) and provide cover and refugia to attract prey species (Objectives HAB1, HAB2, and HAB 7). The Conservation Strategy for greater sandhill crane includes cultivation of alfalfa, rice, and dryland grains close to roosting habitat. Alfalfa, rice, and dryland grains are modeled habitats for greater sandhill crane animal prey and other foods (e.g., grains) and provide high-productivity foraging habitats. Cultivating these crops and managing them for the benefit of greater sandhill crane will increase food availability and should improve foraging success for the crane. Monitoring

vegetation height in grasslands (Objective HAB7) should help maintain foraging habitat quality by improving habitat suitability for prey and increasing prey detectability (e.g., by controlling dense thatch). The effects of noise and hydrologic alterations will be addressed by Objective HAB5. This careful management and monitoring, coupled with the extensive preservation of modeled habitat in large Preserves, ensures that the Conservation Strategy is consistent with Guiding Principle 7 (Section 7.1) to maintain or increase the number of and carrying capacity for wintering greater sandhill cranes present in Plan Area. Similarly, the establishment of SSHCP Preserves in modeled greater sandhill crane foraging and roosting habitat throughout the Plan Area means the Conservation Strategy will ensure that, should a localized population become extirpated from a particular habitat patch, individual greater sandhill cranes from nearby modeled habitat in other preserves would repopulate vacant habitat and thus limit the effects of stochastic disturbances to local subpopulations.

7.6.2.26 Tricolored Blackbird

Estimated Levels of Impact, Preservation, Re-Establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to approximately 31,058 acres of modeled habitat for tricolored blackbird (*Agelaius tricolor*) in the Plan Area. As detailed in Table 7-78, this would include approximately 27,531 acres of nesting/foraging habitat (Cropland, Valley Grassland, Seasonal Wetland, and Freshwater Marsh) and 3,527 acres of modeled foraging habitat (Irrigated Pasture-Grassland, Vernal Pool, Swale and Open Water) (Table 7-86). The majority of the direct and indirect effects for tricolored blackbird (96%) will occur inside the UDA.

To mitigate impacts to tricolored blackbird, the SSHCP will preserve approximately 33,297 acres of modeled habitat (Table 7-86), including 29,193 acres of modeled nesting/foraging habitat and 4,104 acres of modeled foraging habitat throughout the Plan Area. A majority of preservation for this species will be in PPUs 6 and 7.

Additionally, the SSHCP will re-establish or establish approximately 1,010 acres of modeled habitat, including 232 acres of modeled nesting/foraging habitat and 778 acres of modeled foraging habitat. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-87).

Table 7-86
Permanent Effects and Conservation for Tricolored Blackbird

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (Acres)	Total Habitat Preservation (acres)	Total Habitat Establishment and/or Re-Establishment (acres)
Nesting/Foraging Habitat					
Cropland	5,285	Qualitative	5,285	6,947[a]	0
Valley Grassland	22,014	Qualitative	22,014	22,014[b]	0
Seasonal Wetland	105	Qualitative	105	105	105
Freshwater Marsh	127	Qualitative	127	127	127
Total Nesting/ Foraging Habitat	*27,531*	*Qualitative*	*27,531*	*29,193*	*232*
Foraging Habitat					
Irrigated Pasture-Grassland	2,749	Qualitative	2,749	2,749[a]	0
Vernal Pool	389	0	389	966	389
Swale	234	0	234	278	234
Open Water	155	Qualitative	155	155[c]	155[d]
Total Foraging Habitat	*3,527*	*0*	*3,527*	*4,148*	*778*
Grand Total	**31,058**	**0**	**31,058**	**33,341**	**1,010**

[a] Impacts to Cropland or Irrigated Pasture-Grassland can be mitigated by preserving a combination of Cropland and Irrigated Pasture-Grassland.
[b] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.
[c] Preservation of Open Water can be achieved by preserving any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.
[d] Re-establishment and/or establishment of Open Water can be achieved by re-establishing and/or establishing any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

Table 7-87
Biological Goals and Measurable Objectives Applicable to Tricolored Blackbird

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design AMMs (Low-Impact Development (LID) and ROAD AMMs)

Table 7-87
Biological Goals and Measurable Objectives Applicable to Tricolored Blackbird

Applicable Biological Goals	Related Biological Objectives
	• Ground-disturbance AMMs (Best Management Practices (BMPs) and ROAD AMMs)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including Cropland and Irrigated Pasture-Grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.

Table 7-87
Biological Goals and Measurable Objectives Applicable to Tricolored Blackbird

Applicable Biological Goals	Related Biological Objectives
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective OW1. Preserve a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including Cropland and Irrigated Pasture-Grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA and a comprehensive weed detection and abatement plan for the Plan Area, including training of road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends and to track climate change.
	Objective HAB7. Monitor vegetation biomass within grassland land covers.
	Objective AG2. Of the 10,3779,696 acres preserved under Objective AG1, maintain at least 2,000 of those acres of high-quality foraging crops (such as corn, alfalfa, or wheat) preferred by tricolored blackbird, greater sandhill crane, and the covered raptor species. The 2,000 acres will be distributed in strategic locations throughout PPUs 4, 5, or 6 in plots of 20 acres or more. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective TB1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 4,149 acres of modeled foraging habitat for tricolored blackbird is preserved (see Objectives AG1, AG2, FWM1, VG1, VP1, VP3, FWM1, OW1, and SW1).
	Objective TB2. During assembly of the SSHCP Preserve System, ensure that a minimum of 27,532 acres of modeled nesting/foraging habitat for tricolored

Table 7-87
Biological Goals and Measurable Objectives Applicable to Tricolored Blackbird

Applicable Biological Goals	Related Biological Objectives
	blackbird is preserved, including a minimum of 402 acres of Freshwater Marsh and Seasonal Wetland (see Objectives AG1, AG2, VG1, VG1, FWM1, and SW1).
	Objective TB3. During assembly of the SSHCP Preserve System, ensure that a minimum of 917 acres of modeled foraging habitat for tricolored blackbird is re-established and/or established (see Objectives FWM2, SW2, OW2, and VP2).
	Objective TB4. During assembly of the SSHCP Preserve System, ensure that a minimum of 232 acres of modeled nesting/foraging habitat for tricolored blackbird is re-established and/or established (see Objectives FWM2 and SW2).
	Objective TB5. Provide mitigation for loss of any tricolored blackbird nesting colony site that is occupied at the time of Covered Activity implementation or was recorded as an occupied nesting colony at any time since 2008. Sources for occupied nesting colonies are the CNDDB, Tricolored Blackbird Portal, eBird, or other data sources approved by the Wildlife Agencies. Minimum mitigation is to preserve one extant unpreserved occurrence of a nesting colony prior to take of one nesting colony of tricolored blackbirds. Ensure that at least five extant tricolored blackbird colonies that were occupied in recent years are maintained and managed within the SSHCP Preserve System.
	Objective TB6. Conduct an experimental study to identify management actions to preserve tricolored blackbird colonies (e.g., coarse netting to reduce nest predation or impact of pesticides).
	Objective TB7. Ensure that at least one large tricolored blackbird colony (i.e., one that has historically (from 1950 on) supported a minimum of 1,500 individuals) is preserved.
	Objective TB8. For any tricolored blackbird nesting colony that is removed by a Covered Activity, re-establish and/or establish three new colonies within SSHCP Preserves. Re-established and/or established colonies can be in aquatic (freshwater marsh, seasonal wetland) or upland (annual grassland) habitat types, and must be within 0.5 mile of appropriate agricultural forage crops (especially alfalfa) or annual grasslands that provide adequate foraging opportunities.

Analysis of Species Conservation

The SSHCP will preserve approximately 33,297 acres of modeled nesting and foraging habitat. This would include approximately 29,193 acres of modeled nesting/foraging habitat and 4,104 acres of modeled foraging habitat throughout the Plan Area. The SSHCP will provide a system of large-scale landscape-level Preserves that are linked and designed to minimize the effects of habitat fragmentation and edge effects. To the maximum extent possible, newly preserved lands acquired by the SSHCP will be adjacent to and contiguous with existing preserves, enhancing the ecological value of SSHCP Preserves to tricolored blackbird.

By ensuring that 4,104 acres of modeled foraging habitat and 29,193 acres of modeled nesting/foraging habitat is preserved, and a minimum of 778 acres of foraging habitat and 232

acres of modeled nesting/foraging habitat is established or re-established in the Plan Area, as well as managing the habitat value of Croplands in the Preserve System, tricolored blackbirds will have adequate foraging habitat in the Plan Area. In addition, the 1,010 acres of re-established and/or established modeled foraging habitat and 232 acres of re-established and/or established nesting/foraging habitat will ensure that tricolored blackbird have adequate quality nesting/foraging habitat in the Plan Area.

Sites selected for preservation of foraging habitat will be prioritized pursuant to Conservation Action TB1.1 and be within 3 miles of a known nesting site or modeled nesting/foraging habitat on parcels 20 acres or greater in size and/or occur in larger, open space areas. They will be known to support high insect populations during the breeding season (April through July), will expand on or link already preserved lands, and will not be bisected by new roadways or incur impacts from any other infrastructure developments. Lastly they will be located where management will be used to enhance or re-establish natural ecosystem processes and attract Covered Species.

Sites selected for preservation of nesting/foraging habitat will be prioritized pursuant to Conservation Actions TB2.1 and TB2.2 and will be located where management will be used to enhance or re-establish natural ecosystem processes and attract Covered Species.

Preserve sites for aquatic nesting/foraging habitat will be within 3 miles of a known foraging site (intensive row crops, vineyards, and orchards generally do not provide modeled foraging habitat) or modeled nesting habitat on parcels 20 acres or greater in size and/or occur in larger, open space areas. They will be known to currently or historically support a tricolored blackbird colony, have nesting substrate (e.g., tules, cattails) in an extensive area (minimum 2 acres) to accommodate large tricolored blackbird colonies, and have Open Water (e.g., canal, lakeshore, or farm pond) within 1,640 feet (500 meters) of nesting substrate to provide a water source for nestlings. Management of this preserved aquatic nesting/foraging habitat will include periodic thinning or removal of tules or cattails after the nesting season to allow for growth of new tules and cattails, which are strongly preferred by nesting blackbirds. In addition, trees and other potential perching sites within 50 feet of this aquatic nesting/foraging habitat will be removed as necessary to prevent predators from taking eggs or nestlings from active colonies.

Preserve sites for upland nesting/foraging habitat will be within 3 miles of a known foraging site (intensive row crops, vineyards, and orchards generally do not provide modeled foraging habitat) or modeled nesting habitat on parcels 20 acres or greater in size and/or occur in larger, open space areas. They will be known to currently or historically support a tricolored blackbird colony, have nesting substrate (e.g., Himalayan blackberry) thickets in an extensive area (minimum 2 acres) to accommodate large tricolored blackbird colonies, and have Open Water

(e.g., canal, lakeshore, or farm pond) within 1,640 feet (500 meters) of nesting substrate to provide a water source for nestlings. Management of this upland nesting/foraging habitat will include maintaining these dense thickets of blackberry.

Sites for re-establishment and/or establishment of foraging habitat will be prioritized based on the criteria in Conservation Action TB3.1 (Table 7-1). Re-establishment and/or establishment will occur only where currently non-modeled habitat is converted to modeled habitat, and will be located where management will be used to enhance or re-establish natural ecosystem processes and attract Covered Species. The areas will occur within 3 miles of at least 1,000 acres of open space that includes all or a mix of Irrigated Pasture-Grassland, Cropland, Vernal Pool, Seasonal Wetlands, Swale, Freshwater Marsh, Open Water, and/or Valley Grassland that will provide adequate insect prey for nestlings. Surveys will be conducted in the re-establishment areas after the first year and every 5 years thereafter to monitor success and provide for remediation of failed re-establishment areas within 1 year after efforts are deemed unsuccessful.

Sites selected for re-establishment and/or establishment of nesting/foraging habitat will be prioritized pursuant to Conservation Action TB4.1, and will be known to historically support a tricolored black bird colony. They will be located on parcels 20 acres or greater in size and/or occur in larger, open space areas within 1 mile of a known foraging site or SSHCP land cover type that provides modeled nesting and foraging habitat. Lastly, it will have Open Water to provide water for nestlings within 1,640 feet (500 meters) of area where upland nesting substrate can be re-established and/or established.

Implementation of Objectives TB3 and TB4 and their accompanying Conservation Actions will ensure that tricolored blackbird will have new areas of preserved and managed quality nesting and nesting/foraging habitat in the Plan Area. Improvements in nesting and foraging habitat quantity and quality with management and monitoring will contribute to the potential expansion of nesting and foraging activities into areas not currently used by tricolored blackbird.

Ongoing impacts on modeled nesting and foraging habitat loss and conversion and lack of habitat management may already be significantly affecting the tricolored blackbird in the Plan Area. Implementation of Goal 2 and its related measurable objectives for modeled nesting and foraging habitat (Objectives W2 through W5) will help ensure that the adverse impacts of Covered Activities on these habitats will be minimized. Although Goal 2 addresses aquatic resources, some of the land covers included in the objectives for this goal are modeled nesting and foraging habitat (i.e., Seasonal Wetland, Freshwater Marsh, Vernal Pool, Open Water, and Swale) for tricolored blackbird. Using a Stream Setback strategy in conjunction with low-impact and compatible uses in land planning the Preserve System will maintain existing functions and values of nesting and foraging habitat and minimize edge-effect disturbances to tricolored blackbird colonies (e.g., lighting, noise, human activity).

The SSHCP Conservation Strategy ensures that the most current distribution of nesting colonies is considered during Plan implementation. Objective TB5 requires preservation and management of at least five nesting colonies that were recently active prior to the effective date of the permit (based on the last two statewide surveys). In addition, prior to take of a nesting colony, one extant and unprotected colony must be preserved. To meet Objective TB5, Conservation Action TB5.1 will be implemented and will provide a preserved nesting substrate (including flooded, thorny, spiny, or "visually" but not actually spiny vegetation) with open accessible water within 1,640 feet (500 meters) of the nesting substrate with at least 1,000 acres of modeled foraging habitat. Objective TB6 require a study of potential management actions to reduce permanent indirect effects to nest colonies, such as predation and pesticides. Objective TB7 requires that at least one large colony that has historically (since 1950) supported at least 1,500 individuals be preserved. According to Conservation Action TB7-1, that large colony must have preserved nesting habitat and at least 500 acres of modeled foraging habitat within a 1-mile radius of the colony.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands. Further, the SSHCP Conservation Strategy protects individual vernal pool watersheds–SSHCP Preserve boundaries would be established outside the micro-watershed of preserved vernal pools. Using rigorous Preserve Setback AMMs and watershed protection AMMs in conjunction with low-impact AMMs and compatible-use AMMs in project planning, the Preserve will maintain existing ecosystem functions and habitat values of the Vernal Pool Ecosystem within the Preserve System. Through proper land management techniques and continued monitoring of nesting and foraging habitat for tricolored blackbird preserved in the Preserve System, the SSHCP will ensure that habitat functions and values remain the same as the time of acquisition or improve with proper management (HAB1 through HAB7). Management objectives that will, in particular, directly benefit tricolored blackbird are those designed to maintain and enhance nesting and foraging habitat, such as those that ensure planting of Croplands (Objectives AG1 and AG2) and provision of cover and refugia that will attract prey species (Objectives AG1 and AG2). The Conservation Strategy for tricolored blackbird includes cultivation of alfalfa, rice, and dryland grains close to modeled nesting habitat and planting of hedgerows along the borders of agricultural fields. Alfalfa, rice, and dryland grains are modeled habitats for tricolored blackbird and provide high productivity foraging habitats that provide both insect prey that is important during the nesting season and plant matter that is important during the winter (Crase and DeHaven 1978). Cultivating these crops and managing them for the benefit

of tricolored blackbird will increase prey availability and should improve nesting and foraging success for the blackbird. This careful management and monitoring, coupled with the extensive preservation of modeled habitat in large Preserves throughout the Plan Area, means the Conservation Strategy is consistent with Guiding Principle 8 by ensuring that, should a localized population become extirpated from a particular habitat patch, individual tricolored blackbirds from nearby modeled habitat or colonies in other preserves would be able to recolonize vacant habitat and thus limit the effects of stochastic disturbances to local subpopulations.

7.6.2.27 American Badger

Estimated Levels of Impact, Preservation, Re-Establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 22,780 acres of American badger (*Taxidea taxus*) modeled habitat in the Plan Area (Table 7-88), including 389 acres of impacts to Vernal Pool, 234 acres of impacts to Swale, 105 acres of impacts to Seasonal Wetland, 38 acres of impacts to Blue Oak Savanna, and 22,014 acres of impacts to Valley Grassland. Occurrences of this highly mobile species have been documented in PPUs 1, 2, and 6 (Figure 3-29), but it is likely that the species is more widely distributed and will be affected by Covered Activities throughout the Plan Area.

To mitigate these impacts to American badger modeled habitat, the SSHCP will preserve 23,401 acres of American badger modeled habitat, including 966 acres of Vernal Pools, 278 acres of Swale, 105 acres of Seasonal Wetland, 38 acres of Blue Oak Savanna, and 22,014 acres of Valley Grassland (Table 7-88).

The SSHCP will also re-establish and/or establish 766 acres of American badger modeled habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-89).

Table 7-88
Habitat Impacts and Conservation for American Badger

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Establishment/ Re-Establishment (acres)
Blue Oak Savanna	38	Qualitative	38	38[a]	38[b]
Valley Grassland	22,014	Qualitative	22,014[c]	22,014	0
Vernal Pool	389	0	389	966	389
Seasonal Wetlands	105	Qualitative	105	105	105
Swale	234	0	234	278	234
GRAND TOTAL	**22,780**	**0**	**22,780**	**23,401**	**766**

[a] Impacts to Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.
[b] Impacts to Blue Oak Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.
[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

Table 7-89
Biological Goals and Measurable Objectives Applicable to American Badger

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W2.** Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP Design avoidance and minimization measures (Low-Impact Development (LID) and ROAD Measures) • Ground disturbance avoidance and minimization measures (Best Management Practices (BMPs) and ROAD Measures)
	Objective W3. Covered Activities will implement Stream Setback requirements in the UDA for creeks and streams as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish natural land covers (including cropland and irrigated pasture-grassland) that provide habitat for Covered Species.	**Objective VG1**. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.

Table 7-89
Biological Goals and Measurable Objectives Applicable to American Badger

Applicable Biological Goals	Related Biological Objectives
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including cropland and irrigated pasture-grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. Program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends, tracking climate change, and other related tasks.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective AB1.** During assembly of the SSHCP Preserve System, ensure that a minimum of 23,171 acres of modeled habitat for American badger (Taxidea taxus) is preserved (see Objectives BOW1, VG1, VP1, VP3, and SW1).
	Objective AB2. During Preserve assembly, ensure that a minimum of 767 acres of modeled habitat for American badger is re-established and/or established (see Objectives VP2 and SW2).

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link 23,401 acres of the highest-quality habitat for American badger in the Plan Area. Because the range of American badger in the Plan Area is not well understood and observations are generally older, the Conservation Strategy does not target the areas where occurrences have been recorded. Rather, the SSHCP targets preservation of large, connected Preserves that can best support this highly mobile species. In particular, American badger modeled habitat preserved by the SSHCP in PPU 7 could support several badger territory/home ranges, which can range from approximately 340 acres to more than 1,500 acres (Lindzey 1982; Messick 1987; Minta 1993).

Preserves benefiting American badger will be established through land acquisitions that are targeted to (1) capture large continuous areas of American badger modeled habitat, (2) include a diversity of land cover types that provide American badger modeled habitat, (3) add parcels onto existing preserves that increase preserve size and minimize habitat fragmentation and edge effects, and (4) provide connections to existing preserves that are currently isolated from each other.

The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves that include American badger modeled habitat will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. Further, under Conservation Action VPI1.2 at least 90% of the watershed for each preserved vernal pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In these ways, SSHCP Preserves protect riparian and wetland areas and will contribute to the persistence of American badger in the Plan Area. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and preservation of large areas of intact habitat would not occur.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

In addition to modeled habitat preservation, the Implementing Entity will establish or re-establish 766 acres of American badger modeled habitat in the Plan Area, with a priority on re-establishment before establishment.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of habitat for American badger protected in the Preserve System will ensure that American badger habitat requirements within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Management objectives that will directly benefit American badger are those designed to maintain and enhance habitat, including Preserve Management Plans (Objectives HAB1 and HAB2), consideration of management history (Objective HAB3), an invasive species eradication program (Objective HAB4), and monitoring vegetation height in grasslands (Objective HAB7) to improve habitat suitability for important prey and increase prey detectability. Permanent indirect effects on modeled habitat such as increased weeds, litter, and hydrological alterations will be addressed by Objective HAB5 (Table 7-89). These actions should result in higher overall reproductive success and productivity of the Plan Area population, and may allow expansion of American badger into areas not currently used by this species.

7.6.2.28 Western Red Bat

Estimated Levels of Impact, Preservation, Re-Establishment, and Establishment

As discussed in Chapter 6, SSHCP Covered Activities are anticipated to impact up to 23,986 acres of western red bat (*Lasiurus blossevillii*) modeled habitat in the Plan Area (Table 7-90). The majority of impacts to western red bat modeled habitat (97%) occur in the UDA.

The range for western red bat includes the entire Plan Area. There are eight documented occurrences for western red bat in the SSHCP GIS database, and several records from county rabies testing that were not able to be geo-referenced (refer to Section 3.4.6). In addition, a bat monitoring station at the Cosumnes River Preserve has detected western red bats. Due to the apparent widespread distribution of the species in the Plan Area, the conservation analysis is primarily based on modeled foraging and roosting habitat under the assumption that western red bat could use these modeled habitats throughout the Plan Area.

To mitigate impacts to western red bat modeled habitat and to preserve or improve the species' abundance and distribution in the Plan Area, the SSHCP will preserve 24,697 acres of western red bat modeled habitat, consisting of 839 acres of modeled roosting/foraging habitat (Blue Oak Woodland and Savanna, Mixed Riparian Woodland) and 23,858 acres of modeled foraging habitat (Valley Grassland, Mixed Riparian Scrub, Vernal Pool, Seasonal Wetland, Swale, Freshwater Marsh, Open Water, and Streams/Creek) (Table 7-90).

The SSHCP will also re-establish and/or establish 1,765 acres of western red bat modeled habitat in the Plan Area. All preservation, re-establishment, and/or establishment will be consistent with the Biological Goals and Measurable Objectives for this species (Table 7-91).

Table 7-90
Permanent Effects and Conservation for Western Red Bat

Land Cover Types	Direct Effects (acres)	Indirect Effects (acres)	Total Effects (acres)	Total Habitat Preservation (acres)	Total Habitat Establishment/ Re-Establishment (acres)
Foraging					
Mixed Riparian Scrub	189	Qualitative	189	378 [a]	189 [b]
Valley Grassland	22,014	Qualitative	22,014 [c]	22,014	0
Vernal Pool	389	0	389	966	389
Seasonal Wetlands	105	Qualitative	105	105	105
Swale	234	0	234	278	234
Freshwater Marsh	127	Qualitative	127	127	127
Open Water	155	Qualitative	155	155 [d]	155 [e]
Streams/Creeks	117	Qualitative	117	117	117
Total Foraging Habitat	*23,330*	*0*	*23,330*	*24,140*	*1,316*
Roosting/Foraging					
Blue Oak Woodland	9	Qualitative	9	0 [f]	9 [g]
Blue Oak Savanna	38	Qualitative	38	47 [f]	38 [g]
Mine Tailing Riparian Woodland	218	Qualitative	218	218 [h]	218 [i]
Mixed Riparian Woodland	184	Qualitative	184	368 [a]	184 [b]
Orchards	207	Qualitative	207	207 [j]	0
Total Roosting/Foraging Habitat	*656*	*Qualitative*	*656*	*840*	*449*
GRAND TOTAL	**23,986**	**0**	**23,986**	**24,980**	**1,765**

[a] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[b] Impacts to Mixed Riparian Woodland or Mixed Riparian Scrub can be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[c] Total impacts to Valley Grassland include an unknown but small amount of impact that was analyzed qualitatively in Chapter 6.

[d] Preservation of Open Water can be achieved by preserving any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[e] Re-establishment and/or establishment of Open Water can be achieved by re-establishing and/or establishing any aquatic land cover type that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC.

[f] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by preserving any combination of Blue Oak Savanna and Blue Oak Woodland.

[g] Impacts to Blue Oak Woodland or Blue Oak Savanna can be mitigated by re-establishing or establishing any combination of Blue Oak Woodland and Blue Oak Savanna.

[h] Impacts to Mine Tailing Riparian Woodland will be mitigated by preserving any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[i] Impacts to Mine Tailing Riparian Woodland will be mitigated by re-establishing or establishing any combination of Mixed Riparian Woodland and Mixed Riparian Scrub.

[j] Impacts to Orchards will be mitigated by preserving any combination of Cropland and Irrigated Pasture-Grassland.

Table 7-91
Biological Goals and Measurable Objectives Applicable to Western Red Bat

Applicable Biological Goals	Related Biological Objectives
Goal 1. Preserve and link intact landscapes that include the highest-quality habitat for Covered Species within the Plan Area.	**Objective L1.** Establish a minimum Preserve System of 36,282 acres of natural land covers that preserves 34,495 acres and re-establishes or established 1,787 acres of habitat for Covered Species and other native biota as a component of the Preserve System. Of the 34,495 acres of preservation, at least 6,941 acres will be within the UDA. Of the 1,787 acres of re-establishment or establishment at least 130 acres will be within the UDA. Preserves will be assembled in accordance with the Conservation Actions in this table.
	Objective L2. Establish a minimum of 11 Linkage Preserves that provide interconnections between the Landscape, Core, Minor, and Satellite Preserves or existing preserves. Linkage Preserves will have a minimum width of 600 feet and will be located as described in Section 7.5. (minor variations on minimum width may be allowed where there are physical constraints in the environment, in accordance with the process outlined in Chapter 10).
Goal 2. Maintain or improve physical, chemical, and biological functions of aquatic resources within the Plan Area.	**Objective W1.** Ensure that during implementation of Objective L2 (establishing a minimum of 11 Linkage Preserves), the Linkage Preserves that include creeks or streams will include the creek plus a minimum 300-foot setback on each side of the creek.
	Objective W2. Covered Activities will implement the following, as outlined in Section 5.4.2: • Incorporate the SSHCP design avoidance and minimization measures (Low-Impact Development (LID) and ROAD Measures) • Ground disturbance avoidance and minimization measures (Best Management Practices (BMPs) and ROAD Measures)
	Objective W3. Covered Activities will implement stream setback requirements in the UDA for creeks and streams, as described in AMM STREAM-1, STREAM-2, and STREAM-3. Covered Activities will implement Preserve Setback requirements in the UDA, as described in AMM EDGE-3.
	Objective W4. Ensure that aquatic resources are preserved during assembly of the SSHCP Preserve System and are managed in perpetuity (see Objectives VG1, VP1, VP3, SW1, FWM1, ES1, SC1, OW1, RIP1, and RIP3).
	Objective W5. Ensure that aquatic resources are re-established and/or established during assembly of the SSHCP Preserve System in compliance with Conservation Actions listed in Table 7-1 (see Objectives SW2, FWM2, OW2, RIP2, and RIP4).
Goal 3. Preserve, re-establish, or establish, natural land covers (including cropland and irrigated pasture-grassland) that provide habitat for Covered Species.	**Objective RIP1**. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective RIP2. Preserve a minimum of 964 acres of Mixed Riparian Woodland and/or Mixed Riparian Scrub for impacts to Mixed Riparian Woodland, Mixed Riparian Scrub and Mine Tailing Riparian Woodland land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW1. Preserve a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak

Table 7-91
Biological Goals and Measurable Objectives Applicable to Western Red Bat

Applicable Biological Goals	Related Biological Objectives
	Savanna. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective BOW2. Re-establish and/or establish a minimum of 47 acres of Blue Oak Woodland and/or Blue Oak Savanna for direct impacts to Blue Oak Woodland and Blue Oak Savanna. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective VG1. Preserve a minimum of 22,014 acres of Valley Grassland land cover within the Vernal Pool Ecosystem. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP1a. Preserve a minimum of 966 acres of Vernal Pool in the Plan Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP1b. Impacts to Vernal Pool within or adjacent to (within 1 mile of) the Mather Core Recovery Area and Cosumnes/Rancho-Seco Recovery Area will be mitigated within or adjacent to (within 1 mile of) the Mather Core Recovery Area and/or Cosumnes/Rancho-Seco Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP2. Re-establish and/or establish a minimum of 389 acres of functional Vernal Pool, including at least 50 acres within or adjacent to (within 1 mile of) the Mather Core Recovery Area in accordance with the Conservation Actions in Table 7-1.
	Objective VP3. Preserve a minimum of 278 acres of Swale. The Preserves will be assembled in accordance with the Conservation Actions in table 7-1.
	Objective VP4. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective VP5. Preserve a minimum of 26 acres of Swale or Stream/Creek (VPIH) land cover type for impacts to the Stream/Creek (VPIH) land cover type. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW1. Preserve a minimum of 105 acres of Seasonal Wetland. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SW2. Re-establish and/or establish a minimum of 105 acres of Seasonal Wetland. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in this Table 7-1.
	Objective FWM1. Preserve a minimum of 127 acres of Freshwater Marsh. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective FWM2. Re-establish and/or establish a minimum of 127 acres of functional Freshwater Marsh. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective SC1. Preserve a minimum of 117 acres of the Stream/Creek land cover. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
	Objective SC2. Re-establish and/or establish a minimum of 117 acres of the Stream/Creek land cover. Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.

Table 7-91
Biological Goals and Measurable Objectives Applicable to Western Red Bat

Applicable Biological Goals	Related Biological Objectives
	Objective OW1. Preserve a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat for Covered Species affected by the loss of Open Water, as determined by the Technical Advisory Committee (TAC)). The Preserves will be assembled in accordance with the Conservation Actions in this table and in accordance with Section 7.5.
	Objective OW2. Re-establish and/or establish a minimum of 155 acres of Open Water (or a land cover that provides equivalent or better habitat value for Covered Species affected by the loss of Open Water, as determined by the TAC). Re-establishment and/or establishment will occur in accordance with the Conservation Actions in Table 7-1.
	Objective AG1. Preserve a minimum of 9,696 acres of Cropland and/or Irrigated Pasture-Grassland, including 1,000 acres outside the 100-year floodplain in accordance with Objective GS6. The Preserves will be assembled in accordance with the Conservation Actions in Table 7-1.
Goal 4. Maintain or improve habitat value of natural land covers (including cropland and irrigated pasture-grassland) that are preserved within the Plan Area.	**Objective HAB1.** Develop Preserve Management Plans for the benefit of Covered Species.
	Objective HAB2. Assess whether Preserves are being managed and maintained for the benefit of Covered Species.
	Objective HAB3. Record management history for Preserve parcels as they are obtained. Consider management history when developing the initial Preserve Management Plan (PMP).
	Objective HAB4. Develop and implement an early detection and eradication program for invasive species within the Plan Area. The program will include regular weed assessment and mapping within the UDA, and a comprehensive weed detection and abatement plan for the Plan Area, including training road crews to identify and report weeds.
	Objective HAB5. Monitor Preserves for edge effects (e.g., weeds, noise, hydrology, litter).
	Objective HAB6. Collect weather data throughout the county to assist in developing status and trends, track climate change, and other actions.
	Objective HAB7. Monitor vegetation biomass within Grassland land covers.
Goal 5. Maintain or expand the existing distribution of each Covered Species within the Plan Area.	**Objective WR1**. During Preserve assembly, ensure that a minimum of 23,910 acres of modeled foraging habitat for western red bat (*Lasiurus blossevillii*) is preserved (see Objectives BOW1, RIP1, RIP3, AG1, VG1, VP1, VP3, SW1, OW1, FWM1, and SC1).
	Objective WR2. During assembly of the SSHCP Preserve System, ensure that a minimum of 841 acres of modeled roosting/foraging habitat for western red bat is preserved (see Objectives BOW1, RIP1, and RIP3).
	Objective WR3. During assembly of the SSHCP Preserve System, ensure that a minimum of 1,317 acres of modeled foraging habitat for western red bat is re-established and/or established (see Objectives VP2, SW2, OW2, FWM2, RIP2, and RIP4).
	Objective WR4. During assembly of the SSHCP Preserve System, ensure that a minimum of 450 acres of modeled roosting/foraging habitat for western red bat is re-established and/or established (see Objectives RIP2 and RIP4).

Analysis of Species Conservation

The SSHCP Conservation Strategy will preserve and link 24,697 acres of the highest-quality habitat for western red bat in the Plan Area. Because the range of western red bat in the Plan Area is not well understood and observations have generally been based on vector control records, the Conservation Strategy does not target the areas where occurrences have been recorded; rather, the SSHCP targets preservation of large, connected Preserves that can best support this highly mobile species. In particular, the western red bat modeled habitat preserved by the SSHCP in PPU 7 will support extensive foraging habitat for the species. Preservation of riparian woodland roosting habitat and re-establishment/establishment of additional riparian woodland roosting habitat will potentially improve reproductive success of this species.

Most of the modeled foraging and roosting habitat preserved under the SSHCP will be outside the UDA and concentrated in PPUs 5, 6, and 7. PPUs 5 and 6 include the Cosumnes River and Deer Creek areas, which contain the riparian habitat known to support western red bat. The SSHCP also includes planned riparian re-establishment/establishment for the Cosumnes River in PPUs 5 and 6, which is expected to improve and expand roosting habitat for western red bat along the river.

Preserves benefiting western red bat will be established through land acquisitions that are targeted to capture large continuous areas of modeled habitat; include a diversity of land cover types; add parcels onto existing preserves that increase preserve size and minimize habitat fragmentation and edge effects; and provide connections to existing preserves that are currently isolated from each other.

The size and shape of all Preserves in the UDA are constrained by existing land use and zoning designations. However, to the extent possible, SSHCP Preserves that include western red bat modeled habitat will be adjacent to compatible land uses or existing preserves to reduce edge effects related to encroaching urban development. Further, under Conservation Action VPI1.2, at least 90% of the watershed for each preserved Vernal Pool will also be preserved. Refer to Section 7.4.3 for descriptions of the functional size of preserved areas that will result from the combination of SSHCP Preserves with existing preserves. In these ways, SSHCP Preserves will protect riparian and wetland areas, and will contribute to the persistence of western red bat in the Plan Area. In the absence of the SSHCP, land preservation for project-by-project mitigation would not be located in this coordinated and strategic way, and preservation of large areas of intact habitat would not occur.

Implementation of Conservation Actions (Table 7-1) and AMMs (Section 5.4) will avoid and minimize potential edge effects (Section 6.3) on SSHCP Preserves. For example, the AMMs established for Preserve Setbacks under the SSHCP would make setbacks as effective as possible to buffer preserves from edge effects and other environmental stressors associated with urban

development. Under existing project-by-project mitigation, setbacks around preserves may allow for activities and encroachments that reduce the effective preservation area and allow indirect effects to preserved lands.

In addition to modeled habitat preservation, the Implementing Entity will also establish or re-establish 1,765 acres of western red bat modeled habitat in the Plan Area, with a priority on re-establishment before establishment.

As discussed in Chapter 8, Preserve land management techniques, monitoring, and adaptive management of habitat for western red bat protected in the Preserve System will ensure that western red bat habitat requirements within the SSHCP Preserve System are not degraded and will improve under SSHCP management as compared to existing habitat conditions. Management objectives (Table 7-91) that will, in particular, directly benefit western red bat are those designed to maintain and enhance foraging habitat and monitor edge effects of noise. Excessive noise from surrounding developments could interfere with echolocation and reduce foraging success. Monitoring vegetation height in grasslands (Objective HAB7) should help maintain foraging habitat quality by improving habitat suitability for prey and increasing prey detectability for nocturnal predators (e.g., by controlling dense thatch). These actions should result in higher overall reproductive success and productivity of the Plan Area population, and may allow expansion of western red bat into areas not currently used by this species.

7.6.3 Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon

The USFWS published the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* in 2005 for 33 species (20 listed species and 13 species of concern). Generally, the Recovery Plan addresses 16 vernal pool regions, with a focus on species-specific recovery actions within important Core Recovery Areas in each region. The Plan Area is within the Southeastern Sacramento Valley Vernal Pool Region. The Plan Area includes two Core Recovery Areas: the Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area, discussed in more detail below. The Mather Core Recovery Area and the Cosumnes/Rancho-Seco Core Recovery Area were designated by USFWS (2005a) as Zone 1 Core Areas, the highest priority ranking for preservation.

The Recovery Plan includes four listed SSHCP Covered Species: Sacramento Orcutt grass, slender Orcutt grass, vernal pool fairy shrimp, and vernal pool tadpole shrimp (USFWS 2005a). The Recovery Plan also addresses five non-listed “species of concern” that are SSHCP Covered Species: Ahart’s dwarf rush, Boggs Lake hedge-hyssop, legenere, mid-valley fairy shrimp, and western spadefoot (USFWS 2005a).

The Recovery Plan identifies general and species-specific recovery criteria for five recovery and long-term conservation actions (USFWS 2005a, p. III-93 to III-120 and Table III-1). However, USFWS (2005a) also states that alternative strategies, such as development of HCPs or other site-specific planning methods, may present opportunities to conserve species habitat and meet the rationales for the species-specific recovery criteria. HCPs that cover species and vernal pool habitat may be deemed equivalent to implementation of the 2005 Recovery Plan for the covered area if they contain the six elements of the Recovery Plan discussed below.

The SSHCP will preserve large, interconnected blocks of habitat, and the Conservation Actions carried out to meet SSHCP Biological Goals and Measurable Objectives will incorporate, or be consistent with, many of the species-specific recovery criteria for nine Covered Species addressed in the Recovery Plan. Therefore, the SSHCP provides an alternative Conservation Strategy for preserving vernal pool species habitat and meeting the six recovery criteria listed on page III-120 of the 2005 Recovery Plan, as described below.

1. *Permanently protected vernal pool preserves within the area covered by an HCP in large contiguous blocks of suitable habitat.*

   The goals of the SSHCP include protecting the populations of 13 covered vernal pool species in Preserves large enough to maintain and enhance population viability and protect vernal pool and valley grassland landscape functions (Table 7-1). This will be accomplished by protecting approximately 22,907 acres of Vernal Pool Ecosystem, including 995 acres of existing Vernal Pool, 309 acres of Swale, 35.3 acres of Stream/Creek (VPIH), and 21,568 acres of hydrologically connected Valley Grassland. Finally, the SSHCP will also re-establish and/or establish components of the Vernal Pool Ecosystem, including approximately 389 acres of Vernal Pool and 256 acres of Swale. Valley Grassland may be re-established/established at the same time as re-establishment/establishment of vernal pools and swales to form a complete Vernal Pool Ecosystem.

   In the Mather Core Recovery Area, the SSHCP will preserve 5,494 acres of Vernal Pool Ecosystem, including 213 acres of Vernal Pool, 90 acres of Swale, and 5,155 acres of hydrologically connected Valley Grassland. In the Cosumnes/Rancho Seco Recovery Area, the SSHCP will preserve 15,293 acres of Vernal Pool Ecosystem, including 703 acres of Vernal Pool, 189 acres of Swale, and 14,402 acres of hydrologically connected Valley Grassland. Vernal Pools and Valley Grassland will be preserved in four types of vernal pool Preserves throughout the Plan Area:

   - Three Core Preserves will be established within the UDA. These Preserves are within the Mather Core Recovery Area and will provide protection of documented occurrences of Covered Species, protect adjacent suitable vernal pools, and protect the ecological functions of the vernal pool and valley grassland complexes.

- In addition to the Core Preserves, at least 3 Minor Preserves totaling approximately 813 acres and 10 Satellite Preserves totaling approximately 1,508 acres will also be established within the UDA. Within the UDA, the size and shape of minor and Satellite Preserves are substantially constrained by existing land use and zoning designations. However, these Preserves are necessary to provide protection for documented occurrences of Covered Species or areas with high-quality vernal pool habitat.
- A Landscape Preserve, including approximately 10,500 acres of land preservation, will be established outside the UDA within PPU 7. This Landscape Preserve is within the Cosumnes/Rancho-Seco Core Recovery Area and will encompass a wide variety of vernal pool types and Preserve habitat heterogeneity associated with vernal pools and valley grassland in the Plan Area. The Landscape Preserve will be established through land acquisitions that are targeted (1) to establish core areas, (2) to add parcels onto existing preserve lands (e.g., Chance [Howard] Ranch) to increase their size and avoid habitat fragmentation, and (3) to provide connections to existing preserves and/or Preserve areas.

2. *Protection of the entire genetic range of each listed species within the area covered by the HCP.*

The SSHCP Preserve System is designed to maintain or expand the existing distribution of each Covered Species within the Plan Area, pursuant to Goal 5. This will contribute toward preserving the genetic range of the covered vernal pool species throughout the Plan Area. In addition, the SSHCP will ensure that a broad range of habitat types and geographic locations are preserved in the Preserve System. Heterogeneous habitat types and areas generally support greater biodiversity, including genetic diversity within and among populations. They also are more likely to be ecologically complex, and at least some may be more resilient over time than homogeneous habitat areas.

Vernal pool heterogeneity is provided in the Preserve System at three spatial scales: (1) landscape heterogeneity (geologic formations, soils, location within the Plan Area) of preserved vernal pool complexes in the Plan Area; (2) heterogeneity of vernal pool types, spatial patterns, and connectivity within a Preserve; and (3) heterogeneity of individual pools, including sizes, water chemistry, and floristic components. Tables 7-10 and 7-11 in Section 7.6.1.1.1 present the geologic formations and soil types that compose the Preserve System, as compared to the composition of the Plan Area as a whole. Table 7-12 similarly presents the VWADI scores of the Preserve System as compared to the Plan Area. VWADI categorizes vernal pool complexes by the size and density of pools, which captures heterogeneity at both scale 2 and scale 3. By preserving vernal pool heterogeneity at these three scales, the likelihood of capturing genetic diversity is increased, and preservation of biodiversity is better assured.

For vernal pools in the SSHCP Preserve System, primary parameters used to define habitat heterogeneity include the number of different geological formations and soil associations encompassed, and the Vernal Wetland Acre/Density Index, which indicates the variance in the size and density of vernal pools present in different locations of the Plan Area. By establishing Preserves on each of the geologic landforms throughout the Plan Area that currently support vernal pools, preserving the vernal pool heterogeneity as defined above, and ensuring connectivity among the existing and SSHCP preserves in the Plan Area, the SSHCP will preserve a broad range of habitat types. The SSHCP Preserve System includes preservation and species-specific measures distributed within each PPU, rather than allowing conservation to be focused within limited portions of the Plan Area. In addition, the SSHCP targets preservation of occurrences of Sacramento Orcutt grass, slender Orcutt grass, Ahart's dwarf rush, and other endemic vernal pool plants. Preserves will be established to protect these very rare plant species where needed. This targeted preservation will help ensure that the Preserve System contributes to preserving the genetic range of these species, thus helping to preserve their genetic diversity within the Plan Area.

3. *Protection of all populations of species with 25 or fewer total occurrences addressed in this plan within the area covered by the HCP.*

   Three extremely endangered plant species (slender Orcutt grass, Sacramento Orcutt grass, and Ahart's dwarf rush) are present in the Plan Area. The SSHCP will protect all populations of these three species within the Plan Area. The SSHCP will also protect all newly discovered occurrences of slender Orcutt grass and Sacramento Orcutt grass that are found within the Plan Area. Furthermore, to protect these species from population declines and possible extirpation from the Plan Area, the USFWS, CDFW, and Partner Agency Permittees have determined it necessary to preserve occurrences within Minor or Satellite Preserves with minimum 300-foot setbacks around the plant populations. Many of these occurrences are already adversely indirectly affected by adjacent existing development, or could be indirectly affected by adjacent land use designations. These adjacent conditions restricted the ability of the SSHCP to protect these extremely endangered plant occurrences within a larger SSHCP Preserve type (e.g., Core Preserves or Landscape Preserves). Where the extremely endangered plant species are present in Plan Area locations that are suitable for a functioning Core Preserve, those locations will be prioritized for preservation to achieve SSHCP Biological Goals and the USFWS Recovery Plan (2005a) conservation goals for the species (see Conservation Actions for VPP1, VPP6, and VPP7).

4. *Connectivity with other preserves within the area covered by the HCP.*

   Core and Minor Preserves established by the SSHCP contain many of the vernal pool resources within the UDA, and will be connected by Linkage Preserves to other Preserves within the Plan Area. SSHCP Linkage Preserves will be designed to maintain

connectivity among the Preserves, providing for wildlife movement and, in many cases, hydrologic connections between Preserves (see Objective L2 in Table 7-1). Connectivity with other Preserves could allow for movement of cysts between different pools, facilitating genetic exchange. For vernal pool plants, maintaining a linkage of undeveloped habitat improves the chances that pollinators will locate the isolated and ephemeral flowers. Hydrologic connectivity will benefit vernal pools and any linkage or connection to other preserves reduces the chances for disruption of perched aquifers that support vernal pools. The ultimate size and dimensions of the Linkage Preserves will depend on several factors, including habitat types in the linkage, the ecological function(s) the linkage is designed to serve (e.g., overland wildlife movement, drainage), and adjacent land uses. Additional linkage function will be provided by some stream and riparian corridors not specifically identified as Linkage Preserves. Stream and riparian corridors are described in Section 7.6.1.1.2. While these corridors will preserve riparian, stream, and creek habitats, they may also serve to connect vernal pool and valley grassland resources in the SSHCP Preserve System (e.g., by facilitating dispersal of seeds and cysts via wildlife or water flows).

The three Core Preserves inside the UDA will be linked by minimum 600-foot-wide Linkage Preserves (with some minor allowable variation due to physical constraints; see Objective L2). These Linkage Preserves will follow stream channels, where possible, to maintain hydrologic connectivity. In addition to linking the three Core Preserves within the UDA, smaller Minor and Satellite Preserves (where possible considering existing development and infrastructure) will also be connected by Linkage Preserves.

The Landscape Preserves located outside of the UDA in PPU 7 will be connected to existing preserve within the Cosumnes/Rancho Seco Recovery Area.

5. *Adaptive management of the preserves within the area covered by the HCP to support the species addressed in the Recovery Plan*.

   Many of the SSHCP Biological Goals and Measurable Objectives presented in Table 7-1 include in objective language “protect and maintain in perpetuity” Covered Species and their habitats, as well as re-establishment and/or establishment of their habitat, in the Plan Area. These Conservation Actions also require an effectiveness monitoring component for management activities. Management, including adaptive management, for the SSHCP is discussed in Chapter 8.

6. *Sufficient funding for management, maintenance and monitoring of the preserves in perpetuity.*

   Funding for the SSHCP is discussed in Chapter 12.

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