Chapter 5

Conservation Strategy

5.1 Summary

The Placer County Conservation Plan (PCCP) is designed to meet the regulatory requirements of the federal Endangered Species Act (ESA) and the state Natural Community Conservation Plan (NCCP) Act and to streamline compliance with the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA) and other applicable environmental regulations (see Chapter 1). The PCCP conservation strategy, in concert with the Placer County Aquatic Resources Program (CARP), is also designed to comply with the requirements of the Federal Clean Water Act Section 401 and 404 programmatic general permits and the California Department of Fish and Game (CDFG), Section 1600 master streambed alteration agreement.

The PCCP will provide for conservation of landscapes, natural communities, and covered species on the basis of the following general principles:

- Create a Reserve System comprising from 30,000 to 50,000 acres of land for the benefit of natural communities, covered species, biological diversity, and ecosystem function.
- Conserve, restore, enhance, and manage representative natural and semi-natural landscapes[1].
- Protect and maintain habitat areas that are large enough to support sustainable populations of covered species.

[1] A semi-natural landscape is defined as one that is disturbed by human activity but still provides important habitat for a variety of native species. All agricultural lands in the Plan area are considered semi-natural.

- Provide for incorporation of existing natural and semi-natural lands into the Reserve System to enhance their long-term management.
- Provide for timely restoration of riparian woodland, valley oak woodland, vernal pool and vernal pool complexes, other wetlands, and ponds to maximize resiliency, offset losses of these land-cover types and contribute to species recovery.
- Incorporate in the Reserve System a range of environmental gradients and high habitat diversity to provide for shifting species distributions in response to changing circumstances.
- Provide protection and management of aquatic resources in the Plan area, particularly in stream, riparian and vernal pool habitats that support covered species and other native biodiversity, through a combination of acquisition and avoidance.
- Establish reserves that provide conservation of covered species within the Plan area and linkages to adjacent habitat outside the Plan area that sustain the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the Reserve System.
- Preserve major local and regional habitat connections and corridors between key habitat areas and between existing protected areas.
- Establish a framework for long-term management of the Reserve System and streams throughout the Plan area to enhance populations of covered species and maintain biological diversity.
- Establish a framework within the development footprint of avoidance and minimization standards that supports the least damaging practicable alternative for development within PCCP covered area.

The PCCP provides an implementation mechanism to achieve those goals and to mitigate the effects of future urban growth. The mitigation system prescribed in the PCCP will be applied on a case-by-case basis to urban development proposals and other covered activities. The PCCP permits will authorize incidental take of covered species on all natural or semi-natural lands converted to urban uses as well as incidental take from a range of actions expected to occur over the permit duration (see Chapter 2 for a description of covered activities). Over the 50-year permit term, upwards of 40,000 acres may be converted to urban uses. These 40,000 areas represent roughly one fifth of the Plan area which in total covers 216,000 acres.

The PCCP itself does not authorize any particular parcel of land to be developed. That authorization will only come after the customary land use permitting process.

To meet the NCCP Act standards, the conservation strategy contributes to species recovery to help delist currently listed species and to prevent the listing of non-listed species. The strategy has four main components:

1. **Reserve System**. The Plan proposes to progressively establish a large system of interconnected land blocks estimated to be between 30,000 to 50,000 acres. The Reserve System would be capable of protecting, managing, restoring and creating the natural and semi-natural communities and habitats that support the covered species. The Reserve System would be located in the western and northern Valley and northern Foothills.

2. **Stream Protection**. The Plan and associated County Aquatic Resources Program (CARP) provide regulatory protection of the Stream System everywhere in the Plan area. The term Stream System is defined for the purposes of this Plan as an area along a stream extending to the outer boundary of the FEMA 100-year floodplain or the setback specified in Table 6-4 (ranging from 100-600 feet), whichever is greater. Conservation actions in the stream system contribute both covered species habitats and connectivity to the Reserve System

3. **No net loss of wetlands and wetland conservation.** Although the Plan anticipates take of wetlands, including vernal pool wetlands, it provides for both conservation and restoration/creation in the conservation strategy. Restoration/creation will specifically provide compensatory habitat in the RAA or Stream System in order to achieve no net loss of wetland area for each wetland impact through the course of the permit. Upland conservation, which is ecologically important for many wetland habitats (including vernal pools), will be addressed through the creation of the Reserve System.

4. **Avoidance and Minimization**. Specific conditions for avoiding and minimizing take will apply to certain natural communities and species. For the most part, the Plan anticipates 1) conservation actions will take place on lands generally set aside for conservation purposes, 2) implementation of the Reserve System will accomplish avoidance and minimization on a cumulative, regional scale, and 3) avoidance and minimization in the Potential Future Growth (PFG) area will be focused only on specific resources, as noted in Chapter 6.

The PCCP strategy will be implemented by the Placer Conservation Authority (PCA) in partnerships with the Permittees and the Wildlife Agencies. Implementation relies on the following tools:

1. **Conservation Maps**. The Plan contains three maps that together define the geography of the future Reserve System and will guide acquisition and reserve design 1) Conservation Core Concept

Map (Figure 5-1) that depicts the location of generalized core areas and connectors that would meet landscape level objectives. 2) Placer County Conservation Plan Stream Systems (Figure 5-2) that depict the location of the stream systems. 3) The Reserve Acquisition Area (RAA) map (Figure 5-3) that depicts the location of the RAA and the Potential Future Growth (PFG) Area.

2. **Conditions on Covered Activities**. Conditions on covered activities described in Chapter 6 establish specific requirements for mitigation, best management practices and other take minimization measures.

3. **Funding Plan**. Funds to acquire and operate the Reserve System will be provided through a combination of local, generally mitigation-based funds and state or federal conservation funds.

The greatest extent of projected take and hence the greatest extent of mitigation will be for future urban and suburban growth. The conditions on growth establish a series of pro rata mitigation ratios such that urban conversion of an acre will require payment of fees or provision of land that results in conservation of a corresponding proportional area.

Such a system is loosely termed “pay-as-you-go”, meaning that the overall pace of conservation is intended to match the overall pace of growth. For this reason, the actual extent of the Reserve System under the PCCP at the end of the permit term will reflect the actual extent of growth that occurs during the permit term. The Reserve System is intended to be scaled to the rate of growth which may vary from low to high over the period of the permit.

The conservation strategy is based on the best scientific data available at the time of its preparation and takes into account the limitations of the baseline data available for the planning area (see Chapter 3 and species accounts in Appendix D). Avoidance and minimization measures, mitigation requirements and all other conditions on covered activities are addressed in Chapter 6. The actual amount of reserve land that will be established over the 50-year permit term will depend on financing, which is largely dependent on fees collected from future growth. Growth projections are discussed in Chapter 4 and financing is discussed in Chapter 9.

5.2 Conservation Strategy Framework

The conservation strategy was designed in accordance with principles of conservation biology and reflects the recommendations of a group of Science Advisors convened at the beginning of the planning process (Brussard et al. 2004). The strategy addresses regional conservation needs at a descending level of scale, identifies biological goals and objectives to encompass ecological processes, environmental gradients,

biological diversity, and regional wildlife linkages, and proposed conservation actions to implement these goals and objectives.

5.2.1 Regional Conservation Approach

Land preservation is an important component of this conservation strategy. The term land preservation is intended broadly to specify the acquisition and protective management of terrestrial and aquatic land-cover types. Land will be acquired from willing sellers in fee title or through establishment of conservation easements to create the PCCP Reserve System.

Most of the natural communities subject to the Plan require a large geographic extent to retain maximum biological function. Avoidance of small patches of communities such as vernal pool grassland and oak woodland may result in short-term avoidance of take of species present, but is generally inconsistent with long-term maintenance of stable species populations due to multiple factors such as reduced population size, loss of contributing hydrology, edge effects, increased non-native species, lack of management oversight, inability to implement management activities due to adjacent land uses etc. (AECOM 2009). For this reason, avoidance at the natural community level is addressed by designating large areas for conservation and other areas for potential future growth.

Land in the PFG area will have take coverage and provided that the mitigation and avoidance provisions of Chapter 6 are met, development in accordance with current and future general plans, zoning, and project-specific agreements can proceed. While some natural communities in the PFG area, primarily vernal pool complexes, will be converted to urban development, areas designated for conservation and described in this chapter (primarily in the Reserve Acquisition Area and within the Stream System throughout the Plan area) include substantial amounts of natural communities and habitat for covered species, as well as areas important for maintaining regional biological diversity.

This regional avoidance and minimization approach to conservation of land cover (including wetlands) and habitat for covered species complements efforts to avoid or minimize impacts on habitats at the small or project scale (see Chapter 6, Conditions on Covered Activities) and eliminates the need to provide additional avoidance and minimization within the PFG if in conformity with the PCCP and the Stream System protection. The regional avoidance strategy, which is reflected in the design and location of PFG and the RAA, is designed to provide a regional “least environmentally damaging practicable alternative” (LEDPA) to comply with avoidance requirements of the Clean Water Act.

The primary focus of avoidance and minimization measures at the project scale is to avoid and minimize take of individuals of covered species and

of localized and rare high-quality habitat, such as streams and riparian areas that may be affected by covered activities. Stream and riparian setbacks designated by the CARP will help to avoid and minimize impacts to stream and riparian communities and covered species. Avoided and protected riverine and riparian systems will enhance connectivity between natural communities and habitats in the Valley and foothill portions of the Plan area. Additionally, activities within streams will be carefully designed and implemented to minimize their effects on this important resource and habitat for covered species (see Chapter 6).

5.2.2 Conservation Strategy Organization by Landscape, Community, and Species Scale

Plan conservation actions will occur at three scales:

- **Landscape**. Occurring at the scale of miles, landscape level conservation aims to establish large interconnected blocks of land in which optimal conditions for ecological sustainability can be maintained, including hydrological function and land cover diversity, while minimizing land use incompatibility and edge effect.
- **Natural community**. Past land use and parcelization of the Plan area leaves existing natural communities in patches ranging in size from tens of acres to hundreds of acres. This conservation scale addresses natural communities primarily through the enhancement, restoration, and management of vegetation types, particularly as they habitat for covered species. Conservation reserves will encompass viable units of the various natural communities.
- **Species**. Covered species may need protection for individuals and enhancement of populations and groups of populations. These needs may not be fully addressed at the habitat or natural community level. Species-level conservation actions will be incorporated into management plans for conservation reserves and will be include as conditions on covered activities.

All conservation actions are described with enough detail to guide implementation. Because of the large scope of this Plan and its long timeframe, actions are intended to be flexible. Thus, natural community-level actions provide broad management guidelines and principles such that future land managers can implement specific techniques that are best suited to site conditions. Preserving this flexibility is an important part of the conservation strategy.

Implementation will require the preparation of site-specific documents such as reserve management plans, restoration plans. These documents

will be prepared after land is acquired and specific restoration and management needs are determined. Reserve management plans are intended to guide activities within individual reserves. Some management documents will be prepared for the entire Reserve System (e.g., recreation management, invasive plant management, fire management). Reserve management plans for individual reserve units (i.e., multiple parcels in the same area and with similar management needs) will be provided to the Wildlife Agencies for review within 6 months of the first acquisition of the land for that reserve. Reserve Management Plan should be completed within 12 month of acquisition of the land for that reserve. Additional biological monitoring may be required to completely understand existing conditions. Reserve management will use an adaptive management approach that is closely tied to long-term monitoring (see Chapter 7, Monitoring and Adaptive Management Program).

5.2.3 Biological Goals and Objectives

The conservation strategy is designed to achieve landscape, natural community, and species-level biological goals and objectives established for the PCCP.

- **Goals** are broad, guiding principles based on the conservation needs of the resources. A statement of biological goals for covered species is required by United States Fish and Wildlife's (USFWS) 5-Point Policy to be included in Habitat Conservation Plans (HCP) (65 CFR 35242, June 1, 2000).

- **Objectives** are expressed as conservation targets or actions. Objectives are measurable (and quantitative, when possible (e.g., amount of land to be acquired) and achievable within a given time frame; they clearly state a desired result and will collectively achieve the biological goals.

The conservation actions are designed to guide reserve acquisition and management strategies to achieve the goals and objectives of the PCCP. Many of the conservation actions will likely be modified during implementation through the monitoring adaptive management program while goals and objectives will remain static. The monitoring program described in Chapter 7 is closely tied to the biological goals and objectives. Goals and objectives will be considered when evaluating acquisition of reserves, preparing site-specific reserve management plans, developing monitoring programs and evaluating the success of an adaptive management strategy.

Landscape-level goals and objectives are designed to protect, enhance, and restore ecological processes that occur on the scale of the Plan area

as a whole. Such processes include, for example, east-west movement of organisms to and from the Valley floor and the Sierra Nevada foothills.

Natural and semi-natural community-level goals and objectives are designed to protect, enhance, and restore native biodiversity and ecological processes that maintain representative natural and semi-natural communities across a range of successional stages. Managed grazing, for example, will be used to reduce the cover of invasive, nonnative species that damage the biological function of some landscapes. The community-level conservation actions will benefit covered species and other natural species; however, many of the covered species have specific habitat and management needs. Natural Community Goals, Objectives, and Conservation Actions are summarized in Table 5-4.

Species-level conservation goals and objectives supplement conservation actions at the landscape and community-levels, with actions tailored to meet the needs of individual species. The biological goals and objectives are directed to maintain and recover current populations of covered species in the Plan area by protecting, enhancing, and restoring habitats. In some cases, populations of covered species are expected to increase as a result of land preservation, improved water management, habitat enhancement, habitat restoration, and habitat creation. Some covered species are no longer known to regularly occur in the Plan area (e.g., California red-legged frog, western burrowing owl). For such species, goals, objectives, and corresponding conservation actions are designed to facilitate the expansion (or recolonization) of populations into the Plan area by protecting, enhancing, and restoring their habitats. Species-level Goals, Objectives, and Conservation Actions are summarized in Table 5-5.

The species-level goals and objectives are habitat-based, rather than individual or population-based (i.e. goals specifying numbers of individuals or populations). Consistent with the Report of the Science Advisors (Brussard et al. 2004), habitat-based goals were used for species because there are generally not enough data on the abundance and distribution of populations of covered species in the Plan area to set informed numerical goals for covered species. Furthermore, all the covered species have geographic ranges that extend far beyond the Plan area, (e.g., Swainson's hawks migrate annually to South America). The population dynamics, and recovery, of these covered species therefore will be strongly influenced by factors (e.g., threats) and conservation actions operating beyond western Placer County. Thus, it is difficult to meaningfully set specific numerical targets for those species within Placer County conservation lands. Contributions to the recovery of covered species will be facilitated by protecting and enhancing appropriate habitat for these species within the context of broader landscape and community-level goals (e.g., improve or maintain desirable vegetation structure and hydrological regimes, eliminate invasive exotics) (Brussard 2004).

In some cases, conservation actions include the phrase, or a phrase similar to, “where appropriate”. This phrase is used to identify actions that are dependent on site-specific conditions and ecological contexts. Implementation of such “where appropriate” actions will depend on the professional, on-the-ground assessment of ecological conditions by reserve managers.

Goals are listed below by scale: landscape level, natural community level, and species level. The biological goals apply to the Plan area as a region, recognizing that it will be the Reserve System that ultimately is capable of protecting and maintaining community and species. Conservation and management actions will occur primarily within the Reserve System, though similar conservation efforts will be encouraged and in certain instances are already required or will be required on private lands outside of the Reserve System. In cases where species conservation will occur outside the Reserve System (e.g., covered fish in avoided riparian habitat or avoided habitat providing appropriate transit corridors for wildlife), biological goals apply to the Plan area as a whole.

Landscape-level Goals

- **Goal 1.** Protect and maintain landscapes of representative natural and semi-natural communities along a range of environmental gradients that are large enough to support ecosystem function, maintain and contribute to the recovery of populations of covered species and biological diversity, and that can accommodate shifting species distribution due to changing circumstances (e.g., climate change).

- **Goal 2.** Enhance or restore landscapes of representative natural and semi-natural communities for the benefit of native biological diversity and populations of covered species.

- **Goal 3.** Maintain and enhance the effective movement and interchange of native organisms (in a manner that maintains ecological integrity) between reserves within the Plan area, adjacent habitats outside the Plan area, and within the PFG area.

Natural and Semi-natural Community-level Goals

- **Goal 4.** Grassland and vernal pool communities. Protect, restore, and enhance functional grasslands, vernal pool complexes, and the hydrological process that support them to benefit covered species and promote native biodiversity.

- **Goal 5.** Oak woodland. Protect and enhance functional oak woodland communities that benefit covered species and promote native biodiversity.

- **Goal 6.** Valley Oak Woodland. Protect, enhance, and restore valley oak woodland communities that benefit covered species and promote native biodiversity.

- **Goal 7.** Riverine and Riparian. Improve the ecological health of riverine systems by protecting, enhancing, and restoring hydrologic, geomorphic, and botanical processes to maintain functional aquatic and riparian communities that benefit covered species and promote native biodiversity.

- **Goal 8.** Wetland. Protect, maintain, enhance, restore and create fresh emergent wetlands, vernal pools and other seasonal wetlands, springs and seeps, and the hydrologic processes that support them to benefit covered species and promote native biodiversity. There should be no net loss of wetland area over the term of the permit.

- **Goal 9.** Ponds. Protect, maintain, and enhance pond habitats and the hydrological processes that support them to benefit covered species and promote native biodiversity.

- **Goal 10.** Agriculture. Promote agricultural land-uses on Reserves that support habitat for covered species and other wildlife (e.g., migratory waterfowl and shorebirds, raptors) and promote agricultural practices and land management that maximizes biodiversity, benefits covered species and natural communities, and enhances connectivity between natural communities.

Species-level Goals

- **Goal 11.** Bald eagle. Protect or increase the extent of bald eagle habitat to maintain overwintering population of bald eagles in the Plan area.

- **Goal 12.** Swainson's hawk. Maintain or increase the extent of Swainson's hawk habitat to maintain and potentially increase the abundance of nesting Swainson's hawks in the Plan area.

- **Goal 13.** American peregrine falcon. Maintain or increase American peregrine falcon habitat to maintain the abundance of American peregrine falcons overwintering in the Plan area.

- **Goal 14.** California black rail. Maintain or increase the extent of California black rail habitat to maintain and potentially increase the distribution and abundance of California black rail in the Plan area.

- **Goal 15.** Bank swallow. Maintain or increase the extent of bank swallow nesting and foraging habitat within the Plan area.

- **Goal 16.** Western burrowing owl. Maintain or increase the extent of burrowing owl habitat in the Plan area to support overwintering

burrowing owls and promote the expansion of a breeding population of burrowing owls into the Plan area.

- **Goal 17.** Cooper's hawk. Maintain or increase the extent of Cooper's hawk habitat within the Plan area.
- **Goal 18.** Loggerhead shrike. Maintain or increase the extent of Loggerhead shrike habitat within the Plan area.
- **Goal 19.** Northern harrier. Maintain or increase the extent of northern harrier habitat within the Plan area.
- **Goal 20.** Ferruginous hawk. Maintain or increase the extent of habitat for overwintering ferruginous hawks within the Plan area.
- **Goal 21.** Yellow warbler and yellow-breasted chat. Maintain or increase the extent of breeding and migratory stopover habitat for yellow warblers and yellow-breasted chats in the Plan area.
- **Goal 22.** Modesto song sparrow. Maintain or increase the extent of Modesto song sparrow habitat within the Plan area.
- **Goal 23.** Grasshopper sparrow. Maintain or increase the extent of grasshopper sparrow habitat in the Plan area to facilitate the expansion of a breeding population into the Plan area.
- **Goal 24.** Tricolored blackbird. Maintain or increase the extent of tricolored blackbird habitat within the Plan area to maintain and potentially increase the abundance and distribution of breeding tricolored blackbirds within the Plan area.
- **Goal 25.** Vernal Pool Crustaceans (Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp). Maintain or increase the extent of vernal pool complexes to maintain or facilitate the expansion of the populations and distributions of Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp in the Plan area.
- **Goal 26.** Vernal Pool Plants (Bogg's Lake hedge hyssop, dwarf downingia, legenere, Ahart's dwarf rush, and Red Bluff dwarf rush). Maintain or increase the extent of vernal pool complexes to maintain or facilitate the expansion of the populations and distributions of Bogg's Lake hedge hyssop, dwarf downingia, legenere, Ahart's dwarf rush, and Red Bluff dwarf rush in the Plan area.
- **Goal 27.** Western spadefoot toad. Maintain or increase the extent of western spadefoot toad habitat within the Plan area.

- **Goal 28.** Valley elderberry longhorn beetle. Maintain or increase the extent of valley elderberry longhorn beetle habitat within the Plan area.

- **Goal 29.** Giant garter snake. Protect or increase habitat for giant garter snake to facilitate the expansion of a population of giant garter snake into the Plan area.

- **Goal 30.** Central Valley steelhead – distinct population segment and Central Valley fall/late fall-run Chinook salmon. Maintain or increase the availability and quality of habitat for Central Valley steelhead – distinct population segment and Central Valley fall/late fall-run Chinook salmon to potentially expand the distribution and improve the reproductive success and survival of all life stages of these fish in the Plan area.

- **Goal 31.** Foothill yellow-legged frog. Maintain or increase the extent of foothill yellow-legged frog habitat to facilitate the expansion of a foothill yellow-legged frog population into the Plan area.

- **Goal 32.** California red-legged frog. Maintain or increase the extent of California red-legged frog habitat to facilitate the expansion of a California red-legged frog population into the Plan area.

- **Goal 33.** Northwestern pond turtle. Maintain or increase the extent of northwestern pond turtle habitats to potentially increase the abundance and distribution of northwestern pond turtle in the Plan area.

5.3 Reserve System

The Reserve System will provide adequate representation of ecosystem and community types within the Plan area and will protect and restore habitat for the covered species. Additionally, the Reserve System will ensure adequate protection for listed and sensitive species and will protect and enhance biodiversity. Reserve System design will focus on protecting and enhancing landscape-level processes, natural communities, and habitat for covered species. Priorities for acquisition into the Reserve System will emphasize certain species that are at immediate risk of extirpation from the Plan area (e.g., California black rail, western burrowing owl). These species may require reserves acquired and managed primarily for their protection.

The PCCP cannot designate a reserve system fully in advance, because:

- There are no large blocks of public land ownership that can serve as the core of a Reserve System.

- While existing reserves established either as mitigation for past projects or acquired under the Placer Legacy program provide an important initial component of the Reserve System and a logical focus for expansion, these lands are limited in extent and not centered on a particular portion of the Plan area.

- There are no single blocks of contiguous land ownership in the size-range of 5,000 to 10,000 acres ideal for a complete reserve. The current landscape is divided into relatively small parcels typically in the 20 to 400 acre range) and is fragmented by roads and multiple land uses. Large reserves will be assembled through the acquisition of several smaller parcels and/or parcels adjacent to existing reserves, from multiple owners.

- Acquisition depends on a "willing seller" program. This means that the PCA or other program administrator(s) cannot identify parcels for acquisition before there are sufficient funds to enter into sales negotiations with current owners.

The Reserve System will accommodate potential in holdings and inconsistent or even non-compatible land uses. A large component of the Reserve System will be managed primarily as working farms and ranches. The Reserve System will be assembled over the term of the Permit, according to the Stay-Ahead provision (see Section 8.8, Conservation Land Accounting).

Reserve Design and Assembly Principles

Assembly of the Reserve System will be based on scientifically accepted principles of conservation biology and informed by the best available biological data. Information on species (e.g., distribution, habitat relationships, and life history characteristics) and habitats (e.g., distribution, species composition, ecological function) will be used to inform acquisitions for the Reserve System. Relevant ecological data for covered species are summarized in the species accounts in Appendix D.

To support covered and other native species and the ecological processes that support them, the Reserve System will be assembled to account for multiple ecologically relevant spatial scales. Most small- and medium-scale considerations will be driven by the needs of covered species and natural communities. For example, at a small scale, the Reserve System must contain the microhabitats necessary for species to survive. At a medium scale, habitat patches must be large enough to support populations or important portions of populations of species and the seasonal movement of species (e.g., movement by amphibians between aquatic breeding habitat and upland aestivation habitat). At a larger scale, natural communities must be well represented, and reserves must be linked to allow movement of species for genetic exchange and for recolonization following local extirpation.

Biological goals and objectives pertaining to the acquisition and management of the Reserve System were developed at these three scales as discussed above (Section 5.2.1 Biological Goals and Objectives).

In addition to the biological goals and objectives, the principles of conservation biology identified by the Science Advisors (Brussard et al. 2004) and summarized below will be used to assemble the Reserve System during Plan implementation:

- **Maximize Size of Individual Reserves.** Large conservation areas containing large populations of target species are superior to small conservation areas containing small populations. While the persistence of all populations is subject to the effects of normal random environmental events (environmental stochasticity) and catastrophes such as wildfires and severe drought, the persistence of small populations is additionally threatened by random variations in birth or death events (demographic stochasticity) and random changes in genetic composition (genetic stochasticity). Large areas with high quality habitat for target species tend to mitigate the combined effects of these factors. Thus, acquisition of conservation areas should preferentially add to existing protected areas. Conservation areas should be designed to maximize the viability of local populations of area-sensitive species. For the most part, species with limited spatial requirements will be accommodated within conservation areas designed for species with more extensive home ranges.

  There is a tradeoff between area and management intensity. Small conservation areas require much more active management, than large areas and are therefore more costly on an ongoing basis. This trade-off should be weighed when particular parcels are being considered for inclusion in the conservation network.

- **Minimize Distance Between Reserves.** Conservation areas that are close together are better than those far apart. An arrangement of conservation areas that facilitates dispersal of individuals among these areas is necessary to encourage demographic rescue effects (whereby dwindling populations are supplemented by migrants), and continued genetic interchange. All else being equal, conservation areas that are close together are more likely to support sensitive species for longer time periods than will isolated areas; thus, if it is not possible to acquire new conservation areas that add to existing ones, acquisitions should be made in proximity to protected areas. In the absence of suitable landscape linkages, conservation areas should not be separated by gaps of unsuitable habitat greater than the normal dispersal distances of the least mobile target species.

- **Protect Threatened and Sensitive Species and Habitats within Reserves.** Although some species can be conserved in a "working landscape," other species require protection in reserves where conservation is the major land-use goal. Existing patches of habitat that support populations of sensitive species should be provided with reserve-level protection, and these areas should be managed to maintain the structure, composition, and processes found in the natural community on multiple sites, if available.

- **Interconnected Conservation Areas are Better than Isolated Ones**. Interpopulation dispersal is important for the persistence of species at a regional scale. Because of the amount of habitat that already has been developed in western Placer County, populations of most species are badly fragmented. Therefore, it is critical to identify areas that can provide connections between conservation areas to increase the likelihood of successful dispersal. Such dispersal not only enhances the probabilities that sensitive species will persist (Wiens et al. 1993), but it also helps maintain the overall diversity of plants and animals within a given area (Hansen and Urban 1992) and allows the entire regional habitat network to function as a healthy ecological community.

  Multiple linkages among conservation areas are optimal because they provide alternative movement pathways for species. Redundancy is particularly important in areas subject to high rates of disturbance, such as fire.

  Conservation areas in the western part of the County should be linked to habitats to the east whenever possible to provide a diversity of habitats for viable populations of large vertebrates and migratory species and to allow for dispersal of species in response to potential changes in regional climatic conditions.

  Connectivity and degree of fragmentation also can be significant determinants of the spread and magnitude of disturbance factors including fire, disease, and flooding (Turner et al. 1989, EPA 1994) and these factors must also be considered in conservation planning.

- **Landscape Linkages should be Suitable Habitat.** Landscape linkages function better when the habitat within them resembles habitat that is preferred by target species. The network of conservation areas should make use of naturally existing movement corridors in the landscape (such as riparian strips or traditional wildlife migration routes), and whenever possible, natural linkages between conservation areas should be enhanced through restoration or improved management.

  Landscape linkages wide enough to contain resident individuals of target species must be established to connect conservation areas farther apart than the species' normal dispersal distances. These

corridors must include habitat components to meet all of the species' life history requirements. Where doubt exists concerning optimal widths, linkages should be designed to be as wide as possible. The creation of narrow, weedy corridors should be avoided.

Low-impact buffer zones should be planned between developed areas and landscape linkages. Use of off-road vehicles and other disruptive human activities should be prohibited in these buffer zones.

- **Minimize Habitat Fragmentation.** Habitat for a particular species within a conservation area that occurs in less fragmented, contiguous blocks is preferable to habitat that is fragmented. Conservation areas should minimize internal fragmentation and barriers to species movement. Viable populations of many species require large blocks of habitat where the presence of disruptive edge-dwelling species, such as brown-headed cowbirds and house cats, is minimized. Habitat highly fragmented by disturbed or developed lands has relatively little conservation value for species that exhibit high habitat specificity. Species that are susceptible to the deleterious consequences of edge are more likely to retain populations in habitat patches that are rounded or squared than in patches that are elliptical or rectangular when those patches are surrounded by disturbed or developed land. In such circumstances, small, linear strips of habitat that maximize the ratio of edge to area are least desirable.

- **Minimize Roads and Human Impacts within Reserves.** Blocks of habitat that are roadless or otherwise inaccessible to humans serve better to conserve target species than do roaded and accessible habitat blocks. Human contact is thought to be a major cause of decline in certain sensitive species, so populations of these species in habitats that are inaccessible to motorized recreation or similar activities are more likely to persist than those in habitats where human access is less restricted. Currently roadless areas and other wildlands should be maintained in an undeveloped state.

  Access and human use of conservation areas and landscape linkages must be restricted to protect species sensitive to human disturbance. Trails should be diverted from sensitive areas, such as rare plant populations. Fencing and control of domestic dogs and cats may be necessary.

  Where landscape linkages are intersected by roads that cannot feasibly be closed, tunnels, underpasses, or other wildlife crossings should be provided at sites documented to be commonly crossed by animals that are vulnerable to roadkill. The width of such crossings should be roughly proportional to the size of the animal; for example, three-foot-wide tunnels are adequate for amphibians and small mammals, hundred-foot underpasses may be necessary for large mammals. Fences or other barriers can be used to funnel animals into road crossings.

- **Maximize Heterogeneity in Conservation Areas**. Areas that have diverse topography, soils, and vegetation tend to capture a variety of different habitat types and thus support a richer biota than more homogeneous areas. Exchange strategies to conserve some lands to the east and south of the hard line would increase heterogeneity substantially.

Requirements of Covered Species

The Reserve System is intended to preserve, and in many cases enhance, populations of covered species. The ecological information used to determine the needs of covered species are summarized in the species accounts (Appendix D).

The principles listed below will be used to assemble the Reserve System during implementation to more effectively protect and conserve covered species.

- **Protect Multiple Populations of Covered Species.** Multiple populations of covered species will need to be protected and linked through existing or new protected lands to maintain viable populations, to reduce the risk of local extirpation, and to ensure the genetic connectivity of populations. This is especially important for species that may function as metapopulations or for species that naturally occur at low density or small population sizes.

- **Protect Higher-Quality Habitat for Covered Species.** PCCP reserves are intended to protect available high quality habitat for covered species.

- **Protect Suitable but Unoccupied Habitat for Covered Species.** Protecting suitable but unoccupied habitat for covered species creates opportunities to enhance habitat through improved management, attracting species to new areas, and expanding their ranges and population sizes. Protecting unoccupied habitat also allows for future shifts in populations in response to natural and anthropogenic environmental change. Many of the covered species are probably extirpated from the Plan area. Protecting and enhancing unoccupied habitat and corridors to move into such habitat is an important component of the conservation strategy for these species.

5.4 Reserve System Maps

The Plan contains three maps that together formulate the geography of the future Reserve System and will guide acquisition and reserve design. 1) Conservation Core Concept Map that depicts the location of generalized core areas and connectors that would meet landscape level objectives. 2) Placer County Conservation Plan Stream Systems that

depict the location of the Stream Systems. 3) The Reserve Acquisition Area (RAA) map that depicts the location of the RAA and the Potential Future Growth (PFG) Area.

5.4.1 Conservation Core Concept Map

The reserve design principles outlined above were applied to the Plan Area to develop the Conservation Core Concept map (Figure 5-1). This map identifies generalized core areas and connectors that would meet landscape-level objectives. Also embedded within these core areas are representation of sufficient land-cover types to meet both important natural communities and covered species habitats goals and objective. The Conservation Core Concept map is intended to work with the protection of the Stream System (i.e., CARP) to provide direction as to generally where a Reserve System can be built. Implementation of the actual Reserve System is discussed further in this Chapter and in Chapter 6.

The Conservation Core Concept Map takes into account both the current distribution of biological resources as described in Chapter 3 and the historical and projected land use trends as described in Chapter 4. The intent is to reconcile conflicts between conservation and future growth in such a way that a Plan implementing the core concept would have a reasonable likelihood of achieving the Plan's biological goals and objectives over the term of the proposed permit.

The Conservation Core Concept map was developed by first considering areas that could accommodate large blocks of key land-cover types (e.g., vernal pool grassland complex) and covered species with large geographical ranges (e.g., Swainson's hawk) and specific habitat needs (e.g., areas with high densities of vernal pools to accommodate plants and animals that rely on vernal pools). This level of design also considered expanding existing conservation lands to create larger core reserves.

The term "core" refers to habitat areas where geography, relationship to existing reserves, and existing biological resources would be valuable for the Reserve System. "Corridors" may have lower present value, but would serve to integrate core areas and may be suitable for habitat restoration.

Core Area Descriptions

The Conservation Core Concept map depicts the eleven core areas and six connector areas:

<u>Curry Creek Core Area</u> - This core area lies in the southwest corner of the PCCP Reserve Acquisition Area boundary and is mostly within the Curry

Creek watershed. Resources in this area include vernal grasslands, pasture, rice and annual grasslands. The area also includes a narrow stream channel (Curry Creek) that drains existing and planned urban areas to the east and consequently the stream is transitioning to a perennial stream.

This is the only core area south of Placer Parkway and consequently needs to be large enough to provide the necessary function for the resources to be conserved in perpetuity. Because of the presence of Placer Parkway to the north it is not possible to provide unhindered connectivity to other areas of the reserve system to the north. It will be important for this core area to be suitably buffered from anticipated urban land uses to the north, east and south.

Existing conservation is limited to one site on the north side of Curry Creek where a vernal pool compensatory mitigation site was established. There are significant areas where existing habitat conditions can be enhanced or restored including riparian habitat along Curry Creek.

Lower Pleasant Grove Creek Core Area - This large core area is located north of Placer Parkway primarily within the Pleasant Grove watershed. A portion of this core area is also located within the Auburn Ravine Watershed. Pleasant Grove Creek is the only perennial riverine habitat in the area and transects the area in an east-west manner and includes existing valley foothill riparian habitat. The area has extensive annual grasslands, vernal pool grasslands, rice, and valley foothill riparian habitat along Pleasant Grove Creek.

Approximately one third of the core area is already conserved and consequently there is a significant opportunity for building on existing conservation success in this area. It also has a significant potential for restoration or enhancement of grasslands, riparian and vernal pool grasslands. This is a large area that is contiguous to existing conservation lands (the 1,646 acre Toad Hill Ranch mitigation/conservation bank) and the Auburn Ravine Core Area to the north. The area is also close to a smaller reserve area to the east (Sunset Core Area).

Auburn Ravine Core Area - This is a large core area that includes portions of the Auburn Ravine, Markham Ravine and Orchard Creek watersheds. There are restoration opportunities in this area that enhance existing values and have the potential to restore extensive vernal pool grasslands, valley oak woodlands and riparian habitat primarily along Auburn Ravine west of the Orchard Creek. Additionally, Auburn Ravine is the southernmost stream with the potential to support a cold water fishery including salmon and steelhead. While this reach is not important for spawning and rearing, it is important for fish passage to the upper portions of the watershed east of State Route 65.

Sunset Core Area - This one of the smaller Core Areas within the Reserve Acquisition Area. It is comprised of approximately 415 acres of annual grassland. The site is has suitable conditions for vernal pool restoration. There are limited opportunities for connectivity with the primary emphasis on connectivity to the north via an intermittent drainage that is hydrologically connected to existing conservation lands to the northeast.

Lower Coon Creek Core Area - The Lower Coon Creek Core Area is located at the westernmost portion of Coon Creek and its floodplain in Placer County. The area is dominated by grasslands, vernal pool grasslands, and rice. A segment of main stem Coon Creek transects this area in an east-west manner and provides a substantial potential for riparian and valley oak woodland restoration. There are also significant opportunities for restoration of vernal pool grassland complexes in this area.

Sheridan West Core Area - The Sheridan West Core Area is dominated by annual grasslands and pasture. Unlike areas to the east and south, it does not contain a significant amount of vernal pool wetlands and consequently conservation efforts are primarily directed at land preservation and not large scale restoration. The area contains one large existing preserve, the Silvergate Conservation, which was utilized primarily as a wetland mitigation bank. Restoration opportunities are largely associated with the lower reach of Yankee Slough west of the State Route 65 Bypass.

Yankee Slough Core Area - Much like the Sheridan East Core Area, this area is dominated by annual grasslands including vernal pool grasslands. It also includes the main stem of Yankee Slough. Significant conservation has already occurred in this area and there are opportunities for additional restoration.

Sheridan East Core Area - This is one of the larger Core Areas and represents the largest uninterrupted grassland in western Placer County, including vernal pool grasslands. The area is bisected by tributaries of Coon Creek and by Yankee Slough. This is also one of the few areas of the County where valley oak woodlands are present in the landscape.

Camp Far West Core Area - This core area emphasizes conservation along the Bear River, predominately above Camp Far West Reservoir and the blue oak woodland that is dominant in this area. Portions of the Bear River that are not already protected via management practices of the South Sutter Water District may also be conserved.

Garden Bar Core Area - The Garden Bar Core Area includes a significant portion of the upper watershed of Coon Creek and a portion of the Bear River. Of equal or greater importance is the conservation of a large tract of blue oak woodlands and valley foothill riparian along Coon Creek. The area also has the potential to build on significant conservation that

already exists in the area including the Hidden Falls Regional Park and numerous holdings of the Placer Land Trust.

Orr Creek Core Area - The Orr Creek Core Area is a small conservation area located along Highway 49 in the North Auburn Area. It represents one of the few large, unfragmented tracts of blue oak woodland, riparian and wetland habitat in the greater Auburn area.

Lower Markham Ravine Connector Area - This connector area is intended to provide north-south connectivity on the valley floor along the western edge of the Reserve acquisition Area. Conservation in this area will connect the Auburn Ravine Core Area with the Coon Creek Core Area. There are limited opportunities for vernal pool and riparian restoration in this area. The primary emphasis is on conservation of rice lands and grasslands and the narrow riverine corridor of Markham Ravine

Lower Coon Creek Connector Area 1- This connector area is essential to the overall conservation strategy in that it lies in an area that connects the lower reaches of the Coon Creek watershed with the vast upper reaches of the watershed east of State Route 65. The corridor emphasizes first and foremost the conservation of land including agricultural lands and land with high biological resource values. The area is bisected by current State Route 65 and the State Route 65 Bypass and consequently is fragmented by two major roadways. There are significant biological resource values present in the area including riverine, riparian, valley oak, grasslands and vernal pool grasslands and conservation of all these values is important. Moreover, Placer County has invested significant resources restoring the riparian corridor in this area. Of equal importance is the conservation of a contiguous corridor of natural and semi-natural (including agricultural lands) lands to insure the connectivity of the Coon Creek watershed.

Lower Coon Creek Connector Area 2 – This is a unique Connector Area in that it is located within unincorporated Sutter County. In this area, the Placer/Sutter County boundary shifts from a north-south alignment to an east-west alignment for 3 miles and turns north-south again. Coon Creek and its associated floodplain bisect this area crossing in and out of Sutter County. The objective of this connector is to insure that the Coon Creek corridor maintains a width of approximately two miles thus insuring suitable buffering from potential urban areas to the south and to maintain viability of the 100-year floodplain which is approximately 2 miles in width in this area. Though the emphasis would be on open space/floodplain preservation and restoration along Coon Creek, this area also supports important habitat for over-wintering waterfowl.

Yankee Slough Connector Area – The easternmost section of this Connector Area is intended to provide an open space corridor along the north-south contour elevation between the Yankee Slough Core Area and the Camp Far West Core Area to the north. There is a potential for rural residential development in this area due to sovereign rights of the United

Auburn Indian Community and their exemptions from local government zoning and subdivision standards and the California Environmental Quality Act.

The westernmost portion is a relatively small but important area that is situated between the existing State Route 65 and the State Route 65 Bypass. The current State Route 65 highway facility right-of-way and improvements will be transferred to Placer County and will terminate just north of the townsite of Sheridan. This area provides an important connector between two biologically important Core Areas, the Yankee Slough and Sheridan West Core Areas. This area contains the greatest extent of grasslands in western Placer County and is also an important transition between the valley floor and lower elevation blue oak woodlands. Yankee Slough transects this area and is an area that is viable for restoration. While this connector area is small, it provides an important connection between the Core Area along a stream with substantial restoration potential and with important, existing grassland resources.

Bear River Connector Area 1 – The Bear River Connector Area 1 is focused on conservation and restoration along the Bear River west of the Camp Far West Core Area along the Yuba/Placer County boundary. This is an area with long-term mining entitlements that will be in operation for the likely term of the PCCP and consequently, restoration activities will likely take place in the form of reclamation activities as opposed to restoration to implement particular biological goals and objectives of the PCCP. This area does contain extensive valley oak woodlands, spawning habitat for both Steelhead and Chinook salmon, and the riverine and riparian habitat along the Bear River and consequently existing biological values are important to conserve.

Bear River Connector Area 2 – The Bear River Connector Area is intended to maintain connectivity between the PCCP Reserve Acquisition Area and areas to the east (including the balance of the Bear River watershed). The geographic objective is to acquire lands within the narrow watershed of the Bear River through this area. Existing conservation is limited to one Placer Land Trust-owned parcel.

Connectivity and Conservation within the Region

Maintaining linkages with areas outside the Plan area (i.e., regional habitat connectivity) is essential to retaining a high level of native biological diversity within the Plan area. The Conservation Core Concept and associated Stream System (CARP) will protect, enhance, and restore riverine and riparian habitats, thereby increasing connectivity along stream systems that flow through and beyond the Plan area. The major stream corridors of the Bear River, Coon Creek, Auburn Ravine, and Dry Creek support runs of Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon moving between the Pacific Ocean through the Sacramento River system to spawning grounds in the Plan area. These riverine and associated riparian corridors also provide critical connections

for other aquatic and terrestrial species moving through urban or cultivated agricultural areas.

The ultimate PCCP Reserve System will be integrated with conservation efforts outside of Placer County. Currently, four of the adjoining counties have an ongoing conservation program at some stage of implementation (Figure 5-4): Yuba and Sutter County are preparing a NCCP/HCP and Sacramento County has developed the Natomas basin HCP and is in the process of developing the South Sacramento HCP – both south of the PCCP area. Nevada County was formerly engaged in conservation planning, but has suspended activity.

The Reserve System proposes to enhance regional connectivity by providing:

- North-south connectivity through a network of vernal pool grassland reserves extending from the border of the Plan area with Sutter County, east and north to the border of Yuba County. This area has been identified as an "Essential Connectivity Area" by the CA Essential Habitat Connectivity Project (Spencer et al. 2010).

- Connectivity of foothill oak woodlands with protected oak woodlands to the north (see see Chapter 2, Section 2.2.4, Protection of Open Space Lands, Spenceville CAPP)

- Connectivity for Central Valley Steelhead and Chinook Salmon between the Sacramento River to spawning grounds in Plan area streams.

- A network of reserves within the Plan area that will prevent further fragmentation of the landscape and increase permeability (e.g., movement) for species to move through the Plan area and to habitats adjacent to the Plan area.

Connectivity within the Plan Area

Increasing connectivity between habitats within the Plan area is important to the persistence of many populations. Although vernal pool complexes are separated hydrologically by watershed boundaries, vernal pool species such as plants can move through the landscape across watershed boundaries on the wind (wind can disperse the seeds of plants), whereas crustaceans can be dispersed on the feet and in the intestines of waterfowl and amphibians. The assembly of the Reserve System, and extensive restoration of vernal pool grassland complexes in the western portion of the Plan area, will substantially increase the amount of protected vernal pool grasslands, thereby reducing landscape-level fragmentation and increasing permeability for covered species.

The Conservation Core Concept map (Figure 5-1) and the Stream System map (Figure 5-2) shows potential linkages for east-to-west and

north-to-south connectivity within and across watersheds. Connectivity within watersheds will be achieved by expanding and linking reserves with terrestrial, riparian, aquatic, and stream habitats, particularly within the Bear River, Coon Creek, Markham Ravine, Auburn Ravine, and Pleasant Grove-Curry Creek watersheds. Acquisition, restoration, and enhancement, in conjunction with project-level avoidance of stream zones (through the CARP; see Appendix M) will enhance connectivity within watersheds, from the western boundary of the Plan area in the Central Valley to the upper reaches of the watersheds in the foothills in the eastern portion of the Plan area. Connectivity will also extend to ongoing conservation strategies within the Yuba Sutter NCCP/HCP to the west of Placer County and the Spenceville Conceptual Area Protection Plan (see Chapter 2, Section 2.2.4, Protection of Open Space Lands) area that extends north from Coon Creek through Nevada, Yuba, and Butte Counties. Although other watersheds in the western Placer planning area provide important functions and values to a number of covered species, for the most part those watersheds are too fragmented and developed to consider for long-term preservation and inclusion into the PCCP. Instead, these watersheds will focus on specific covered species with a particular emphasis on salmonids and those species dependent upon viable riparian corridors.

5.4.2 Placer County Conservation Plan Stream Systems

Protection of the Stream System, which includes aquatic habitat and other aquatic resources, is vital for ensuring the long-term viability of covered species. The term Stream System is defined for the purposes of this Plan as an area along a stream extending to the outer boundary of the FEMA 100-year floodplain or the setback specified in Table 6-4 (ranging from 100-600 feet), whichever is greater. Figure 5-2 depicts the location of the PCCP Stream System. In the PFG area, the Stream System will be protected primarily through avoidance and minimization of impacts--Covered Activities in the PFG area will be required to include a Stream System setback in which impacts must be avoided or minimized, and must implement Low Impact Development Standards (LIDS). In the RAA, the Stream System will be protected through acquisition, restoration, and enhancement actions. The PCCP is designed to ensure no net loss of aquatic resource extent or function within the Plan area by requiring restoration of aquatic land-cover types that are impacted by Covered Activities. Chapter 6 and Appendix M (Placer County Aquatic Resources Program [CARP]) provide details for Stream System regulation.

In general, the PCCP land acquisition strategy focuses on acquiring land to protect existing stands of riparian land-cover and the restoration of former riparian habitats. This strategy will provide habitat for covered species, protect aquatic resources, improve biodiversity and to improve

connectivity along riparian corridors. Land acquisition will be focused along the Bear River, Coon Creek, Doty Ravine, Auburn Ravine, and Pleasant Grove Creek in part to acquire areas with high quality riparian habitats adjacent to high quality salmonid spawning habitat. Stream and riparian habitat will also be avoided in the PFG area and RAA by implementation of the Stream System setback and LIDS. Acquisition of riparian and stream habitat will occur primarily within the Reserve Acquisition Area, whereas the Stream System setbacks will be applied throughout the Plan area. Acquisition and avoidance of riparian habitat will provide the dual benefit of protecting riparian woodlands and riverine habitats.

5.4.3 Reserve Acquisition Area Map

The RAA map is intended to guide the Permittees and the PCA in future acquisition of lands for the Reserve System. The Conservation Core Concept Map described above represents the application of general conservation planning reserve design principles to the geography of the Plan area. In order to implement the PCCP, a more specific map showing the main Reserve Acquisition Area (RAA) was developed through a technical advisory process (the Biological Working Group) and a stakeholder process (Ad Hoc Committee) as described below.

The Use of Maps to Define the Reserve System
Regional conservation plans take a variety of approaches in the use of maps to display land acquisition requirements. At one end of the spectrum, a conservation plan may use maps to delineate exactly where reserves are to be created. In this type of plan, often called a map-based plan, map designations define the application of regulations, fees, land acquisition, restoration, or other elements of the plan. Because all landowners must agree to the designation placed on their lands, purely map-based plans (otherwise known as hard boundary or hard line plans) are difficult to develop on a large scale and are rare. Indeed, because the Plan area is almost entirely private land and the PCCP relies on a willing seller program, the actual locations of most future reserves cannot be determined during the planning stage.

At the other end of the spectrum, a conservation plan may display no maps or only very general maps and instead include a process-based land acquisition strategy. A purely process-based plan (also known as a policy-based or criteria-based plan) has no maps of where reserves will be established or other mitigation accomplished. Instead, the conservation plan outlines a detailed process by which reserves are assembled according to a set of clear criteria. The amount of flexibility in a process-based plan depends on the flexibility of the reserve assembly criteria.

The PCCP incorporates enough flexibility to allow the PCA to assemble the Reserve System within the constraints of a willing seller program, while ensuring that the assembled Reserve System will meet the biological goals and objectives of the Plan. The PCCP uses a hybrid approach in which maps display conservation priorities on the regional scale of the Plan area. Land acquisition will be undertaken in accordance with a detailed set of requirements, while maintaining flexibility in how the Reserve System is ultimately assembled.

RAA Overview

The Plan area is subdivided into two major zones to geographically separate areas primarily intended for preservation, conservation, and agriculture from urban and suburban development (Figure 5-3).

The PCCP land planning status (i.e., PFG, RAA) identifies the treatment of land by local governments for future planning and administration of general plans and zoning as well as specifying land for incidental take coverage.

- The **Reserve Acquisition Area** is where the future land acquisition and management for conservation may take place. Land throughout the Plan area, including the RAA, will have take coverage and will be able to be used in any way allowed under general plans, zoning, and any project-specific agreement current at the date of the PCCP permit. Substantial changes in general plans, zoning, or agreements that expand development and increase take would not be covered without a PCCP amendment.

- **Existing reserves** have already been established, including mitigation banks where future mitigation credits remain available. The Plan anticipates that these existing reserves will be maintained in perpetuity, regardless of ownership. The Plan covers incidental take of covered species on existing reserves only in conjunction with reserve management activities associated with implementation of the PCCP conservation strategy. The management actions covered by the PCCP are presented in Chapter 2, Section 2.3.7, Conservation Strategy Implementation and other Placer County Conservation Programs.

- **The Potential Future Growth** Covered Activities in the PFG area must avoid impacts in the Stream System setback and must implement LIDS, as further explained in the CARP, but the PCCP anticipates that the PFG area will become increasingly urbanized over time. Even with the anticipated urbanization, the Stream Setback and LIDS will contribute to the conservation strategy, goals and objectives of this Plan.

The Reserve System in relation to the RAA

The majority of land acquired for the Reserve System will be in the RAA. However, depending on the natural resource values present, some acquisitions may occur in the PFG area as long as they meet size and connectivity requirements. PFG avoidance is addressed in Chapter 6. Management within the Reserve System will be directed first and foremost to the conservation of natural communities and covered species.

The RAA consists of two elements:

1) Existing conservation areas are lands already protected in perpetuity as a consequence of local, state, federal and private sector conservation activities. As of 2010, existing reserves contributing to PCCP biological objectives amounted to 16,000 acres. The existing reserves include lands acquired through the Placer Legacy program, some of which are creditable to anticipated PCCP obligations if they were not purchased with mitigation funds. The existing reserve land in the Plan area are provided in Table 2.2 and depicted on Figure 2-4.

2) Lands that could be acquired or protected with conservation easements during the 50-year permit term for permanent conservation. The entirety of the RAA is approximately 70,200 acres. The Plan proposes that portions of the RAA, as much as 44,000 acres, would be acquired to achieve the conservation objectives of the Plan. Area not acquired will continue in agriculture and will continue to contribute passively to regional biological values.

Development of the Reserve Acquisition Area Map

On January 23, 2007, the Board of Supervisors acknowledged that two members of the Board of Supervisors (Kirk Uhler and Robert Weygandt) and two Council Members of the City of Lincoln (Tom Cosgrove and Primo Santini, and later Mayor Spencer Short replacing Councilmember Santini) would meet to discuss the development of a PCCP Reserve Map. These four elected officials formed what came to be known as the Ad Hoc Committee. The Board also directed staff to prepare a draft PCCP Reserve Map that combined two draft reserve map alternatives as the starting point of discussions with the Resource Agencies.

Since February 2007, the Ad Hoc Committee has met with staff from the County and the City of Lincoln to discuss the PCCP. A significant amount of discussion has been devoted to the preparation of a Reserve Map. The Ad Hoc Committee has also met with staff and managers of the Resource Agencies to discuss Reserve Maps and the Ad Hoc Committee's approach to developing a conservation plan. The Reserve Map has been revised numerous times since February 2007. The final Reserve Map presented in the PCCP represents the collective consensus of the Ad Hoc Committee. This revised map was approved by the Board of Supervisors on January 12, 2010 and serves as the basis for the RAA

and biological goals and objectives contained in the PCCP; the map has been updated as needed to show existing reserve lands.

The Draft Ad Hoc Reserve Map consists of three basic elements: 1) The RAA; 2) the PFG area; and 3) the boundaries of the CARP. The non-participating cities of Roseville, Rocklin, Auburn, and the Town of Loomis are also included on the Reserve Map for reference. Placer County is proposing to provide coverage for the PCCP in the Spheres of Influence for Roseville, the Sunset Industrial Area, and Auburn for the North Auburn/Bowman Area.

In summary, the RAA was defined after months of deliberation by the Ad Hoc Committee. The Committee reviewed analyses prepared by staff, comments from Resource Agencies, input from property owners, input from stakeholder interests including the Biological Stakeholder Working Group, and non-participating Cities.

The stakeholder map was meant to serve as an implementation tool for the conservation core concept identified through the biological goal-setting process (Section 5.4.1). Table 5-1 shows the areal correspondence between the RAA map and the core concept map. Table 5-1 Shows the breakdown of Plan area, and the Valley and Foothills subareas as to the area in or out the core/connector designation and shows how much of that core/connector falls in either existing reserves (EXR) or in the RAA from the stakeholders' map. In both Valley and Foothills, the potential conservation from the RAA map accommodates roughly 97% of the conservation objectives identified through the core conservation concept map.

The RAA extends from the Valley floor to the upper portions of numerous watersheds, encompassing the transition from grasslands to oak woodland to coniferous forest. At its narrowest, it is one mile wide and at its widest it is approximately fourteen miles across. All major salmon and steelhead stream systems are identified for habitat conservation, fish passage improvements, and restoration. Every major natural community has thousands of acres within which conservation and restoration can occur with the guarantee protection in perpetuity, as well as management and monitoring. Lastly, the RAA provides for the buildout of the County and City of Lincoln land use diagrams, although buildout is not anticipated within the 50-year permit term. At year 2060, roughly 30 percent of the PFG area will remain undeveloped and roughly half of the RAA will remain in private ownership. Consequently, there will be a capacity for additional conservation after 2060, for the remaining holding capacity.

5.4.4 Data Sources

The primary sources of data for the conservation strategy were the ecological accounts of covered species (Appendix D), the species

distribution models (Appendix D), and the inventory of existing conditions summarized in Chapter 3. Other sources consulted to develop the conservation strategy are cited throughout the chapters. Additional general sources are listed below.

- Species recovery plans and management plans, if available: Monitoring Plan for the American Peregrine Falcon, A Species Recovered Under the Endangered Species Act (USFWS 2003); Recovery Plan for the California Red-Legged Frog (USFWS 2002); Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005); National Bald Eagle Management Guidelines(USWFS 2007); California State Recovery Plan for Bank Swallow (CDFG 1992); Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*) (USFWS1999); Recovery Plan for the Valley Elderberry Longhorn Beetle (USFWS 1984); Public Draft Recovery Plan for the Evolutionary Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead (NMFS 2009).

- Species and natural community experts, including the independent Science Advisors for the Plan.

- Approved or in-process HCPs for adjacent or nearby areas with similar natural communities and covered species (e.g., Santa Clara Valley HCP/NCCP [in-process]; Natomas Basin HCP, East Contra Costa County HCP/NCCP [approved]; San Joaquin County Multi-Species Habitat Conservation and Open Space Plan [approved]; South Sacramento County HCP [in-process]).

- Local land acquisition priorities of open space agencies and organizations, where they overlap with the biological goals and objectives of the Plan: Placer Legacy Program, Placer Land Trust.

The landscape and community-level biological goals and objectives were initially developed for the first Agency Review Draft PCCP (2005) through a series of interagency working group meetings composed of key technical staff from TRA Environmental Sciences, staff of the County Planning Department, and experts from the Wildlife Agencies. The meetings took place from August to October 2005.

The purpose of each working group meeting was to collaboratively develop working draft landscape and natural community-level biological goals and objectives. Each working group meeting began with an overview of the specific natural communities, including occurrence of various species, key threats, ecological needs, and issues for the conservation strategy. Natural community goals and objectives were projected on a large screen so that participant comments could be incorporated real time. Over a series of four meetings, participants worked through preliminary draft goals and objectives for the landscape

level and for all natural communities. Follow-up emails were generated to obtain comments on and or edits to the working draft goals and objectives.

Species-level goals and objectives were developed by technical staff of TRA Environmental Sciences with input from County technical staff. The species-level biological goals and objectives were developed using the following primary sources:

- Ecological data from species accounts, descriptions of natural and semi-natural communities, the scientific literature, and envirograms prepared by experts at the University of Nevada, Reno under the direction of Dr. Peter Brussard;
- Recommendations in the Science Advisor's Report (Brussard et al. 2004);
- Species data from other HCPs (e.g., East Contra Costa HCP/NCCP; Santa Clara Valley Habitat Plan) prepared or under preparation that addressed the same species and/or habitats;
- Information from scientific studies prepared in support of the PCCP (see next list of bullet points, below), as listed in the Bibliography;
- Federal and state recovery plans for covered species, including conservation targets or management recommendations for covered species;
- Critical habitat rules for covered species;
- Other sources with conservation targets or conservation recommendations that address the covered species, natural communities, or Plan area (California Partners in Flight 2000; California Partners in Flight 2002; Riparian Habitat Joint Venture 2004; Tricolored Blackbird Working Group 2007);and
- Input from resource specialists, outside workshops, including staff from the Wildlife Agencies and local "species experts" with intimate knowledge of the covered species and natural communities within the Plan area.

The biological goals and objectives (for all levels) developed for the first Agency Review Draft PCCP (2005) were refined and revised by TRA Environmental Sciences and staff of the County Planning Department for the second Draft PCCP to reflect Agency Review comments, the structure of the second Draft PCCP, and new biological information.

During the early stages of the formulation of the PCCP, the County and its interagency and scientific advisors determined that additional studies were needed to fill gaps in the scientific knowledge of biological resources

in western Placer County. The following studies were conducted between 2003 and 2005 to inform the development of the biological goals, objectives, and conservation actions necessary to achieve these goals:

- Important Migrant and Wintering Bird Concentration Areas of Western Placer County, Jones and Stokes Associates (JSA), February 2003;
- Aquatic and Wetland Resources in Western Placer County, North Fork Associates, December 2003;
- Streams of Western Placer County, Aquatic Habitat and Biological Resources, Resource Assessment, Prepared by Randy Bailey, December 2003;
- Salmonid Spawning Habitat Surveys for Western Placer County, JSA, March 24, 2004;
- Relationships Between Animals and Site Attributes in Riparian Ecosystems in Western Placer County, JSA, May 10, 2004;
- Preliminary Assessment of the Effects of Habitat and Landscape Variables on Vernal Pool Ecosystems, ECORP Consulting, Inc., August 12, 2004;
- Setback Recommendations to Conserve Riparian Areas and Streams in Western Placer County, JSA, February 2005;
- Assessment of Habitat Conditions for Chinook Salmon and Steelhead in Western Placer County, CA , JSA 2005;
- Placer County Natural Resources Report: A Scientific Assessment of Watersheds, Ecosystems, and Species of the Phase I Planning Area. JSA April 2004.

Although most of the studies were focused on identifying the distribution and quality of existing natural resources in the County, some contained recommendations for conserving resources.

5.5 Landscape Conservation Actions – Assembling the Reserve System

The conservation strategy is composed of a series of conservation actions. Conservation actions are tools, strategies, comprehensive programs, and actions to conserve natural communities, habitats, and landscape-level processes and to conserve and help recover covered species in the Plan area. Conservation actions are listed in Tables 5-4 and 5-5.

The following subsections describe the landscape-level and natural community-level conservation actions. Section 5.7, Benefits of Conservation Actions for Covered Species relates the landscape-level and natural community-level conservation actions to each covered species, while also discussing in detail the species-level conservation actions.

5.5.1 Land Acquisition and Restoration Actions

An important part of the conservation strategy is the creation of a Reserve System. Many parts of the Reserve System will link existing protected areas with newly protected lands. When completed, this Reserve System will protect substantial areas of high-quality habitat for covered species and will provide extensive new opportunities for habitat enhancement, restoration, and creation.

Land in the Reserve System will be enhanced, where appropriate or as required as mitigation, to improve habitat for covered species and natural communities. The details of habitat enhancement activities are described starting in Section 5.5.3. Habitat restoration and creation will occur in targeted sites for wetlands, streams, and ponds as described in Sections 5.6.4 and 5.6.5

Reserve Assembly Process

The PCA will establish the Reserve System through acquisition of land in fee title, conservation easement, or purchase of credits at an approved Bank. Lands will only be acquired from willing sellers or donors. Candidate lands for acquisition must meet one or more of the biological goals and objectives and the land acquisition requirements described below. The PCA will assemble the Reserve System in the following ways:

- Enhancement of land owned by a Permittee and inclusion in a conservation easement.
- Purchase conservation easements or land in fee title from willing sellers.
- Purchase of land or conservation easements in partnership with other organization(s) (not to be used as mitigation for another project that is not a covered activity).
- Acceptance of land or easement dedication in lieu of fee payment if the easement contributes to the goals and objectives of the PCCP and is approved by the PCA.

- Acceptance of credits sold in private mitigation banks if they meet the terms of the Plan (see Section 8.8.2 in Chapter 8).
- Acceptance of land or easement dedication as a gift or charitable donation.

Acquisition of land in fee title and conservation easements will likely be the primary mechanism used in most watersheds. The terms of each conservation easement may be tailored to each landowner, parcel, and agricultural operation, but will be consistent with goals of the conservation strategy, the general principles for easements outlined in this Plan (see Chapter 8), and the guidelines in the Implementing Agreement. Conservation easements on farm lands will help to meet the biological goals and objectives of the PCCP while maintaining economically viable agricultural operations.

The land and conservation easement acquisition process and the conditions under which the other four reserve assembly techniques may be used are discussed in detail in Chapter 8.

To achieve the PCCP's biological goals and objectives, including contribution to the recovery of covered species, it is important to focus land acquisition where it will have the greatest conservation benefit. By concentrating land acquisition in certain areas, larger effective reserves can be assembled by augmenting and connecting existing protected lands. However, the PCA must have flexibility in deciding where to acquire land because the Plan depends on the availability of willing sellers. The PCCP balances these needs by focusing acquisition of certain land-cover types within certain watersheds. Despite this flexibility, the PCA should prioritize land acquisition, where possible, in order to buy parcels of greatest conservation value.

When possible, land should first be acquired adjacent to existing protected areas to ensure that, in the unlikely event that public funding does not become available (see Chapter 9 for details), the Reserve System is composed of contiguous units rather than isolated parcels.

The land acquisition process is described in Chapter 8, Section 8.7. All land acquisition will be approved by CDFG and USFWS to ensure consistency with the biological goals and objectives. All land acquisition that includes suitable habitat for covered fish will also be approved by NMFS to ensure consistency with the biological goals and objectives for covered fish.

Acquisition Requirements

Field Verification Prior to Acquisition

Land-cover data, species occurrence data, and species habitat distribution models were developed for this Plan at a regional scale.

These data and models were used to develop a sound conservation strategy for the Plan area at this regional scale and are not intended for site-specific planning because of the limitations described in Chapter 3.

To account for some of the uncertainty inherent in this conservation strategy, biological resources in potential reserves will be verified in the field prior to land acquisition. The PCA will conduct pre-acquisition assessments on potential reserve lands to evaluate whether they are likely to meet PCCP requirements. The PCA will develop standard protocols and a report template for pre-acquisition assessment prior to the first acquisition during implementation. The biological suitability of the site for the Reserve System will be determined on the basis of the following information:

- The results of past biological surveys, updated land-cover mapping, assessments of habitat suitability for covered species, air photograph interpretation, and the biological resources present or expected on the site;
- An evaluation of the site's enhancement and restoration potential;
- An evaluation of how well the site achieves the reserve design and assembly principles listed above (Section 5.3); and
- An evaluation of the site's existing and potential biological value in the context of the remaining unmet biological goals and objectives and land acquisition requirements.

Types of information collected during these assessments will include an evaluation of location, quantity, quality, and type of populations of covered species; covered species habitat; and natural communities present, as well as other site conditions or infrastructure that would benefit or conflict with the Plan's biological goals and objectives. The site's restoration and enhancement potential will also be evaluated. This information will help the PCA prioritize acquisition of reserve lands based on their relative contribution toward meeting the biological goals and objectives.

Acquisition Requirements for Terrestrial Natural and Semi-Natural Communities

Mitigation (through fees and land dedication in lieu of fees) is expected to provide for a large component (approximately 80 percent) of the land acquired for the Reserve System. While the impact assessment in Chapter 4 (see Table 4-4) provides estimates of land conversion over the term of the permit, actual land conversion (both rate of land conversion and total land conversion at end of permit term), and hence mitigation, may be lower than the estimates provided.

Therefore, to ensure that the PCA establishes a viable reserve system, even if land conversion does not occur at the rate estimated, the Permittees will ensure that, at a minimum, a land acquisition strategy and reserve design will be implemented that would be attainable through a combination of even limited mitigation fee revenues and federal and state funding (see Chapter 9 for federal and state funding estimates). The minimum land acquisition strategy and reserve design does not replace the PCCP's overall land acquisition strategy and reserve design. Instead, the minimum land acquisition strategy will ensure that the reserve system created by the PCCP will be viable over the long-term, even if a slow rate of development results in lower mitigation fee revenues available for reserve system land acquisitions.

The assessment of take, mitigation, and implementation of the Reserve System Section 5.2.2) addresses a low and high growth scenario. It is unlikely that growth in the 50-year permit term will be less than the low growth scenario, so that lower level constitutes the minimum land acquisition required under the PCCP: 17,000 acres in the Valley and 5,000 acres in the Foothills.

Acquisition and Restoration Requirements for Aquatic Land-Cover Types

While the impact assessment in Chapter 4 provides estimates of conversion of aquatic land-cover types (i.e., fresh emergent wetlands, seasonal wetlands, vernal pools, ponds, riparian, and riverine), there is uncertainty in the degree of impacts to aquatic features because of uncertainty in the land-cover mapping (particularly for mapping of vernal pools) and the extent to which development will avoid riparian areas and other wetlands.

All wetlands, vernal pools, ponds, and streams to be impacted or preserved will be formally delineated in the field prior to impacts or acquisition (see Chapter 6 for delineation requirements). To offset impacts to these aquatic land-cover types, the PCA will acquire these land-cover types according to the ratios in Table 6-1 and Table 6-2.

Aquatic land-cover types will also be restored or created according to the ratios in Table 6-3 to ensure no net loss of wetted areas. Guidelines for restoration and creation are described in the sections below in regard to each natural community.

The preservation ratios in Table 6-3 were determined based on the following factors.

- The biological value of the land-cover type (e.g., overall biological diversity, function as habitat for covered species, ecosystem function); and

- Standard mitigation ratios used by state and federal regulatory agencies (these ratios were used as starting points for the PCCP).

Avoidance and minimization of impacts on aquatic and terrestrial land-cover types (see Chapter 6) at project sites may reduce the amount of preservation area required if preserved land-cover types meet minimum avoidance requirements (see Chapter 6, Section 6.11, Conditions to Minimize Impacts to Natural Communities).

Buffer Zones within the Reserve System

When the PCA acquires land adjacent to existing or planned urban development that has no buffer zone, or an inadequate buffer zone, one must be created on the reserve. Landowners adjacent to PCA reserves will not be required to implement buffers and setbacks on their property to avoid and minimize impacts to covered species (see Chapter 6, Conditions to Minimize Impacts to Covered Species) when the covered species occurs on a neighboring PCA reserve. In addition to serving as a separation to minimize edge effects on the reserve, the buffer zone will receive treatments to reduce fuel loads and minimize fire hazards. Treatments and adjacent urban development may incrementally reduce habitat functions within the buffer. To account for this loss of habitat function, any area adjacent to development that is required as a buffer will not be credited toward land acquisition requirements (see Chapter 6, Condition 12, Fuel Management Buffer, for required fuel buffers). The remainder of any buffer zone may be credited toward terrestrial land-cover because it will provide habitat for some species. Aquatic land-cover types and breeding habitat for aquatic covered species without sufficient buffer zones will not be credited toward meeting land acquisition requirements because their proximity to intensive urban development can greatly reduce their habitat value.

Stay-Ahead Provision and Rough Proportionality

The timing and sequence of reserve assembly relative to impacts of covered activities is critical to the success of the PCCP. Progress toward assembling the Reserve System must stay ahead of progress toward total impacts allowed under the permit. This ensures that reserve assembly is keeping pace with development and that the PCA is making steady progress toward the complete Reserve System.

Demonstrating progress toward assembly of the Reserve System is a requirement under the NCCP Act. The NCCP Act requires that implementation of mitigation and conservation actions be “roughly proportional in time and extent to the impact on habitat or covered species authorized under the plan” (California Fish and Game Code Section 2820[b][9]). The Stay-Ahead provision in this Plan described in Chapter 8 addresses this requirement.

To meet the Stay-Ahead provision at the beginning of Plan implementation, some land should be acquired prior to any permits being issued or immediately after permit issuance in order to "jump start" the Reserve System. The PCA should acquire land-cover types at the beginning of the permit term that corresponds to the predicted impacts in this same timeframe.

Conservation Outside the Plan Area

It is intended that the main part of the Reserve System will be established within the Plan area in western Placer County. There are several places outside the Plan area where conservation management activities to improve watershed integrity would serve PCCP objectives. Cooperative conservation actions in these areas could also benefit the reserve system by expanding the resource available for a reserve, increasing contiguous reserve size, or improving connectivity, particularly in a high priority watershed. Figure 5-5 depicts the location where acquisition and management of conservation could occur. Lands that may meet these needs are:

- Land along the Placer/Sutter County border, in particular, the lower portion of the Coon Creek and Auburn Ravine.
- Portions of the floodplain along the Bear River that is within the Coon Creek watershed within Sutter County.
- Lands contained within the levees of the Natomas East Main Drainage, Cross Canal, Pleasant Grove Creek Canal, and East Side Canal for conservation actions which improve fish passage and water quality for salmonids in Placer County.
- Mitigation and Conservation Banks approved by the Wildlife Agencies and/or the ACOE that contain the Plan area within the service boundary. Mitigation and Conservation Banks locations are not depicted on Figure 5-5.

Land acquired with these limits by the PCA - will be credited towards applicable plan requirements. Any land acquired by the PCA outside of the Plan area will receive incidental take coverage for PCA activities directly related to acquisition and management of reserve land.

Contributors to the Reserve System

The PCCP establishes a framework for compliance with state and federal environmental laws and regulations while accommodating future growth in the Plan area. Without the PCCP, the responsibility for conserving threatened and endangered species and their habitats would rest only with those public and private entities whose activities directly affect species and their habitats.

Approximately 16,123 acres are already owned by public agencies or private conservation organizations or are subject to private conservation easements (Tables 2-2 and Figure 2-4). Most of these existing conservation lands will not be enrolled within the ultimate PCCP Reserve System. However, they will help achieve the biological goals and objectives of the PCCP because they provide habitat linkages, are a source of covered species for PCCP reserves and can be the nuclei for future PCCP acquisitions.

The PCCP incorporates input from a diverse group of entities and offers a balanced approach to conserving species and habitats while equitably distributing the costs. Funding for the acquisition of land and land and easement donations to assemble the Reserve System will come from several different sources, which will help to distribute the costs associated with acquiring and managing reserve lands. The PCCP distributes this responsibility for conservation more widely under the assumption that the benefits of a successful program will be shared by a broader group that includes existing and future communities within the Plan area as well as the citizens of California and the United States.

As a result, the PCCP includes several classes of contributors to the establishment of reserves. These include:

As a result, the PCCP includes several classes of contributors to the establishment of reserves. These include:

- Acquisition of Lands Mitigating Private Development: The PCCP requires that lands be acquired through development fee, land dedication in lieu of development fee, or credits purchased from an Agency-approved conservation/mitigation bank to mitigate impacts for the loss of natural communities and habitat for covered species resulting from urban development on private lands and other covered activities. It is expected that the majority of land acquisition and management will be funded through mitigation. Mitigation and conservation banks, which have credits available at the time of PCCP adoption, will be able to apply those creditable lands to the establishment of the reserve system. However, credits which are sold to non-participating agencies, cannot to the Reserve System.

- Acquisition of Lands through State and Federal Monies: Funds to acquire land may come from state and federal sources such as grants and state bond measures (see Chapter 9, Section 9.3.3, Potential Funding Sources, for more detail).

- Federal and State Acquisition of Private Lands: Lands acquired by federal and state agencies for conservation purposes may include lands acquired as mitigation for state and federal projects or other conservation programs.

- Incorporation of Existing and Future Placer Legacy Lands into the Reserve System (see Section 2.2.4): In 2000, Placer County began acquiring open space lands for agricultural, recreational and habitat purposes through the Placer Legacy Program. Since that time, Placer Legacy has acquired or co-acquired over seven thousand acres of Placer County's natural and agricultural landscapes.

  Some existing Placer Legacy conservation lands that contribute the biological goals and objectives of the PCCP are proposed for inclusion in the Reserve System. Enrolled existing conservation lands must conduct their management and monitoring according to the requirements and guidelines outlined in the PCCP. In some cases, this new obligation will represent an improvement over the type and level of habitat and species management and monitoring practices that are currently in place. In other cases, this requirement will simply standardize management and monitoring to provide a cohesive reserve system throughout the Plan area and ensure consistent management and monitoring in perpetuity.

  The following existing conservation lands are proposed for inclusion within the PCCP Reserve System (*new acquisitions will be listed in the next draft*):

  - Hidden Falls Regional Park – Phases I (220 acres) and II (961 acres);
  - Taylor Ranch – 38 acres (out of 321 total);
  - Liberty Ranch – 75 acres (out of 313 total) and;
  - Bruin Ranch – 933 acres (out of 1,773, total);
  - Doty Ravine – 418 acres (Jump-start only).

- Incorporation of other Existing Conservation Lands into the Reserve System See Section 2.2.4 for a complete list of other open space areas that will be incorporated in to the Reserve System.

- Incorporation of Land Acquired by other Organizations or through Partnerships (see Chapter 8, Section 8.8.2): Agencies and organizations who are not Permittees, such as the Central Valley Joint Venture member organizations, Ducks Unlimited, and Placer Land Trust, are expected to acquire land in the Plan area during the permit term. Because many of their acquisitions will help meet the goals and objectives of the PCCP, it may be appropriate that the PCA receive credit toward Plan requirements if the acquisitions are made in a funding partnership with the PCA and they are consistent with Plan goals.

5.5.2 Landscape Elements and Relationship to Objectives

The PCCP anticipates building the Reserve System from the full slate of natural and semi-natural (mainly agriculture) landcover types now in the Plan area. This approach is necessary because there are no large blocks of natural land that can meet size and connectivity needs and because semi-natural landcover provides some habitat for covered species, can supply land for restoration, serve as buffers for habitat, and provide connectivity between habitat patches.

The conservation strategy envisions ultimately building sufficiently large land blocks as reserves that it will be possible to substantially protect and manage representative areas of all natural communities in the RAA and Stream System (CARP avoidance areas). The PCA will oversee construction of the Reserve System and will need to provide sufficient areas of landscape to keep the PCCP in compliance with the permit for mitigation and the stay-ahead provision. The mitigation ratios described in Chapter 6 are set in anticipation of this compliance monitoring and define the elements of the Plan area landscape that will be available for the Reserve System.

The principal landscape elements are as listed here. The correspondence to Placer WHR is shown in Table 3-2. These aggregated natural communities were selected to balance the need for specificity for in-kind mitigation with the burden of field determination and complex compliance monitoring requirements. As shown in the discussions of mitigation ratios in Chapter 6, the ratios are applied broadly to all natural and semi-natural land in the Valley and to all natural land in the Foothills. Wetlands are accounted separately.

1. Grassland/Vernal Pool Complex
2. Other Wetland
3. Riverine and Riparian
    - 3.1 Valley Foothill Riparian Woodland
    - 3.2 Other Stream System
4. Oak Woodland
    - 4.1 Valley Oak Woodland
    - 4.2 Other Oak Woodland
5. Agriculture

When the take estimates from covered activities shown in Chapter 4 are matched with the mitigation ratios established in Chapter 6 as conditions on covered activities, the time progression of future growth can be used to predict the time progression of landscape element that will be available for assembly into the Reserve System.

The following practical demonstration of mitigation and conservation strategy implementation for the Valley and for the Foothills shows how the

Reserve Acquisition Area and Stream System are large enough and have sufficient biological resources to allow a functional Reserve System to be created through the mitigation process. As stated elsewhere, it is expected that non-local funds would also be available to advance NCCP objectives, but the mitigation schema described here constitutes an adequate minimum.

Valley: Take, Mitigation and Reserve System Implementation

In the Valley, the forecast is based on predicted growth rates applied to the PFG. The forecast starts with 2010 as the base year and shows ten-year increments out to 2060, the proposed initial term of the PCCP. Table 5-2 shows the forecast of take and mitigation for the Valley and compares it with Reserve System objectives. The analysis is presented in Appendix G, Take Assessment Methodology; the following key points describe the results.

1. Future growth in the Valley will occur at urban and suburban densities. Potential land conversion in the Valley is estimated by applying growth projections developed by Hausrath Economics Group (HEG) using regional demographics models. The model gives estimates for land area conversion in 10-year intervals up to the year 2060 permit term. The impact on communities is summarized in Table 5-2 A. The PCCP permit would cover the maximum projected year 2060 growth impact as a covered activity, indicated as “Permit”. The PFG has a slightly larger land area available for growth than is predicted to be needed by 2060, the column “buildout” shows the extent of land take and corresponding mitigation that would apply if essentially all of the PFG were subject to take.

2. The Plan determines that it is reasonably foreseeable that urban and suburban growth over the 50-year permit term will fall between 50 percent and 100 percent of the Permit year 2060 HEG growth projection. This defines the low and high impact scenario shown in Table 5-2.B.

3. Potential development is used to estimate: a) probable levels of land conversion and take of natural communities, and b) the effect of Plan mitigation requirements resulting in c) reasonable expectations of additional conservation reserves that will be established.

4. Potential impact is estimated by a pro rata assignment of growth area to the resources present in the several demographic projection units. Actual growth patterns may differ, and changing trends in land use may results in denser growth, but the overall effect on the land will not differ appreciably.

5. The Valley Plan area now has roughly 10,060 acres in existing reserves.

6. The PCCP draws the RAA as an additional roughly 46,000 acres around the existing reserves. The conservation strategy anticipates acquiring from 17,000 to 34,000 acres of the RAA to create the Reserve System, for a total of from 27,000 to 44,000 acres in conservation management.

7. Urban and suburban development will affect the biological resources of the Plan area through: direct impact and indirect impact. Direct impact is the land area cleared for actual construction, and is termed the "footprint". Indirect impact is the aggregate of secondary and fragmentation effects that occur in land left uncleared, but adjacent to new homes and roads. For the PCCP in the Valley, indirect impact is assumed to occur on the balance of any parcel greater than 20 acres that is developed.

8. The Plan also establishes protection of the Stream System through the CARP; the take estimates account for the regulatory effect of the CARP.

9. Land cover likely affected by full projected year 2060 growth is summarized in Table 5-2.A. The land cover classes have been aggregated into the categories addressed by the mitigation requirements. In general, potential growth may have an effect on some 25,000 acres (34 percent) of natural and semi-natural communities in the Valley.

10. The PCCP sets proposed mitigation ratios in Chapter 6, Conditions on Covered Activities. The ratios express the area of mitigation land (or fee equivalent) needed to offset the impact. In general, the ratios are 1.35:1 (135 percent) for direct and indirect impact. Certain conditions such as riparian or valley oak woodland have higher ratios.

11. Applying the PCCP mitigation ratios to the potential development estimate give the corresponding mitigation land area shown in Table 5-2.C. The combined land area required to offset direct and indirect effects of full potential development is roughly 34,000 acres.

12. Reserve acquisition to balance this effect would need to be apportioned by general land cover class, with roughly 27,000 acres of grassland and the balance agriculture and small amounts of riparian and woodland.

13. Table 5-2 D shows the general availability of land cover classes in the RAA, the stream system in the PFG, and in some of the

existing reserves where credits are available. PCCP mitigation for the full growth scenario would require roughly 73 percent of the mitigation potentially available; grassland area is likely insufficient and mitigation would have to be accommodated out-of –county or by restoration of agricultural land. The low growth scenario can be easily accommodated by the RAA, using as much as 36 percent of the land area and some 53 percent of the existing grassland.

14. The Plan uses a range of from 50 percent to 100 percent of projected year 2060 growth as the low and high range of reasonably foreseeable growth. Applying these percentages to mitigation gives the results of Table 5-2 C, showing that the Plan is likely to generate land or fee equivalents for some 17,000 to 34,000 acres of mitigation land area. This practicality test validates the proposed conditions (mitigation ratios) as serving to implement the conservation strategy for reserve acquisition.

15. Wetlands including vernal pools are accounted separately. Wetland area affected is estimated by applying density assumptions to the land cover analysis. Table 5-2 E shows the estimated take of wetland wetted area by permit decade. Most of the impact is expected on vernal pools; other wetlands are more associated with the Stream System and are protected by the CARP. The full growth scenario is projected to result in loss of some 342 acres of vernal pool wetland and a small amount of other wetlands.

16. Mitigation ratios specify preservation at 1:1 (100 percent) and restoration at 1.25:1 (125 percent). Table 5-2 F applies these ratios and shows the corresponding area of preservation and restoration that would be required. The figures reflect the minimum proposed Plan requirement that 0.75 of the 1.25:1 restoration be as vernal pool. The maximum take would require preservation of a corresponding 342 acres of vernal pools and restoration of from 256 to 428 acres, with the balance being some other wetland type.

17. Although a direct inventory of wetlands is not available, applying the same density assumptions to RAA land as are used to estimate take shows in Table 5-2 G that roughly 74 percent of RAA land should be able to accommodate the vernal pool preservation projected for the 2060 permit mitigation requirements.

18. Table 5-2H shows that with preservation and restoration, there would be no net loss of wetlands overall.

Foothills: Take, Mitigation and Reserve System Implementation

In the Foothills, the forecast is based on buildout of rural residential land use under existing zoning. Growth projections for this low density land use are difficult to make, but the PCCP assumes that the permit will cover essentially all buildout of low density land in the Foothills, less the growth potential of some 16,000 acres of land in the existing reserves and in the RAA to be incorporated into future reserve system. Higher density, redevelopment, and infill may add population to the Foothills, but will not significantly affect take of natural habitats.

Table 5-3 compares the forecast of take and mitigation for the Foothills with Reserve System objectives. The analysis is presented in Appendix G, Take Assessment Methodology; the following key points describe the results.

1. Future growth in the foothills will occur at suburban and rural residential densities; rural residential density (one dwelling per 1 to 10 acres) is the greater potential land conversion of natural community because of the land area needed for each dwelling, access, and associated land clearing. Even lower density residential development is allowed on parcels larger than 10 acres under agricultural zoning. This is termed rural development.

2. Potential land conversion in the Foothills is estimated by analyzing existing occupancy (parcels already built), existing zoning and parcel size. The analysis only considers existing parcels greater than one acre, so the potential to add new dwellings in the foothills overall is somewhat greater than the rural and rural residential results alone.

3. Potential development is used to estimate: a) probably levels of land conversion and take of natural communities, and b) the effect of Plan mitigation requirements resulting in c) reasonable expectations of additional conservation reserves that will be established.

4. The Plan determines that it is reasonably foreseeable that rural and rural residential growth over the 50-year permit term will fall between 40 percent (low) and 80 percent (high) of the maximum estimated build out under existing zoning. Actual growth patterns may differ, in particular, rezoning or planned unit development may allow denser growth, but the overall effect on the land will not differ appreciably.

5. Existing zoning would allow some, mainly rural development in the areas now in Existing Reserves and in the Reserve Acquisition Area (RAA). The estimate for potential development needs to be discounted for land that is already in reserves or that may become

reserves through action of the PCCP. In essence, PCA acquisition will be an alternative to development in the rural north Foothills.

6. The Foothills Plan area now has 6,030 acres in existing reserves.

7. The PCCP draws the RAA in roughly 24,100 acres around the existing reserves. The conservation strategy anticipates acquiring from 5,000 to 10,000 acres of the RAA to create the Reserve System, for a total of from 11,000 to 16,000 acres in conservation management.

8. Rural and rural residential development will affect the biological resources of the Plan area through: a) direct impact and b) indirect impact. Direct impact is the land area cleared for actual construction, and is termed the "footprint". Indirect impact is the aggregate of secondary and fragmentation effects that occur in land left uncleared, but adjacent to new homes and roads. For the PCCP, indirect impact is assumed to occur on the balance of any parcel greater than 10 acres that is subdivided.

9. Land cover likely affected by full potential development is summarized in Table 5-3 A. This estimate discounts potential development from existing reserves and from 10,000 acres of the RAA. The land cover classes have been aggregated into the categories addressed by the mitigation requirements. In general, potential rural and rural residential growth may have direct effect (land clearing) on some 10,200 acres (12 percent) and indirect effect of 16,400 acres (19 percent) on natural communities in the Foothills.

10. The PCCP set proposed mitigation ratios in Chapter 6, conditions on Covered Activities. The ratios express the area of mitigation land (or fee equivalent) needed to offset the impact. In general, the ratios are 1:1 (100 percent) for direct impact and 0.1:1 (10 percent) for indirect impact. Certain conditions such as riparian or valley oak woodland have higher ratios.

11. Applying the PCCP mitigation ratios to the potential development estimate give the corresponding mitigation land area shown in Table 5-3 B. The combined land area required to offset direct and indirect effects of full potential development is roughly 12,774 acres.

12. Reserve acquisition to balance this effect would need to be at least 50 percent oak woodland, at least 8 percent riparian and smaller amounts of other natural communities. The roughly one-third impact on grassland can be mitigated through a combination of grassland and woodland, and as a practical matter, may

comprise the oak woodland-grassland transition termed savannah.

13. The Plan uses a range of from 40 percent to 80 percent of build out of current zoning as the low and high range of reasonably foreseeable growth. Applying these percentages to mitigation gives the results of Table 5-3 C, showing that the Plan is likely to generate land or fee equivalents for purchase of some 5,000 to 10,000 acres of mitigation land area.

14. The Foothills RAA is roughly 24,100 acres. Table 5-3 D applies a quantitative conservation objective expressed as a percent of each existing community that would be acquired for the Reserve System. Seeking to acquire 60 percent of RAA oak woodland would produce 8,000 acres. Together with the 5,600 acres on existing reserves, the PCCP would accomplish conservation of roughly 43 percent of oak woodland in the Foothills.

15. Targets for other communities contribute to the PCCP goal of upwards of 10,000 acres of additional conservation land in the foothills. The RAA designation can accommodate these acquisition goals. This practicality test validates the proposed conditions (mitigation ratios) as serving to implement the conservation strategy for reserve acquisition.

16. The Plan has a second benefit in that the conservation in the RAA will steer development away from the resources most subject to adverse impact and fragmentation and it establishes protection of the Stream System through the CARP.

Reserve System Target

The landscape elements shown as mitigation categories include the WHR landcover types; the contribution of each element to the Reserve System will come mainly from the RAA and to some degree from the Stream System. The process and the priority of acquiring land are described in this Chapter, but the Plan cannot show what land will be in reserve at each forecast interval. The Plan can assure that the extent of landscape elements shown will be provided as that is necessary for compliance. When the landscape of the RAA is analyzed, we can see the likely presence of landscape elements and their corresponding WHR landcover types, including the density and characteristics of vernal pool grassland.

Generally, the RAA and Stream System provide enough land area to mitigate the high level of forecast growth through year 2060. If growth is slower than forecast, the rate of take and hence the funds available for assembling the Reserve System will be less. The PCCP sets a conservation target, reflecting the maximum projected extent of the covered activities and a minimum, reflecting the low growth scenario. This

allows the Plan to set the following overall quantitative conservation objectives:

1. Valley : Reserve System PCCP new acquisition
    a. Target: 34,000 acres; 27,000 acres vernal pool grassland (including restoration)
    b. Minimum: 17,000 acres; 15,000 acres vernal pool grassland
2. Foothills: Reserve System PCCP new acquisition
    a. Target: 10,000 acres; 7,500 acres oak woodland
    b. Minimum: 5,000 acres; 4,000 acres oak woodland

5.5.3 Land Management

The primary means of mitigating impacts on and conserving covered species and natural communities is acquisition of high-quality habitat in accordance with the reserve design criteria outlined above. In order to meet regulatory requirements and to contribute to the recovery of covered species, habitat enhancement, restoration, and creation are also important components of the conservation strategy. Some land-cover types that are lost to covered activities will be replaced with the same or similar communities or land-cover types within the PCCP reserves. Habitat enhancement, restoration, and creation ensure that there will be no net loss of certain resources (e.g., wetlands, breeding habitat for specific covered species). In other cases, restoration and enhancement are used to supplement preservation to adequately conserve land-cover types or covered species habitat.

All land acquired for the PCCP Reserve System, whether controlled through easement or purchased outright, will require preservation, management, enhancement, restoration, and to a lesser extent, habitat creation. Habitat enhancement, restoration, and creation will occur in addition to, not as a substitute for, land preservation. Success criteria for habitat enhancement, restoration, and creation will be based in part on reference sites in the region. Reference sites where possible will be selected based on their condition as representative of high quality communities in the Plan area. If reference sites are not able to be established the PCA will coordinate with the Wildlife Agencies to establishing optimal functions and values for the conditions that are unique to the Plan Area (e.g., summer flows where historically they would be absent). Use of reference stands will allow habitat enhancement, restoration, and creation plans to incorporate any unique regional characteristics of these habitats.

Descriptions

Habitat Enhancement

Habitat enhancement is the improvement of an existing degraded terrestrial vegetation community or aquatic habitat. Enhancement

involves measures such as increasing native species richness, species diversity, overall vegetative cover, and wildlife habitat function. Terrestrial habitat enhancement activities typically occur on soils that are largely intact (e.g., soils that have not been tilled or otherwise disturbed). An example of enhancement would be planting valley oak seedlings in an existing stand of valley oaks to increase oak cover and density and improve the age-class structure of the valley oak population. Improving wildlife habitat function might include removing barriers to animal movement such as fences or stream crossing that impair migration of anadromous salmonids within the Reserve System.

The measures of enhancement will differ according to each natural community and site, because natural communities differ in species composition and vegetative structure and threats to communities vary by site. The appropriateness of habitat enhancement will be considered on a site-by-site basis and in the context of the entire Reserve System and Plan goals and objectives. Habitat enhancement will be undertaken within the reserves on land-cover types, where appropriate, to conserve the populations of species and maintain or improve ecological processes. In some cases one species' enhancement needs may conflict with another species needs. Therefore in these cases, species-specific enhancement or restoration may be appropriate, in other cases general habitat type enhancement or restoration (with more general diversity goals) may be appropriate.

Habitat Restoration

Habitat restoration is the establishment of a vegetation community or aquatic habitat in an area that historically supported it, but no longer does because of environmental changes in site conditions or past disturbance. Restoration may involve altering site conditions to improve its ability to support the historic land-cover types. In this Plan, habitat restoration is only allowed in those land-cover types for which techniques are generally successful and where restoration would substantially increase habitat for covered species and native biological diversity. Habitat restoration will be focused in the PCCP Reserve System, including existing conservation lands that may be part of the Reserve System. Habitat restoration that is counted towards the total conservation benefit of the PCCP is allowed on private lands or public lands outside the Reserve and Stream Systems as long as the following conditions are met:

- The restoration site meets the Reserve design requirements, including being permanently protected through a conservation easement or similar mechanism (see Chapter 8). The site would also be maintained in perpetuity according to the terms of the Plan by the PCA or a Permittee. If the site is maintained by a third party, the third party must enter into a contract with the PCA to ensure management according to the terms of the Plan; and,

- The PCA monitors the restoration site.

Habitat restoration may not re-establish all functions of natural communities. For example, recent studies of wetland restoration projects indicate that many of them fail to meet success criteria or lack important functions of natural reference sites (National Research Council 2001). The conservation strategy takes this uncertainty into account by relying primarily on protecting existing habitat and by requiring habitat restoration in amounts exceeding typical mitigation ratios. Also, uncertainty is taken into account by the adaptive management strategy (see Chapter 7, Monitoring and Adaptive Management Program).

Habitat Creation

Habitat creation is the establishment of a vegetation community or aquatic habitat in an area that did not previously support it. For example, ponds can be created as breeding habitat for California red-legged frog in areas along streams that did not previously have ponds. This type of habitat creation must be balanced by the need to maintain and enhance stream functions. (Pond creation can also be undertaken off stream). Habitat creation should occur in damaged or disturbed areas whenever possible to offset the loss of existing habitats by the creation of new ones.

In-kind/like-function habitat creation is the establishment of the same land-cover type as the land-cover type lost to the covered activity, with the new land cover eventually performing the same functions as the lost habitat. For example, creating an artificial pond populated with species similar to those found in a natural pond would be in-kind/like-function creation.

Out-of-kind/like-function creation of habitat is the establishment of a different land-cover type performing some of the same ecological functions as the affected land cover type. Out-of-kind/like-function creation or restoration is not allowed under the PCCP except in situations where historic physical conditions can be restored to recreate a community that was historically present. If conditions supporting these communities could be restored, then the historic communities could be recreated out-of-kind.

Land Management on Reserves

Reserve management is designed to maintain and enhance natural communities, habitat for covered and other native species, native biological diversity, and ecosystem function. The location of reserves and condition of resources within these reserves will not be known until suitable sites are identified, surveyed, and acquired. Therefore, site-specific management objectives and techniques cannot be developed until reserve sites are known. The PCA will prepare reserve-specific plans (reserve management plans). Reserve management plans will identify, on the basis of site-specific conditions and reserve objectives,

the management and maintenance actions necessary to ensure that desired ecosystem characteristics and functions are maintained, restored (where applicable), and enhanced. Reserve management plans must also address and minimize the conflicts that may arise when managing for multiple species and habitats.

Reserve Management Plans

Reserve management plans will be prepared by the PCA for each reserve. Reserves with cultivated land or land irrigated for crops or pasture will include agricultural management plans (see section below). Reserve management plans will describe reserve-specific management strategies to maintain, and where necessary, improve existing habitat for covered species. These plans will also facilitate the management of enhanced, restored, and created habitats to maintain or improve their functions over time through the adaptive management process.

Reserve management plans will be prepared as soon as reasonably possible and will be provided to the Wildlife Agencies for review within 6 months of the first acquisition of the land for a reserve. Reserve Management Plan should be completed within 12 month of acquisition of the first parcel in a reserve unit. Reserve units are defined as groups of contiguous or neighboring parcels that have similar natural communities, covered species, and infrastructure. This time period will provide an opportunity to conduct thorough inventories of the site's resources over at least one full set of seasons or one year. It will also provide the time necessary to seek review and advice from the Wildlife Agencies and other parties, including the public. Management plans will be developed in cooperation with land management agencies, resource agencies, and current grazing lessees, if any. If a property has an existing reserve management plan, that plan shall be amend or a new plan created management plan. The PCA will cover the costs of amending or creating a new management plan.

As additional lands are added to the reserve unit, policies, goals, and management actions for the existing area may, if appropriate, be applied to the area of expansion. If conditions on the additional lands warrant, the management plan will be revised to reflect new management methods that may become necessary. Until management plans are developed and formally approved, reserve lands will be managed in the interim to maintain and improve habitats for covered species in accordance with the best available information and management methods currently being used in the Plan area or in other established PCCP reserves. Until a reserve management plan is prepared, management regimes that existed prior to acquisition will continue until it can be shown through management on other PCCP reserves or elsewhere in the Plan area, pilot studies, experimentation, or other relevant studies that changing management will benefit natural communities or covered species.

Management plans will be modified periodically as appropriate pursuant to the PCCP's adaptive management program (Chapter 7) to respond to changing conditions in the reserve areas and new scientific information. The PCA will formally review and, where appropriate, systematically revise reserve management plans at least every five years. This review should be based on an evaluation of the success of management methods (i.e., knowledge gained through the monitoring and adaptive management program) in achieving objectives of the reserve, as well as on results of other outside research.

Reserve management plans must be prepared in collaboration with the Wildlife Agencies and approved by the Permittees and the Wildlife Agencies. The Wildlife Agencies will review all draft reserve management plans and provide comments to the PCA within 60 days of receipt of these documents. The Wildlife Agencies will notify the PCA in writing once their comments have been incorporated to their satisfaction, thus constituting approval of the management plan. These deadlines are established to ensure the timely review and comment on the management plans by Wildlife Agency staff and to enable the PCA to implement conservation actions as soon as possible. If comments are received from the Wildlife Agencies after 60 days, the PCA will incorporate their comments to the best of its ability in the next update of the management plan.

Land management on new reserves must not wait until adoption of the first reserve management plan. Until the first reserve management plan is approved, land management will occur according to the guidelines in this chapter and best scientific practices. The conservation actions in sections 5.3 and 5.4 below describe the objectives, principles, and management actions to be implemented on reserves.

As applicable to each reserve unit, reserve management plans should include the following types of information.

Objectives of the Conservation Area

Each reserve plan will clearly identify the biological objectives for the reserve unit. Biological objectives for each reserve unit will be a subset of the PCCP's biological goals and objectives (Tables 5-4 and 5-5). Each reserve management plan will also identify the conservation actions applicable to the reserve (see below).

Vegetation Management

Habitat management will be a critical function within all reserves, and ensuring appropriate habitat management will be an important task for PCA and the management plan. As part of the objectives for each reserve, each reserve management plan will describe reserve-specific objectives for the following goals.

- Reduce the abundance and distribution of invasive plants.

- Increase or maintain the abundance and distribution of covered plants (where applicable) and native vegetation.

- As indicated by pre-acquisition assessments and targeted studies and informed by the monitoring and adaptive management program, manage vegetation to reduce the fuel load on the reserve so that the risk to biological resources from catastrophic wildfire is at an acceptable level and the risk to adjacent urban areas is minimized (meeting all state and local requirements). The development of reserve-specific fuel management plans will be guided by the Guidelines for Wildfire Management on Reserves (Appendix E). The methods and intensity of fuel management will vary depending on natural community type (e.g., oak woodlands vs. vernal pool grasslands), the amount of fuel occurring at time of acquisition, the location of the reserve relative to human populations and structures, emergency vehicle access and other factors.

- Minimize the impacts of vegetation management techniques on native biological diversity and covered species. Some impacts on covered species from vegetation management are expected and are included in the take allowances provided in this Plan.

For each biological objective, the reserve management plan will describe the management actions necessary to achieve the community and species-level biological goals and objectives, as outlined in Table 5-5 and described below in Sections 5.3, Conservation Actions, and Section5.4, Benefits of Conservation Actions for Covered Species. Management activities may include: control of water supply and availability; suitable agricultural practices (see below); livestock grazing or mowing programs to reduce cover of nonnative vegetation; application of herbicides (e.g., spot spraying) to control invasive species; erosion control; enhancement of native plant communities; habitat enhancement activities for the covered species (e.g., construction of artificial burrows for western burrowing owl); control of nonnative predators; enhanced ditch and drain management for ditches on reserve lands; and coordination of any research conducted within reserves with outside species experts and other individuals and groups. Management activities will be conducted so as to minimize the potential for the management activities benefiting one covered species to adversely affect another. However, in some cases, management for one or more species will adversely affect other species and given overall goals and objectives of the Plan may sometimes be necessary.

Management of Invasive Species

Each reserve management plan will include a section on management of invasive species. This section should incorporate management tools for controlling and, if possible, eradicating invasive plants and animals. An Invasive Species Control Program will be developed for the Reserve System as a whole (see Section 5.3.2 below) and applicable elements of this system-wide program will be incorporated into each reserve

management plan. Actions to control invasive plants and animals that are described in Section 5.3.2 will also be incorporated as relevant into individual reserve management plans.

Fire Management

Each reserve management plan will include a section on fire management. This section will be based on the system-wide fire management plan for the Reserve System, to be developed using guidance from the Guidelines for Wildfire Management on Reserves (Appendix E). The fire management section of each reserve management plan will include implementation of minimum impact suppression techniques where feasible. The plans will also include the following elements specific to each reserve:

- A map of fire access roads and gates;
- Identification of fuel-load management methods and criteria for their application;
- Criteria and procedures for use of prescribed fire for management purposes;
- A description of fire-suppression criteria, procedures, resources, and responsibilities, including criteria for selecting fire-fighting water sources; and
- A discussion of restoration and rehabilitation of vegetation following a fire.
- Fuel management activities should be designed to reduce or eliminate impacts to nesting birds.

Fire is an important natural component of local ecosystems. Therefore, some wildfires should be allowed to burn naturally to provide periodic disturbances that will benefit natural communities and covered species, if feasible, within the larger land-use context. The fire management plan must include a clear decision system to determine when a wildfire will be left to burn and when it must be partially or wholly contained to prevent damage to structures, prevent injuries, or cause excessive disturbance to natural communities.

Fire management plans, to the extent practicable, must be consistent with achieving the biological objectives of the reserve. Reserve fire management plans will be coordinated with the California Department of Forestry and Fire Protection (Cal-Fire) and any other firefighting agency that has responsibility for Reserve System lands. Copies of all fire plans, including maps of access roads and gates, will be provided to all firefighting units. Additionally, the plans may include prescribed burn guidelines for management of fire-dependent natural systems. This would include coordination with other land management entities to assure adequate availability of burn permits from the Placer County Air Pollution

Control District. Any proposed burning as part of the Plan is required to meet the District's current Regulation 3: Open Burning.

The development of the fire management plan will include, based on the location of existing access roads and gates, an assessment of the need to develop additional fire access roads sited to minimize impacts on sensitive species and communities and to minimize the need for new access roads (which could affect sensitive species and communities) to be constructed under emergency conditions (i.e., during fires). Preserve managers are required to coordinate with fire services to identify restoration and/or enhancement sites so they can be avoid.

Maintenance of Infrastructure

Each reserve management plan will include a map showing the location of existing infrastructure, such as roads, firebreaks, fences, gates, pumps, wells, water control structures, ditches, canals, drains, powerlines and buildings. The management plan will include a schedule for inspecting infrastructure to determine the need for maintenance. Work needed to maintain infrastructure (e.g., firebreaks, fences) will be conducted as soon as practicable needs have been identified. The management plan will also identify periods during which maintenance activities should be conducted to avoid or minimize adverse affects on natural communities and covered species. Each reserve management plan will include a hazardous materials management/spill prevention plan that will identify procedures that must be followed if hazardous materials are encountered or a spill occurs on the reserve.

Monitoring

Each reserve management plan will describe monitoring schedules and reporting requirements, applicable to the individual reserve. The monitoring element of reserve management plans will tier from, and supplement the overall system-wide monitoring plan. Reserve management plans will also describe how monitoring will be coordinated with monitoring conducted elsewhere in the Reserve System and on other public lands in the Plan area. Examples of the types of monitoring that will be required, as applicable to each reserve area, are described in Chapter 7, Monitoring and Adaptive Management Program.

Adaptive Management

Each reserve management plan will include a specific adaptive management approach that will tier from and supplement the overall adaptive management program for the PCCP (see Chapter 7). The adaptive management section of the reserve management plan will include a description of how the results from monitoring will be used to adjust management of the reserve within the decision-making structure of the adaptive management process.

Recreational Use

Each reserve management plan will incorporate applicable elements of a system-wide recreation plan. The recreation plan will be developed by

the PCA and will be implemented for all new land acquired in fee title or conservation easements for the Reserve System. This plan will address lands that are acquired for the Reserve System where the PCA determines based on recommendations of the Wildlife Agencies and Science Advisory Group that recreational and educational uses are compatible with the preservation and enhancement of natural communities, covered species, and biological diversity. Among other prescriptions, the recreation management plan will restrict recreation and access to biologically sensitive areas and any area of specific concern.

Reserve Management Plans for Reserves That Include Agricultural Lands

Reserve management plans will be prepared by the PCA for reserves that include cultivated agriculture or irrigated pasture to ensure compatibility with habitat management goals. In western Placer County, agricultural land is an important component of open space and retains value for covered species when managed properly. For example, properly managed grazing can enhance vernal pool grasslands, rice production can provide valuable benefits to waterfowl and other wildlife, and agricultural lands can support a prey base for covered raptors such as Swainson's hawk and western burrowing owl. Agricultural land can also provide open-space corridors for movement of wildlife between habitats on reserves, particularly through vegetated buffer strips and riparian habitats.

If agricultural parcels are acquired that will be completely restored to natural land-cover types and agricultural operations will cease, a reserve management plan will be prepared according to the requirements described above for reserves that do not support cultivated agriculture or irrigated pasture.

Agricultural lands owned in fee title by the PCA may continue in agriculture use under lease to farmers where that use is consistent with the biological goals for the site. Some agricultural lands will be protected under conservation easements; in these cases, the PCA will prepare the management plans in cooperation with the landowner that are consistent with the terms of the conservation easement.

The reserve management plan for agricultural lands will describe the agricultural practices that will be undertaken to ensure the land's compatibility with the PCCP. The management plan will also include limitations on permitted practices to reduce adverse effects of some practices on covered and other native species. Habitat maintenance and enhancement measures required in agricultural management plans will be compatible with maintaining the ongoing economic viability of agricultural use.

Reserve management plans on agricultural lands are necessary to provide sufficient enforceable terms in agricultural lease agreements and

conservation easement agreements to ensure that preserved agricultural lands will be managed in a manner that will achieve biological objectives and meet permit terms and conditions (e.g., monitoring requirements). These plans will describe the agricultural practices that will be undertaken to ensure the land's suitability as habitat for covered species or as an upland buffer adjacent to riparian land-cover. Site-specific conservation actions designed to maintain and enhance habitat for western burrowing owl, tricolored blackbird, Swainson's hawk, or other native species will also be documented in the reserve management plan. Reserve management plans for reserves with agricultural land will include the components listed below.

- An inventory of the conservation values of the site at the time the easement is enacted or land acquired in fee title, including habitat values for relevant covered species.
- A schedule of major farming activities (e.g., tiling, planting, harvesting).
- A description of allowable crop types and locations farmed.
- A description of allowable crop rotation patterns.
- A description of grazing rotation regimen, including rotational interior fencing regimes (e.g., timing, density and types of stock etc.). If necessary, establish residual dray matter standards.
- A description of how roads and field margins will be maintained and who will be responsible for this maintenance.
- A list of herbicides and pesticides that may be applied and a schedule for application.
- A description of provisions for compliance inspections, including access and landowner notification.
- Specific measures to maintain and enhance habitat for covered species through avoidance, minimization, and enhancement.
- Provisions for adaptive management and monitoring consistent with Chapter 7.
- It is assumed that there will not be public access to agricultural reserve lands, although access on a site-specific basis may be allowed.

Reserve management plans for reserves with agricultural lands must be completed by the PCA as soon as reasonably possible but will be provided to the Wildlife Agencies for review within 6 months of acquiring the agricultural parcel or of placing a conservation easement on the

parcel. Reserve Management Plan should be completed within 12 month of acquisition of the land for that reserve. The key elements of the reserve management plan (e.g., conservation goals and standards) will be negotiated with the landowner and included in the conservation easement when this form of ownership interest is acquired. The management plan will include details on the techniques and tools that will be used to achieve these goals. See Chapter 8 for the required elements of these easements, including the prohibitions on uses that would degrade the conservation value of the easement land. Preparation of agricultural management plans will include opportunities for public review and comments.

5.6 Benefits of Conservation Actions for Covered Natural Communities

The following sections introduce the general principles of natural community management and describe conservation and management guidelines for each major natural community type represented in the Plan area.

- Grassland and Vernal Pool Complex
- Oak Woodland
- Riverine and Riparian
- Wetland and Open Water
- Agricultural Land

Each natural community discussion presents:

- **Biological Goals and Objectives:** A summary of the biological goals and objectives for that community, including covered species habitat.
- **Acquisition, Restoration, and Enhancement:** A summary of the acquisition, restoration, and enhancement requirements as they apply to that landscape or natural community.
- **Management Techniques and Tools:** Guidelines and specific techniques and tools that are recommended to achieve the biological goals and objectives.
- **Threats and Uncertainties:** Describes the uncertainties associated with the conservation actions and external threats that may make their successful application more difficult.

5.6.1 Natural Community Conservation and Management – General Principles

Restoration and Enhancement of Natural Communities

A primary goal of the PCCP reserve system is to establish self-sustaining natural communities capable of supporting the covered. It is expected that many of the lands purchased for the reserve system will be disturbed to some degree or previously used for other purposes and will require restoration or enhancement. Restoration and enhancement programs will therefore play an important role in developing native plant and animal communities on PCCP reserve lands.

The management plan for each reserve or block of reserves will identify specific restoration and enhancement needs; discuss the expected costs of such restoration, and describe the timing of implementation. In this PCCP, the techniques for enhancement and restoration are articulated as conservation actions and are summarized in each natural community section below. Activities could include:

Restoring Natural Drainage Patterns/Erosion Control. Restoring the natural drainage pattern of a reserve unit, whether it is to prevent unnatural ponding, to restore natural ponding, or to channel runoff to appropriate areas. For example, it is important to provide drainage patterns and moisture regimes suitable for vernal pool grassland species. In addition, the growth of exotic plant species and erosion may be deterred by the restoration of natural moisture regimes.

Exotic/Invasive Plant Control. Invasive, nonnative plant species can dominate natural communities such as grasslands. Grazing, and to a lesser extent, where necessary, fire, manual removal, and herbicides will be used to control invasive plant populations. If necessary, integrated pest management programs for exotic or other plants will be implemented in consultation with the County Agricultural Commissioner's offices or other suitable experts (e.g., if exotic or invasive plant species threaten native plant communities) and as covered by the reserve management plan prepared for the reserve.

Native and Nonnative, Invasive Animal Control. Native and nonnative invasive animals can eliminate or severely reduce the populations of covered species through direct predation or competitive exclusion. Many species of native amphibians, for example, cannot coexist in wetlands with bullfrogs. The PCA will develop an invasive animal control program for management on Reserve System lands. Techniques to control nonnative, invasive animals will be developed within an adaptive management framework, but will generally involve targeted trapping to minimize harm to native species.

Domestic/Feral Animal Control. In some portions of the Plan area, wild cats and dogs are a real threat to covered species including spadefoot toads, western burrowing owls and other birds. If cats or dogs are already established in reserve areas, it may be necessary to control them.

Replanting/Revegetation. Replanting and revegetation will be a major component of reserve system management as there may be areas that have been previously disturbed and require revegetation. Areas where exotic plants are removed may need to be revegetated with native plants. Planting specific nest trees or shrubs for covered bird species may be warranted on certain reserves. Replanted or revegetated areas should be protected immediately from invasive species and/or agricultural practices that could damage these areas. Caging of individual plants and/or fencing of replanted or revegetated areas are recommended.
Establishment of New Covered Species Populations. Deliberate establishment of covered species is typically only done with explicit authorization from the wildlife agencies. However, reserve sites will be managed such that appropriate habitat is maintained or restored to encourage or attract occupation by covered species.

Removal of Structures, Roads and other infrastructure. Old, dilapidated or unused structures, roads or other abandoned infrastructure on reserve sites should be removed and the land will be restored to appropriate habitat for the covered species. If mining infrastructure (i.e. shaft or adits) are present they shall be secured (i.e. capped).

5.6.2 Grassland and Vernal Pool Grassland Complex Conservation and Management – Valley

Biological Goal and Objectives

The main goal for conservation and management of grasslands and vernal pool grassland complexes is to protect, restore (and create, in limited circumstances), and enhance grasslands and vernal pools (including seasonal wetlands) in functional vernal pool grassland complexes. This includes protecting and where necessary, restoring the hydrological processes that sustains the complexes.

The following objectives are designed to achieve this goal:

- Protect grasslands, pasture, and vernal pool complexes in large, blocks upwards of 1000 acres to support hydrological and ecosystem function, representative biodiversity, and covered species within the Reserve System. The present pattern of roads and drainages in the Valley creates parcels in the size range of 80 to 320 acres, but an

assembly of neighboring parcels can function as a contiguous block with proper management. Large, contiguous tracts are also more efficiently managed as a unit, rather than individual, isolated preserves. Protect contiguous tracts of grasslands and other upland habitats surrounding vernal pool complexes to protect hydrological (e.g., surface and sub-surface flows) and ecological processes (e.g., movement of species such as western spadefoot toad and pollinators between habitats) necessary to sustain viable vernal pool ecosystems as part of the Reserve System within the Plan area.

- Enhance individual vernal pools and vernal pool complexes by promoting regeneration and recruitment of representative native species.
- Protect and where necessary, enhance hydrological and other natural processes to support native biodiversity and populations of covered species.
- Enhance grasslands and pasture to promote native biodiversity and populations of covered species within the Reserve System.
- Restore vernal pool complexes on lands that once supported vernal pools.

Information included in Appendix Q and R will be used to direct, in part, vernal pool conservation and management (EcoAnalysts 2009a; 2009b).

Acquisition, Restoration, Creation, and Enhancement

Acquisition

The PCA will acquire grasslands and vernal pool complexes throughout the RAA, and will seek acquisitions in areas that will expand the size of existing reserves and/or provide linkages to other reserves within the Plan area or protected natural communities beyond the Plan area (Figure 5-1).

In addition, the PCA will prioritize vernal pool acquisition based on whether properties occur within USFWS Vernal Pool Critical Habitat for vernal pool fairy shrimp and USFWS Vernal Pool Recovery Core Area (not to be confused with the PCCP core areas in Figure 5-1), particularly where critical habitat and core areas fall within the RAA. (The Western Placer County core area comprises 36,260 acres, all in the Plan area, including 2,580 acres of critical habitat designated for vernal pool fairy shrimp. Sixty percent of the critical habitat and 45 percent of the core habitat are in the PFG [with the balance of the total in the RAA]). Focusing acquisition of critical habitat and core areas in the RAA (as opposed to PFG) will help to separate future vernal pool reserves from

urban/suburban development and associated secondary impacts (e.g., runoff, spread of invasive species, light and noise pollution).

Sites that support occurrences of large populations of covered species or rare occurrences (e.g., Conservancy fairy shrimp, which currently has one known occurrence in the Plan area) will also be prioritized for acquisition. The PCA will also work to protect and restore vernal pools with a diversity of characteristics (e.g., size, depth, inundation period, etc.) to ensure provision of habitat for all covered species. Areas acquired to protect vernal pools and vernal pool grassland complexes in the Reserve System will meet or exceed the following criteria:

- In general, the minimum area for an acquisition of a vernal pool complex is 200 acres if the area is not contiguous with other reserve lands or within the Stream System. The area may consist of one or more properties.

- There is no minimum size for acquiring or incorporating areas that are adjacent to other reserve lands or Stream System.

- There is no minimum size for acquiring or incorporating vernal pools that occur on Mehrten Formations. Mehrten vernal pools will only be excluded from consideration if existing or future hydrologic, land use, or other characteristics threaten long-term viability.

- Areas to be acquired or incorporated will have on-site and off-site hydrological conditions that ensure that vernal pool resources can be protected in perpetuity. Off-site hydrological conditions that detrimentally impact vernal pools on the site to be acquired must be restored before preservation credits can be allotted.

- No outfall or similar storm drainage facility can be directed to, or constructed within, areas to be acquired for protection of vernal pool complexes unless such facilities are directed to intermittent or perennial streams or storm drainage facilities and where such discharges do not affect the hydrology of protected vernal pools and swales. The purpose of this stipulation is to avoid inundation of vernal pools beyond the natural hydro-period.

- Lands acquired to protect vernal pool complexes must be able to allow grazing, or other suitable means to control invasive species and to ensure ecological integrity. Such methods may not be compatible on reserves imbedded within an urban/suburban matrix.

- The interface between urban/suburban land uses and reserve lands should be minimized to decrease edge effects, as described in General Condition 1 (see Chapter 6). An acceptable boundary interface ratio between urban/suburban and reserve lands is to be developed to ensure that incompatible land uses and indirect effects are minimized.

- To minimize edge effects from adjacent urban and suburban land, vernal pool wetlands or swales located within the reserve should be no closer than 250 feet from in the PFG area or located such that adequate hydrology can be maintained in the event of future development.

The PCA will consider acquisition for subsequent restoration of previously disturbed vernal pool complexes based on whether restoration is likely to increase vernal pool density (as measured in wetted-per-total acre) without exceeding the density present in 1937 aerial photos or other information approved by USFWS and/or CDFG and without harming existing vernal pool or upland habitat. Additional criteria will include whether or not sites occur outside of the Stream System, historically supported vernal pools (based on 1937 and 1938 aerial photos or other information approved by USFWS and/or CDFG), have hydrological conditions that ensure vernal pool complexes can be restored and protected in perpetuity, and have not been laser-leveled for agriculture or other uses.

In addition, the PCA will emphasize the acquisition (and subsequent enhancement) of contiguous tracts of grassland, pasture, and non-vernal pool wetland habitats that surround vernal pool complexes based on whether such tracts protect hydrological processes (e.g., surface and sub-surface flows), protect ecological processes (e.g., movement of species such as western spadefoot toad and pollinators between habitats), or buffer covered vernal pool species from human-caused disturbance. Such tracts may contain fresh emergent and seasonal wetland, valley foothill riparian, oak woodland, annual grassland, and pasture. Agricultural land-cover types such as irrigated pasture may be acquired and vernal pools restored to provide upland habitat suitable for buffering vernal pool complexes.

Restoration and Creation

Vernal pool complexes have been degraded in western Placer County and throughout their range by direct disturbance, invasion of nonnative species, or by alteration of hydrological patterns. For many complexes, habitat restoration may be necessary to regain proper functioning of a vernal pool ecosystem (USFWS 2005). Furthermore, vernal pools will be restored and created to provide compensatory mitigation for take of vernal pools and to ensure no net loss of wetted area. Vernal pool restoration is the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural and historic functions to a former or degraded vernal pool (U.S. Environmental Protection Agency 2005, as cited in USFWS 2005).

To restore vernal pool habitat, the PCA will use nearby, natural, high-quality pools as models for the development of each vernal pool complex restoration plan. In doing so, the PCA will consider the natural geographic, topographic and edaphic characteristics of the site where the pool or complex is to be restored (USFWS 2005). Each restoration plan

will consider the size and depth of pools to be constructed, hydrologic connections within complexes, depth from soil surface to hardpan, and upland area to pool-area ratios (USFWS 2005). Research may be necessary to help define an appropriate relationship between uplands and vernal pools to maximize habitat quality and recovery potential for covered species (USFWS 2005). Clearly defined objectives will be identified for all restoration projects. Success criteria will be established before each restoration plan is implemented; however, objectives and success criteria will be modified and improved as new information becomes available through the monitoring and adaptive management program (see Chapter 7). A methodology for assessing the success of vernal pool restoration efforts has been developed for the PCCP by Christopher Rogers of EcoAnalysts, Inc. (Appendix Q, Placer County Vernal Pool Functionality Assessment Method). This methodology provides a quantitative method for monitoring the health and functionality of restored (and otherwise managed) vernal pools, and will be used by the PCA to guide the development of success criteria and a program to monitor the status of restored and managed vernal pools on the Reserve System.

For each restoration plan, the PCA will coordinate with the Wildlife Agencies to develop a list of site-specific aspects of vernal pool grassland complex that need to be restored. The PCA will also coordinate with the Wildlife Agencies to ensure that scientifically-based and site-specific restoration methods are implemented while restoring the hydrological and ecological processes in the vernal pool and upland habitats of each site.

Monitoring of restored and created vernal pools in the Plan area indicates that future restoration in the Plan area has a high potential for success. In Placer County, more than 100 vernal pools have been restored or constructed by A. Teichert & Son at their site near Lincoln. Pools restored and constructed in 1996 and 1997 have been monitored using the methods In Appendix Q. By the end of the 2008 monitoring period, restored and created pools had met or exceeded success criteria, and even exceeded reference pools in some measures of success (EcoAnalysts 2009 – Appendix R). These vernal pools and others restored regionally (e.g., USFWS has restored vernal pools in Colusa and Llano Seco in the Sacramento USFWS Wildlife Refuge (Silveira 2007)) may be used to inform vernal pool restoration in the Reserve System. Restoration techniques will be based on review of existing mechanisms and the ecological literature. They may include:

- Restoring vernal pool topography;
- Restoring vernal pool isolation from permanent (or longer-term) water sources;
- Re-introducing vernal pool cysts, seeds, and/or plants, where necessary;

- Restoring water quality; and
- Removing non-native, invasive, and non-vernal pool native species.

Restoring upland habitat may include small-scale planting and seeding of native forb and grass species into vernal pool grassland complexes and adjacent uplands to restore remnant patches of native vegetation and habitats for populations of pollinators. The majority of management actions in grasslands fall under the category of habitat enhancement and are described below.

In certain cases, creation of vernal pools may be necessary to mitigate for lost resources. Vernal pool creation is the construction of a vernal pool in an area that was not a vernal pool in the recent past (within the last 100 to 200 years) and that is isolated from existing vernal pools (U.S. Environmental Protection Agency 2005). Little data exist to assess the long-term success of the creation of vernal pools. Preliminary results indicate that some created vernal pools have vernal pool fairy shrimp, vernal pool tadpole shrimp and other invertebrates and plants native to vernal pools (De Weese 1998; EcoAnalysts 2009). Creation of vernal pools within a vernal pool complex of existing pools is not recommended by the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005) because it may alter the hydrology of the existing pool system and may have an adverse effect on ground-nesting bees and other upland plant and animal species. Therefore, the PCA will minimize the use of vernal pool creation as a strategy to mitigate for lost resources. Rather, conservation efforts will focus on preservation and enhancement of existing high quality vernal pools, with restoration serving to supplement preservation to protect and restore vernal pool complexes at the levels of the landscape and local watershed and to mitigate for resources lost to covered activities. Creation of vernal pools, when necessary, must be approved by the Wildlife Agencies to receive credit for mitigation and land acquisition.

Enhancement

Although enhancement actions for each preserve will be determined on a case-by-case basis, they will be conducted to ameliorate the specific threats that occur on each site. As described in Chapter 3, specific threats to vernal pool grasslands include: modification to the duration of inundation and hydroperiod due to changes in the hydrology of surface flows and perched groundwater flows; non-native vegetation (including annual grasses and noxious weeds); impacts from recreational use; impacts to water quality; non-native predators; and decreased pollination and dispersal of vernal pool species due to impacts to vernal pool uplands. Therefore, actions for maintaining and enhancing preserves with vernal pool grasslands will likely include:

- Enhancing vernal pool topography and hydrology;

- Managing recreational use on Reserves (see General Condition 9, Chapter 6, and Section 5.2.5, Reserve Management Plans); and
- Managing non-native plants.

Specific threats to grasslands include the loss of remnant patches of native grasses and loss of native forb diversity in annual grasslands. Therefore, actions for maintaining and enhancing grasslands will likely include enhancing remnant populations of native forbs grasses.

The PCA will implement grazing, disking, controlled burns (where feasible within the land-use context of the landscape), and other grassland management practices on a rotational basis to allow patches to grow to middle-height and to create a diversity of grassland structural types within the landscape to benefit grassland species with different microhabitat requirements.

Management Techniques and Tools

Specific management methods, restoration techniques, and monitoring techniques needed to enhance habitats and ensure threats are ameliorated or eliminated cannot be adequately defined until conditions are assessed on the ground (USFWS 2005). Furthermore, most methods, expected outcomes, and monitoring techniques are not yet fully researched or tested (USFWS 2005). Specific management regimes will likely need to be tailored to site-specific conditions because threats and specific environmental conditions vary among geographic areas and species (USFWS 2005). The current strategy is to base management on existing information, including knowledge of historic management regimes and observed outcomes of ongoing management, but also to incorporate new information resulting from research and monitoring (USFWS 2005).

Priorities for enhancement actions for specific sites, and the tools and techniques for implementing each action, will be identified in reserve management plans based on the specific threats that occur at each site. Management efforts will be monitored and management tools and techniques will be refined within an adaptive management framework. The following is a discussion of the tools and techniques that are currently available for implementing the enhancement and restoration actions that are described above.

Restoration of Vernal Pool Topography

The main method for restoring vernal pool topography is to reconstruct the characteristic depth from the overlying soil surface to the impermeable layer beneath (USFWS 2005). Techniques for restoring vernal pool topography typically include mechanical recontouring, excavating, grading, and compacting soil of vernal pools. Restoring vernal pool topography within areas that were once used for agriculture may include ceasing tillage and irrigation practices, removing silt

accumulated from agricultural use, and repairing damage caused by agricultural vehicles. In some cases, restoration may involve removing ditches, raised roads, trails, and other barriers to restore surface flow.

Techniques for enhancing vernal pool topography will likely include repairing damage from agriculture, off-road vehicle use, and social trails. Most often, such small-scale enhancement can be accomplished through the use of hand tools.

Restoration of Vernal Pool Isolation

In some cases, vernal pools may be connected to permanent (or more long-term) sources of water through human-caused alterations to the landscape, which can adversely modify vernal pool hydroperiod. In these cases, vernal pools may need to be isolated from permanent water sources to restore seasonal inundation. However, before water is diverted from pools, a full evaluation of existing conditions must be conducted (e.g., current extent of hydroperiod; ability to maintain suitable hydroperiod should isolation be restored) to assess which species could benefit from diversion, and which species could be negatively impacted. Vernal pool hydrology has been dramatically modified in many places through the addition of roads, culverts, berms, etc., and the species that inhabit those pools are adapted to that condition. Therefore, restoring hydroperiod or drainage patterns could have negative consequences for the species in those pools. In some cases, run off from roads and impediments to drainage can create good habitat for vernal pool species even though they would not have historically been there (Marty, pers. comm. 2011).

The main method for isolating vernal pools from permanent or other sources of water that alter hydroperiod is to divert runoff that originates from streams and/or agriculture such as rice from draining into vernal pools. Techniques may include constructing or repairing drainage ditches or retention basins, as well as rerouting existing drainage ditches. At the Sacramento National Wildlife Refuge, USFWS has plans to route drain water from adjacent rice fields on private lands around refuge vernal pools (Silveira 2007); this effort may be used as a model to inform potential run-off diversion projects in the Plan area.

Re-introduction of Vernal Pool Cysts, Seeds, and/or Plants

Restored vernal pools may naturally be colonized by vernal pool plants and invertebrates; however, if the restored habitat is too distant from natural functioning vernal pools (greater than 0.3 mile distant), restored pools may need to be inoculated with soil salvaged from vernal pools that would be affected by proposed projects near to restored pools or inoculum selected from nearby pools. Translocating species could disrupt local genetic structure of populations and community structure;

therefore, the PCA, in collaboration with the Wildlife Agencies and scientists, will develop guidelines for translocation to maximize probability for success and to minimize potential impacts. Guidelines should include, for example, a thorough assessment of plants and animals existing at the site and an evaluation of species that could benefit and be potentially negatively impacted by translocation. Should the PCA use translocations to restore populations of covered plants and invertebrates, the PCA will use small-scale pilot studies to evaluate potential impacts to inform translocation projects.

Should translocations be used as a restoration and enhancement tool, all inoculum must be collected dry, stored dry with access to air, and applied to the restored habitat during the dry season and in a dry condition. Seeds and cysts may be collected from pools by raking the soil of the donor site or collecting the seeds from plants with mature fruit. To increase seed quantity and to ensure correct identification, plants may be propagated in a nursery and then harvested for seed. Both annual and perennial plants are typically direct-seeded. However, perennial plants may sometimes be pre-germinated in a nursery. If accurate cyst identification is required, adult females (with cysts) may be collected from vernal pools directly. Cysts are typically re-introduced to new sites by spreading them on the ground before the vernal pools fill.

Vernal pool inoculum must come from specifically selected pools of similar size, depth, fetch, ponding duration and geomorphic surface as the restoration pools to be inoculated. No more than five percent of the surface area of a source pool should be taken, and the pool substrate must not be penetrated for inoculum deeper than 0.5 inch. There are no limits on the surface area to be removed from pools to be lost due to development; however, the inoculum should never be taken from greater than a 0.5 inch depth. All inoculum placed in restored vernal pools should be spread evenly and sparsely onto the restored vernal pool substrate to introduce vernal pool organisms.

To increase the diversity of forbs within vernal pool uplands and grasslands, the PCA may collect forb seeds from nearby reference sites and disperse the seeds by hand. It is sometimes desirable to disperse seeds onto gopher mounds, as the mounds provide suitable microhabitat for germination and growth (Weiss, personal communication).

Restoring and Enhancing Vernal Pool Water Quality

In some cases, polluted runoff may be impacting vernal pools. The main method for restoring vernal pool water quality is to divert polluted runoff. However, similar to restoring vernal pool isolation, altering drainage patterns could have negative consequences for the species in those pools. In some cases, run off from roads and impediments to drainage can create good habitat for vernal pool species even though they would not have historically been there (Marty, pers. comm. 2011). Therefore,

before water is diverted from pools, a full evaluation of existing conditions must be conducted (e.g., current extent of hydroperiod; ability to maintain suitable hydroperiod should polluted water be diverted) to assess which species could benefit from diversion, and which species could be negatively impacted.

Should polluted water sources be diverted, techniques for restoring vernal pool water quality may include using drainage ditches or retention basins to divert runoff that originates from surfaces such as roads, agriculture, or other urban hard-scapes. In addition, outfall or similar storm drainage facilities may be redirected or diverted. In some cases, roads and trails may be removed or converted to boardwalks.

As discussed below (under prescribed grazing), over-grazing can impact water quality. Techniques for reducing the impacts of grazing on water quality include reducing the number of livestock, removing livestock from vernal pool complexes during late spring (when livestock tend to congregate in pools to cool-off), providing stock ponds as supplements for vernal pools as drinking sources, and utilizing types of cattle that are less likely than others to congregate in and around pools.

Invasive Plant Control in Grasslands and Vernal Pool Complexes

Restoration of vernal pool topography from grasslands, pasture, and irrigated pasture may be followed by the removal of the agricultural seed-bank, which may include such pasture species as vetch and alfalfa. Although likely rare, the restoration of vernal pools may include the removal of non-native agricultural species, such as rice, or aggressive invasive native non-vernal pool species that are more typical of riparian and fresh emergent wetland communities.

Particularly invasive plants may need to be removed or controlled for vernal pool and grassland restoration. Aggressive, invasive species that occur in vernal pools include non-native *Crypsis schoenoides* (swamp grass), *Glyceria declinata* (mannagrass), *Lepidium latifolium* (broadleaved pepperweed), *Salsola* spp. (Russian thistle), *Centaurea solstitialis* (yellow star-thistle), *Convolvulus arvensis* (bindweed), non-native *Hordeum* spp. (barley), *Medicago polymorpha* (California burclover), *Taeniatherum caput-medusae* (medusahead), small quaking grass (*Briza minor*), soft chess (*Bromus hordeaceus*), lesser hawkbit (*Leontodon taraxacoides*), hyssop loosestrife (*Lythrum hyssopifolium*), and aggressive invasive native species such as *Xanthium strumarium* (cocklebur) and *Phyla nodiflora* (lippia), (USFWS 2005; JSA 2004). *Lolium multiflorum*, (Italian ryegrass), in particular, should be controlled to protect vernal pools (USFWS 2005). Non-native plant species that tend to displace legenere include mannagrass and lippia (Holland 1983; CNDDB 2010).

Noxious weeds that occur in annual grasslands of western Placer County include yellow star-thistle, Italian thistle (*Carduus pycnocephalus*), and medusa-head. Other invasive plants that may occur include barbed goatgrass (*Aegilops triuncialis*), tree-of-heaven (*Ailanthus altissima*), ripgut brome (Bromus diandrus), spotted knapweed (*Centaurea* spp.), artichoke thistle (*Cynara cardunculus*), broadleaved pepperweed, Italian ryegrass, Russian thistle, and puncture vine (*Tribulus terrestris*) (JSA 2004). Effective methods have not been developed to control many invasive species that occur in the vernal pool grasslands of the Plan area. Management techniques will be monitored and developed within an adaptive management framework to created effective control methods.

Techniques that may be used to remove or manage invasive, non-native, or non-vernal pool native plants may include grazing, limited controlled burning in combination with grazing, chemicals, tools, and hand-pulling (USFWS 2005). The approach may vary by site, depending on the potential effect on listed taxa in the area, local concerns such as air quality, costs (USFWS 2005) and potential impacts to covered species. Off-site or greenhouse trials may be conducted before the habitat of rare taxa is manipulated, and results from the research should be incorporated within management plans (USFWS 2005). When management actions to control invasive species and manage vegetation could impact nesting birds, such techniques will be use to minimize impacts to bird nesting.

Prescribed Grazing

Grazing will be the primary tool used to control invasive vegetation, maintain appropriate hydroperiods in vernal pools, and reduce wildfire fuels in vernal pool grassland complexes and annual grasslands. Grazing can be used to help protect remnant native grasslands from invasion by non-native annual grasses and invasive plants. Native bunchgrasses can tolerate and even thrive with light grazing and a low frequency of fire. Domestic grazing animals may provide ecological functions similar to those provided by native grazing animals (e.g., deer and pronghorn antelope) that formerly grazed the Central Valley in pre-European times. Low to moderate levels of grazing appear to benefit vernal pool complex ecosystems by reducing the cover and competition of nonnative annual grasses, resulting in higher diversity of native plants (Robins and Vollmar 2002, as cited in JSA 2004; Marty 2005).

In an experiment that compared grazed and ungrazed vernal pools, after three years of treatment, ungrazed pools had 88 percent higher cover of exotic annual grasses and 47 percent lower relative cover of native species than pools that were grazed year-round at rates of one animal unit (cow/calf pair) per 5.9 acres (Marty 2005; Pyke and Marty 2005). Release from grazing also reduced pool inundation period by 50 to 80 percent, making it difficult for some vernal-pool endemic species to complete their life cycle.

Although prescribed grazing may be beneficial for vernal pool management, overgrazing may adversely modify vernal pool water quality

through increased sedimentation and nutrient inputs, and is listed as a potential threat to some occurrences of vernal pool species (USFWS 2009, citing CNDDB 2007; C. Rogers pers. comm.). Because there is little information regarding optimal stocking rates (USFWS 2009), the existing or recent grazing regime used at the site (upon acquisition) should be continued unless monitoring indicates that an alternative grazing regime will be more beneficial to targeted species or desired ecosystem conditions. The PCA will interview the existing and/or past property owners to identify recent and historic grazing regimes in inform the development of a grazing management plan.

Because cattle are more likely to enter pools in the late spring to soak their hooves in the mud and escape the bites of the heel-fly on warm days, managers should consider removing cattle each year in early May to avoid excessive deposition of manure, as well as trampling of vernal pool plants and crustacean cysts (Griggs 2000).

Grazing in annual grasslands will also be used to reduce fuel loads (see Appendix E, Fuel Management). Large amounts of standing dead material can be found in late summer in years of abundant rainfall when grazing pressure has not been intense enough (Mayer and Laudenslayer 1988, as cited in JSA 2004). As in vernal pools, grazing will also be used to increase native forb diversity in annual grasslands by reducing competition from nonnative invasive species.

Prescribed Burning and Fire Management

Historically, fires in grasslands were caused by lightning strikes and human ignition. Periodic fire is an important influence on grasslands, as it helps to prevent succession to shrubby, woody community types. Prescribed burning as a tool to manage grasslands has been studied extensively in California and elsewhere (Harrison et al. 2003; Rice 2005). A review of existing literature in 2004 found that burning has mixed results depending on the starting condition of the ecosystem and on the timing and frequency of the burns (Rice 2005). Research indicates that for fire to successfully reduce nonnative and increase native plant cover, burns must be targeted toward the specific system and species conditions.

Prescribed burning may be used as a tool in limited circumstances in combination with grazing to manage nonnative vegetation in vernal pool grassland complexes. Prescribed burning may be used as a management tool if conditions indicate that prescribed burning will be beneficial to ecosystem function and when feasible within the larger land-use context (e.g., safety to human population and structures, air quality). Burning can increase native species richness and cover in all vernal pool zones (pool, edge and upland), though adding fire to a grazed vernal pool system does not effectively eradicate nonnative species across the board (Marty 2007). Furthermore, this effect is site-dependent and likely depends on productivity rates and grazing regime. Fire effects can be ephemeral, sometimes dissipating within three years (Marty 2007).

Should fire be considered as a management tool in vernal pool grassland complexes, the effects of prescribed burning on cover of native and invasive species, vernal pool hydroperiod, and other ecosystem functions will be assessed in a pilot study before being implemented as a management tool. If burns are implemented in the Reserve System as a management tool, considerations will include the blooming and seeding times of the targeted nonnative species, the history of site use, and the likely condition of the native soil seed bank. Fires should be conducted at a time when the seeds of the targeted invasive plants will be destroyed. Single burns are generally unsuccessful at restoring native diversity and cover to grasslands; multiple burns are usually required. If used, controlled burning will be used in conjunction with grazing or mowing to control infestations of invasive species. If native vegetation on a site has been particularly denuded, supplementary seeding of native species may be required.

Visitor-use Management

Many vernal pool wetlands are used for “mud bogging” where off road vehicles are driven around and through a pool. This activity typically causes great mechanical damage to pool topography and causes direct mortality of organisms in the pool by crushing them or displacing them outside the pool. Strong steel gates and fence posts to prevent off road vehicle use may be required at specific sites to prevent this activity.

Access to reserves will be restricted to a well-designed system of entry and exit (see Section 5.2.5, Land Management on Reserves, and Chapter 6, Section 6.11.1, General Condition 9, Prepare and Implement Recreation Plans, for discussion of recreation on reserves). The Reserve System will protect against incursions into vernal pools by off-road vehicles, horses, bicycles, dumping, unauthorized hunting, and other prohibited activities through the use of signs, locating trails away from vernal pools, education, barriers, and if necessary, through law enforcement . Visitors will be restricted to trails and boardwalks. Management plans will be site-specific, but will include an access component to address the needs for parking, roads, fences, barriers, signs, trails, boardwalks, etc. In some cases, monitoring may be necessary along access points to prevent illegal access and use. Trespass and illegal use of reserves will be reduced by implementing General Condition 1, Reserve and Reserve Acquisition Area Interface Design (see Chapter 6), and by restricting recreation activities on the Reserve System to activities that have a minimal likelihood of impacting natural communities and covered species (see Chapter 6, General Condition 9, Prepare and Implement Recreation Plans).

Ground Squirrel Population Enhancement

Ground squirrel populations have been historically controlled to reduce damage to structures (e.g., levees) and agriculture. However, not all areas in the Plan area have historically supported ground squirrels, likely because suitable soil conditions are not available. Where California ground squirrels occur, they can play a key role in the grassland natural

community. For instance, ground squirrels create large burrow systems in grasslands. Such disturbance helps maintain plant species diversity. Ground squirrels also provide a prey base for raptors and mammals. In addition, their burrows provide nest sites for burrowing owls and refugia for covered amphibians. Historically, hunting and rodenticides have been used to control rodents and reduce conflicts with livestock. These practices may have decreased the populations of rodents, reducing prey availability for their predators.

To help restore ground squirrel populations to grassland ecosystems within the Reserve System, the PCA will minimize existing rodent control measures (e.g., poisoning, hunting, and trapping). Minimizing existing ground squirrel control measures may be sufficient to increase squirrel populations in some areas. However, some rodent control measures will likely remain necessary in certain areas where dense rodent populations may compromise important infrastructure (e.g., pond berms, road embankments, railroad beds, levees, dam faces). The use of rodenticides or other rodent control measures will be prohibited in reserves except as necessary to address adverse impacts on essential structures within or immediately adjacent to reserves.

Threats and Uncertainties

Although prescribed grazing may be beneficial for vernal pool and grassland management, overgrazing may adversely modify vernal pool water quality through increased sedimentation and nutrient inputs. Therefore, it will be necessary to determine appropriate stocking rates and seasonal enclosure times on a case-by-case basis and through an adaptive management framework for individual sites.

The success of vernal pool restoration and enhancement is partly dependent on rainfall rates. Rainfall rates can, in turn, be affected by periods of drought and long-term climate change.

Protection of existing pools and restoration are the preferred strategies for the conservation of vernal pools and associated covered species. However, in limited circumstances, vernal pools will be created to help to achieve the biological goals and objectives of the Plan. Creation is considered an experimental science, with the greatest potential for failure (when compared to protection and restoration). Creation of vernal pools within a vernal pool complex of existing pools can alter the hydrology of the existing pools and can have adverse effects on ground-nesting bees and other upland plants and animals (USFWS 2005). Therefore, vernal pools will only be created in areas where they will be isolated hydrologically from existing pools and when adequate amounts of surrounding upland habitat are protected.

5.6.3 Oak Woodland Conservation and Management

Biological Goals and Objectives

The main goal for conservation and management of oak woodlands on the Reserve System is to protect, maintain, and enhance functional oak woodlands that benefit covered species and promote native biodiversity. The following objectives are designed to achieve this goal:

- Protect a diversity of oak woodland land-cover types, when available for acquisition, to support biodiversity and covered species as part of the Reserve System within the Plan area.
- Enhance and restore oak woodlands on the Reserve System by promoting regeneration and recruitment of representative species and sustaining the natural processes and native species diversity found in these communities.
- Include minor habitats and small-patch ecosystems. Woodlands include small patches of foothill chaparral, cliff/rock outcrops seeps and other localized land-cover types. Although some land-cover types are more widely represented regionally, they are generally interspersed within oak woodlands in the Plan area and will be conserved in regional-scale reserves.

Acquisition, Restoration, and Enhancement

Acquisition

The PCA will undertake acquisition to expand the size of existing oak woodland reserves and to provide linkage to existing reserves within the Reserve System and/or to protected natural communities beyond the Plan area.

Restoration

The primary conservation strategy for oak woodlands is protection and enhancement, particularly enhancement of regeneration, of existing oak woodlands. Oak woodland restoration is considered an inferior alternative to acquisition or protection (through other means) of intact habitat. This assertion is based on two premises: 1) the ability to restore oak woodland (and many other habitats) is uncertain; there are probably as many failures as there are successes in this practice; and 2) the timeframe for realizing habitat benefits from restored oak woodlands is lengthy. Protecting existing habitat now is a much more pragmatic approach. Nevertheless, in certain cases restoration will be implemented,

primarily of valley oak woodlands. Restoration plays a more important role in the conservation strategy for valley oak woodland because this cover type has been extensively cleared for agriculture and development in the Central Valley (JSA 2004). Site-specific restoration plans will be developed within each reserve management plan. Restoration actions for each site will be considered on a case-by-case basis, but may include restoring valley oak woodlands and planting other species of oaks to facilitate regeneration and to restore connectivity between existing oak woodlands. It is anticipated that mitigation for impacts to individual oak trees (see Chapter 6, Section 6.5.3, Community Condition 3.3) will contribute to the restoration (e.g., through replanting) of oak woodlands.

Valley oak restoration will take place primarily in the Valley portion of the Plan area on deep, well-drained alluvial soils, often along river bottoms, while other oak woodlands (e.g., blue oak woodland) will be restored in the north foothills region of the Plan area.

The initial criterion for selecting sites to restore oak woodland is that the site is suitable for the community. That is, it formerly supported oak woodland, has soils, topographic, and hydrologic conditions that can sustain oak woodland and it has not been degraded to the extent that restoration is infeasible. Other criteria for site selection are based on the potential to achieve habitat benefits. For example, in cases where there are gaps in habitat connectivity, restoration of key parcels can eventually lead to substantial benefits. This would be particularly relevant to restoration of upland oak woodlands adjacent to valley foothill riparian woodland, to increase connectivity across upland and riparian habitats and to reduce forest fragmentation at the landscape-level. Other examples may include re-establishment of oaks in rangeland where oak clearing has occurred in the past.

Placer County, Caltrans, Placer Land Trust and other entities are already involved in the planning and implementation of restoration on conservation reserves along Coon Creek, Doty Ravine and in other locations. These projects not only contribute to creating connectivity and furthering objectives of the PCCP, but can provide case studies of appropriate restoration techniques.

Restoring sites may involve controlling non-native plants and animals, implementing progressive livestock management, and incorporating fire into management regimes. Natural regeneration and planted seedlings can be protected with seedling and sprout shelters. These techniques are discussed further below.

Oak Woodland Enhancement

Enhancement will occur in oak woodlands protected in the Reserve System, where appropriate. Specific management and enhancement guidelines will be developed within reserve management plans.

Management techniques are detailed in the "Management Techniques" section and generally include:

- Enhancing within-stand and stand-edge regeneration, especially for stands of valley oak and blue oak;
- Managing invasive plants and animals in the understory; and,
- Reducing fuel loads to reduce the chance of catastrophic wildfires.

Techniques for implementing these actions are discussed below.

Management Techniques and Tools

Various management techniques and tools will be used to enhance and restore oak woodlands on the Reserve System. Placer County's Oak Woodland Management Plan and Native Tree Mitigation Policy Report (2003) contain numerous suggestions for managing and protecting oak woodlands. The Interim County Guidelines for Evaluating Development Impacts on Oak Woodlands (2008), which apply to CEQA analysis for projects proposed in oak woodlands, also provide guidance for protecting oak woodlands before, during and after development occurs. Those documents are incorporated herein by reference.

As described in Chapter 3, lack of regeneration is a specific threat to the persistence of blue oak woodland and valley oak woodland in the Plan area. Therefore, techniques that are specifically designed to maintain and enhance regeneration are likely to be especially important for these land-cover types.

The main methods for restoring and enhancing valley oak and blue oak regeneration are to utilize artificial regeneration (e.g., planting) and to protect seedlings with shelters. Other methods include controlling non-native plants that compete with seedlings for resources, controlling non-native animals that feed on acorns, seedlings, and saplings, implementing progressive livestock management, and incorporating fire into management regimes.

Artificial Regeneration and Seedling/Sprout Shelters

In recent years, many techniques and protective devices have been developed that can enhance oak regeneration on small spatial scales (Brussard et al. 2004; McCreary 2001; McCreary 2005). Limited research suggests that shelters protect seedlings from damage from most animals, including livestock, and may be most important for individual trees less than six feet tall at grazed sites that are less than six feet tall (McCreary 2005). Careful selection of critical areas for this kind of "intensive care" management (Pavlik et al. 1998, 2000, 2001) is necessary to be cost-effective and ecologically meaningful. Selective protection of stump-sprouts after stands have been thinned for fuel management or wood

harvest is also critical (Brussard et al. 2004; Standiford and Tinnin 1996; McCreary 2001).

Prescribed Burning

As in grasslands, prescribed burning may be used as a management tool on reserves when conditions indicate that prescribed burning will be beneficial to ecosystem function and when feasible within the larger land-use context (e.g., safety to human population and structures). Prescribed burns will be applied in compliance with the system-wide fire management plan to be developed for the Reserve System (see Section 5.2.5, Land Management) and will adhere to General Condition 10, Wildfire Buffer and Wildfire Fuels Management (Chapter 6). This discussion here focuses on the use of prescribed burning to enhance regeneration. See the section on fuel load reduction, below, and Appendix F, Wildfire Management in Conservation Reserves, for further discussion of wildfire fuels management.

Frequent fires historically occurred in oak woodlands, and fire control has affected regeneration negatively in both valley and blue oak stands. Young trees of both species will sprout when damaged by fire, but older trees will not. Thus, frequent fires tend to maintain oak stands of younger age classes. In locations where other impacts such as agricultural clearing have not occurred, a century of fire control has resulted in the predominance of older trees. When these stands eventually burn, they may not regenerate themselves. Furthermore, the absence of frequent, non-catastrophic ground fires encourages the invasion of evergreen oaks, and their seedlings seem to be more browse resistant than those of deciduous oaks (Brussard et al. 2004).

Low-intensity ground fires may increase oak regeneration by improving soil conditions for oak establishment, reducing predation on acorns and seedlings, and removing invasive species that hinder seedling growth (Standiford and Tinnin 1996; CalPIF 2002; Brussard et al. 2004). The benefits are neither universal nor reliable, however (especially at low elevation grassland-oak woodland boundaries), and the optimal fire frequency for many woodland types has yet to be determined (Brussard et al. 2004; McCreary 2001). When oak regeneration, versus reducing the risk of wildfire, is the primary management goal, fire will be used sparingly (Fry 2008; Bartolome et al. 2002), as seedling mortality and top-kill are common during prescribed burns (Fry 2008). Fry (2008) suggests fire-free intervals of 10-14 years in order to allow saplings to grow tall enough to withstand browse pressure and subsequent fires.

Hunting and Trapping of Feral Animals

Non-native animals (e.g. feral pigs, wild turkey) can severely impact oak woodlands (Brussard et al. 2004, McCreary 2001, Sweitzer and Van Vuren 1998). Pigs spend a significant amount of time rooting beneath the soil surface in search of bulbs, acorns, earthworms and other invertebrates. Their high rate of consumption is a grave threat to oak regeneration because, if the opportunity arises, they will consume all

available oak acorns and seedlings (Ward 2009). Vegetation consumption by feral pigs also reduces availability of above ground vegetation, which provides critical cover for native wildlife. Mass consumption by feral pigs of acorns and seedlings can alter plant species composition and reduce species diversity. Feral pigs feed mostly on plant material and insects, although they will also prey on eggs and nestlings of ground nesting birds, small mammals, reptiles, and amphibians. Pig rooting and wallowing disturbs and loosens the soil surface and contributes to soil erosion. This behavior near streams and unpaved roads can increase sediment loads into nearby waterways and negatively affect water quality.

Feral pigs depend on permanent water sources and prefer oak woodlands because of the abundance of food. Existing Placer Land Trust reserves in the Big Hill and Bear River area have suffered significant damage from feral pigs (Ward 2009). Adjacent landowners have also voiced their concerns about the damage that pigs have inflicted on their properties (Ward 2009). The Placer Land Trust is currently working with the Department of Fish and Game (DFG), Placer County Wildlife Services, other agencies, community members, neighbors, and landowner partners to develop a strategy that will help reduce the negative effects of feral pig populations on Placer Land Trust preserves and neighboring lands. Existing depredation is occurring on PLT properties and adjacent lands with a cooperative agreement with DFG game wardens to trap and remove feral pigs. Planned management activities include a fall pig hunt with Department of Fish and Game in order to assess the viability of hunting as a component of land management. If successful, this hunting program may serve as a model for pig control in PCCP reserves. As an alternative, Henry W. Coe State Park in Santa Clara County has been operating a successful pig-trapping program for several years (Sweitzer and Loggins 2001), which could also be used as a model for pig control in Placer County.

Invasive Plant Removal and Management

Invasive, non-native plants in oak woodlands can be controlled on a large scale with grazing (see below) and disking and on a small scale with mowing, mulching, hoeing, or judicious use of herbicides (Brussard et al. 2004; McCreary 2001; Tu et al. 2001).

As described in Chapter 3, blue oak woodland is especially susceptible to high-intensity wildfires, partly due to years of fire suppression. Therefore, techniques that are specifically designed to decrease the risk of high-intensity wildfire are likely to be especially important for this woodland type.

Management of grasslands that comprise oak woodland savanna will be similar to that discussed for grasslands in the above vernal pool complex – grassland section.

Prescribed Grazing

Prescribed grazing can reduce the impacts of non-native plant species on oak regeneration (Brussard et al. 2004). The failure of valley oak regeneration seems to be related to competition for soil nutrients and moisture between oak seedlings and introduced annual plants. Invasive plants that occur in the area include Himalayan blackberry, yellow starthistle, barbed goatgrass, and medusahead rye. Invasive, non-native plants can be controlled on a large scale with prescribed grazing (Brussard et al. 2004; McCreary 2001; Tu et al. 2001).

Prescribed grazing can also reduce the impacts of native wildlife on oak regeneration. Tecklin et al. (2002) reported that moderate grazing (five weeks per year) decreases bark stripping and gridling damage from animals such as voles because grazing reduces the vole thatch habitat (Tecklin et al. 2002).

The techniques and timing of prescribed grazing not only determine its effectiveness, but also the extent of unintended damage to oak seedlings. Winter grazing is less damaging to seedlings than spring or summer grazing (Hall et al. 1992; Jackson et al. 1998; Brussard et al. 2004), especially in oak woodlands with deciduous oak species such as blue oak, presumably because deciduous seedlings are less palatable without their foliage (Hall 1992, McCreary and Tecklin 2005). Summer grazing is more damaging than winter and spring grazing because during the summer, oak seedlings are often the only green vegetation in the grazed pastures, and are therefore more palatable than the dry annual grasses (Hall 1992, cited in McCreary and Tecklin 2005). Within all seasons, total damage to seedlings increases with increasing stock density (Hall 1992, McCreary and Tecklin 2005).

Fuel Load Reduction

Techniques described here and in the report on “Wild Fire Guidelines in Conservation Reserves (2009) (Appendix E) prepared for the County by Richard Harris will be used to manage fuels in the Reserve System. Each reserve management plan will include a section on fire management that will discuss the fuel management methods and techniques to be used on reserves.

Prescribed grazing can reduce the risk of wildfire, as managed grazing is a very effective way to reduce ladder fuels and overall fuel loads (City of Rocklin 2009; Franklin et al. 2006, as cited in Fry 2008). Mechanical reduction of fuel loads can reduce the risk of wildfire; however, the techniques and timing of fuel load reduction can affect covered species, as well as the extent of unintended damage to oak seedlings and wildlife. For example, removal of downed and standing dead trees can destroy or eliminate essential habitat components for many important and often rare animal species (Brussard et al. 2004). Constant removal of these materials can lead to soil nutrient depletion, reduction in beneficial insect populations, and reduction in the numbers of small vertebrates (Tietje and Vreeland 1997; Brussard et al. 2004).

Threats and Uncertainties

Substantially reducing the feral pig population as well as managing the grazing rotation in the Reserve System are important long-term goals that will enhance oak woodlands by allowing for improved oak regeneration. In addition, while there is little known about the impact on oak regeneration from wild turkey, large population numbers could cause impacts. Adaptive management techniques should be used to address over-population of species that cause impacts to oak regeneration. To be successful, such an effort must also be promoted on private and public land adjacent to, but outside the Reserve System. Coordinating with Placer Land Trust, private land owners, and other land managers in the Plan area, will help to provide landscape-level control.

5.6.4 Riverine and Riparian Conservation and Management

Biological Goals and Objectives

The main goal for conservation and management of riverine and riparian communities is to improve the ecological health of riverine systems by protecting, enhancing, and restoring hydrologic and geomorphic processes to maintain functional aquatic and riparian communities that benefit covered species and promote native biodiversity.

The following objectives are designed to achieve this goal:

- Protect stream reaches within the Plan area to promote habitat function (i.e., water temperature and shade conditions suitable for covered fish), and movement of animals and plants (i.e., dispersal of seeds of riparian species) along riverine and riparian corridors that traverse the Plan area.
- Restore stream reaches that support covered fish, amphibians, and reptile species within the Reserve System to improve natural community function, connectivity, and water quality.
- Enhance stream reaches within the Reserve System to maintain and improve ecosystem functions and connectivity between habitats.
- Protect valley foothill riparian habitat within the Reserve System to promote habitat function within riparian and riverine habitats, and facilitate wildlife movement across the Plan area landscape.
- Restore valley foothill riparian habitat within the Reserve System to: connect fragmented riparian corridors; slow the movement of flood waters; allow the deposition of sediment to improve channel and bank formation processes; reduce sediment loading in river and stream

systems; and improve habitat for covered species, including the creation of complex rearing habitat for covered fish species.

- Enhance functional valley foothill riparian communities that benefit covered species and promote native biodiversity.

Species covered by the PCCP that utilize or potentially utilize riverine and riparian habitats for meeting part or all of their habitat requirements include valley elderberry longhorn beetle, bank swallow, northwestern pond turtle, yellow warbler, yellow-breasted chat, Cooper's hawk, Modesto song sparrow, California red-legged frog, foothill yellow-legged frog, Central Valley steelhead, and Central Valley fall/late fall-run Chinook salmon.

Restoration and enhancement actions will focus on improving habitat conditions for native species, with particular focus on covered species. Where possible and feasible, projects will seek to remove channelization structures, restore historic river morphology, restore and enhance riparian vegetation, improve fish passage, reduce sediment loading, improve water quality, and reduce juvenile salmonid entrainment. The PCA will implement riverine and riparian enhancement actions in all stream systems in the Reserve System. The PCA will conduct site assessments during Plan implementation to identify specific restoration project areas based on the site selection guidelines discussed below.

The riverine and riparian conservation actions, combined with project-level avoidance of the stream zone and other riverine and riparian avoidance and minimization measures (see Chapter 6 and CARP, Appendix M), provide a comprehensive conservation strategy to protect, enhance, and restore riverine and riparian habitats and constituent covered species.

The following documents were used to develop the riverine and riparian conservation strategy.

- Streams Of Western Placer County Aquatic Habitat And Biological Resources Resource Assessment (Bailey 2003);
- Salmonid Spawning Habitat Surveys for Placer County (JSA 2004c); Assessment of Habitat Conditions for Chinook Salmon and Steelhead in Western Placer County, California (JSA 2005a);
- Auburn Ravine and Coon Creek Ecosystem Restoration Plan (Placer County 2002);
- Dry Creek Watershed Coordinated Resource Management Plan (ECORP 2003); and
- Pleasant Grove and Curry Creek Ecosystem Restoration Plan (Foothill Associates 2006).

These documents contain valuable information regarding the conditions of riverine and riparian habitats in western Placer County and provide specific implementation objectives and tasks to enhance and restore aquatic and riparian conditions within Plan area watersheds. and may be used by the PCA to guide the riverine and riparian acquisition, restoration, and enhancement strategy.

Acquisition, Restoration, and Enhancement

The overriding conservation strategy for riverine and riparian systems is to protect, enhance, and restore areas with existing high-quality riparian and stream habitat. The PCA will focus acquisition on riparian and riverine segments with existing high-quality habitat or with the potential for habitat restoration. Areas with lower habitat value will also be acquired into the Reserve System, primarily for the purpose of restoration, to increase connectivity by reconnecting fragmented riparian and riverine corridors.

Management of riverine and riparian communities is discussed separately for organizational purposes. Acquisition of riverine and riparian habitats into the Reserve System is likely to occur in concert because these habitats are geographically and functionally closely related. Land acquisition and restoration of these two communities should be planned and implemented simultaneously for the same sites.

Riverine and Riparian Acquisition

The PCA will protect stream and riparian segments on key stream reaches through land acquisition (fee title or conservation easement) or through landowner dedications through CARP. Priority will be given to acquiring large intact riparian stands and riverine and riparian segments that are inhabited by one or more covered species, are adjacent to undeveloped upland habitats and/or adjacent to existing reserves, have the proper riparian widths and channel morphology for the geographic setting, are identified in specific watershed management plans, and/or provide connectivity between reserves and/or existing riparian habitat. Acquisition should mostly occur below dams or permanent natural barriers that restrict Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon from high quality spawning or rearing habitat. Acquisition will provide opportunities to enhance habitat for covered fish, amphibian, and reptile species and to restore streams and valley foothill riparian habitats.

The PCA will focus acquisition of riverine and riparian habitats in the following stream systems, where they occur in the RAA:

- Bear River in the valley and foothills;
- Coon Creek in the valley and foothills;

- Doty Ravine in the valley;
- Markham Ravine in the valley;
- Auburn Ravine in the valley;
- Pleasant Grove Creek in the valley; and
- Curry Creek in the valley.

Opportunities for acquisition of riverine and riparian habitats will be limited in the PFG area because the cost of land will likely be higher than in the RAA and smaller parcel sizes in the PFG limit the ability to acquire larger, contiguous reserves. Stream systems (e.g., Dry Creek and its tributaries) that run through the PFG, however, will be protected from future development through the Stream System avoidance measure (General Condition 3, Chapter 6).

Riverine Restoration and Enhancement

Stream restoration is defined here as any substantial physical alteration to the stream system that is intended to improve conditions for native biota. Stream restoration will occur within and outside of the Reserve System. Restoration occurring outside of the Reserve System will occur in partnership with private and public landowners.

Opportunities for stream restoration and enhancement occur on all the stream systems listed above. The PCA will conduct additional site assessments during implementation to identify specific restoration project areas based on the site selection guidelines described below. To benefit Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon, impacts to stream reaches that support covered fish must be offset by restoration in reaches that support covered fish.

The overall goal of stream restoration is to create a naturally functioning, self-sustaining system that provides high habitat value for native biota while continuing to meet urban requirements for flood control, drinking water, agriculture, and recreation. For western Placer County streams, this generally means providing the channel width and depth to convey 100-year flood flows while maintaining the habitat complexity necessary to ensure water quality and streambed conditions remain suitable for all life stages of covered aquatic species. Complex habitat, with a mix of pools, riffles and runs, and varying bed characteristics (from boulders to gravels), increases the survivability of salmonids, frogs, and turtles. The more varied and complex the habitat, the more likely these species can adapt to, or find refuge from, impairments to water quality caused by modified and/or polluted inflows.

Potential restoration and enhancement actions in western Placer County riverine systems will include: the setting back and/or stabilization of creek

banks; the removal of features such as rip-rap, dikes, and levees; re-establishment of historic stream morphology; and the modification of road crossings, culverts, and water diversions to allow for fish passage. Some of the specific restoration and enhancement methods and techniques that are likely to be implemented in western Placer County are discussed in the Management Techniques and Tools section below.

Although some restoration projects may have the goal of returning the site to some historic condition, this is not always possible or feasible and thus some projects will target specific habitat characteristics that benefit one or more covered species. In addition, some restoration or enhancement actions, such as channel erosion control measures, are not meant to be permanent and may need to be periodically maintained. All restoration projects must be accompanied by a detailed restoration plan must adhere to the goals and objectives stipulated in the PCCP, and must include provisions for assessing and monitoring success.

Riparian Restoration and Enhancement

Riparian restoration is defined here once occurred or as the re-establishment of riparian vegetation in areas where it has been severely degraded. Riparian restoration will be used to reestablish, reconnect, and expand existing riparian woodland. Riparian stream systems will be managed and restored to support complex vegetation structure and riparian habitats across a range of successional stages. Riparian restoration will also reduce sedimentation in streams and improve water quality. Restoration of riparian buffers, creek bank stabilization, and runoff capture are methods for reducing sediment loads to streams. Riparian and stream restoration may often occur together in the same location. Riparian restoration often provides direct benefits such as improved shade, filtration of contaminants, decreased sedimentation, and increased input of organic material.

The PCA will conduct site assessments during project implementation to identify specific restoration project areas based on the site selection guidelines described below. Some present riparian restoration opportunities in the Plan area have been identified for the PCCP development process by North Fork Associates through aerial photograph interpretation. Figure 5-6 displays preliminary results along upper and lower Coon Creek, upper and lower Yankee Slough, lower Markham Ravine, Auburn Ravine, lower Pleasant Grove Creek, and Curry Creek. Existing watershed resource management plans listed at the beginning of this section also identify potential opportunities for restoration in the Pleasant Grove/Curry Creek, Auburn Ravine, Coon Creek, and Dry Creek watersheds. Additional opportunities for riparian restoration may be identified through site assessments.

Enhancement of valley foothill riparian woodland would be appropriate in all watersheds throughout the Reserve System. Enhancement will

include increasing cover, density, structural diversity, and species diversity of riparian vegetation in as well as removing invasive plants such as Himalayan blackberry. Enhancement can involve direct removal of non-native species, plantings of natives, and restoration of natural stream meanders. Specific riparian restoration and enhancement methods that are likely to be implemented in western Placer County are discussed in the Management Techniques and Tools section below.

Guidelines for Selecting Restoration Project Types and Locations
Restoration sites will be selected according to criteria that include but are not limited to those listed below:

- Moderate to high potential for success of restoration activities, based on the geographic setting;
- Moderate to high potential to support covered species after restoration;
- The target land-cover type is representative of the historic condition;
- The restoration area is proximate to intact riparian corridors that support, or are likely to support, covered species;
- The extent and quality of existing habitats (e.g., percent of native vegetation);
- The use of existing habitat by wildlife and the potential for adverse effects of the restoration project;
- The potential for a net increase in the extent and quality of habitat;
- The restoration project will have a net positive effect on existing native biota;
- The restoration project will have a net positive effect on the quality of the riverine and riparian community; and
- The ability of the restoration project to contribute to the conservation goals of habitat connectivity in this Plan.

Restoration site selection will be the responsibility of the PCA. The PCA will use PCCP guidelines, existing data from reports, and watershed management plans to determine the extent of project impacts and the proper location and method for mitigation. To this end, the PCA will also work in consultation with the appropriate watershed group (e.g. Save Auburn Ravine Salmon and Steelhead , Auburn Ravine/Coon Creek Coordinated Resource Management Plan Group, Dry Creek Watershed Council, Dry Creek Conservancy, and the Pleasant Grove - Curry Creek Ecosystem Restoration Project Group) and, when necessary, Wildlife Agencies.

Site Restoration Plans

Detailed restoration plans and specifications will be developed for individual sites or stream reaches based on specific geomorphic, hydraulic, and hydrologic conditions; extent and quality of existing habitats; existing wildlife use; and the potential for adverse effects (e.g., disturbance and/or removal of existing habitat). Restoration plans will satisfy the requirements listed below:

- Define restoration goals and objectives, performance indicators, and success criteria;
- Collect and analyze baseline data (e.g., soil type and suitability for riparian planting, low-flow conditions, past land use history/alterations);
- Identify suitable/feasible restoration measures;
- Develop conceptual restoration designs;
- Develop detailed restoration designs (plans and specifications) that identify and describe construction methods, planting areas and methods, planting species (including collection and propagation methods), and maintenance requirements; and
- Prepare an adaptive management and monitoring plan based on the guidelines in Chapter 7 that includes descriptions of responsible parties; monitoring methods and schedule; indicators (e.g., vegetative cover); success criteria (e.g., 20 percent cover by year five); and adaptive management measures (e.g., replanting with different species).

Management Techniques, Tools, and Outreach

The overall goal of enhancement and restoration actions is to promote natural community functions and habitat heterogeneity and connectivity. Enhancement of streams and valley foothill riparian woodland will occur throughout the Reserve System as indicated by pre-acquisition assessments and informed by the monitoring and adaptive management program. Stream enhancement and restoration actions include activities that restore natural riparian processes and improve habitat conditions for covered fish. Stream enhancement also includes actions that affect only small segments of streams or creeks such as installing in-stream woody debris or augmenting spawning gravel.

Enhancement and restoration of valley foothill riparian woodland will include enhancing and restoring the cover, density, structural diversity, and species diversity of riparian vegetation as well as removing invasive plants such as red sesbania (*Sesbania punicea*) and Himalayan blackberry. The management tools discussed below will be used to maintain natural or semi-natural functions or to achieve them in currently degraded communities. In many cases, these techniques can also be

used to manage existing high-quality habitats for the benefit of streams and riparian communities.

In-Channel Habitat Management

In-channel habitat management actions include the restoration of the channel to remove anthropogenic features (e.g., concrete, earthen, or otherwise engineered channels), as well as enhancement actions that modify specific elements of in-channel habitat (e.g., installing large woody debris, gravel placement and cleaning).

Channelization is the process by which creeks, streams, and rivers are modified to convey flood flows. Channelization employs hardened stream banks, straightening of stream alignments, culverts, levees, and dikes, often accompanied by widening, straightening, and deepening of the channel. Channelization may accelerate or otherwise change flood-flows and lead to unnatural changes in channel morphology such as increased sedimentation, channel incision, stream bank instability, and erosion. The net result is almost always a reduction in habitat quantity and quality for salmonids and other riverine- and riparian-dependent species. When opportunities exist, the PCA will remove channelization features within, and outside of, the Reserve System and restore riverine and riparian habitat.

Channel restoration may entail reconstruction of a channel or incremental process restoration (installation of a natural structural feature to induce change in a channel). Channel restoration guidelines and designs are presented in Flosi et al. 1998, Circuit Rider Productions (2004). Channel restoration can also be used to restore bank stability and reduce bank erosion; thereby improving aquatic habitat and water quality. Channel restoration techniques may affect the local slope, length, sinuosity, and dimensions of the channel, as well as alter basic channel processes related to sediment transport, and are very useful for treating the underlying causes of habitat degradation. In implementation, the effects of restoration on local channel geometry should be carefully considered and proper hydraulic analysis performed (Flosi et al. 1998). Other techniques to improve in-channel habitat include: removing non-native vegetation and revegetating with native plants to influence physical processes; installing large woody debris and other in-stream structural elements, such as rocks and boulders, to improve channel complexity, as well as to promote woody debris recruitment and enhance rearing habitat; and augmenting gravel within potential spawning grounds.

Together, these restoration techniques can serve to slow the movement of flood waters, allow the deposition of sediment to improve channel and bank formation processes, reduce sediment loading in river and stream systems, and improve habitat for covered species – including the creation of complex rearing habitat for covered fish species.

Beaver policy underdevelopment.

Sediment Management

The reduction of sediment, particularly fine sediment, in western Placer County creeks requires restoration of creek morphology and a reduction in the rate at which sediment is delivered to streams. The restoration techniques discussed above (e.g., removal of channelization features, restoration of historic meander patterns, stabilizing stream banks on selected stream reaches) will restore some of the natural processes by which streams move and store sediment and reduce delivery of some sediment into streams. When erosion control is necessary, wherever possible, a vegetative method for reducing erosion, such as bioengineering, is preferable to a structural approach such as riprap. If a structural approach is necessary, native vegetation should be planted on the structure (Circuit Rider Productions 2004). The reduction of fine sediment input to streams is a high priority in Auburn Ravine, Coon Creek, Doty Ravine, Miner's Ravine, Secret Ravine, and the main stem of Dry Creek, and a medium priority in the Bear River, Pleasant Grove Creek, and Curry Creek (County of Placer 2002, ECORP 2003; Foothill Associates 2006). General Conditions 2, 3, and 4 will reduce inputs of fine sediments into streams.

Gravel cleaning can be used to enhance gravel beds that are already impaired due to excess fine sediment load. Gravel replenishment can be used in streams deficient in spawning gravel due to dams or other artificial structures that prevent gravel recruitment or transport. The use of gravel cleaning or replenishment actions will likely result in additional maintenance requirements, because natural processes will not maintain these actions.

Gravel cleaning and replenishment can be effective where the cause and source of excessive fines, including upland sources such as unpaved roads and land grading activities, have been controlled or remedied.

The PCA will identify specific stream reaches with degraded spawning habitat where cleaning or replenishment of gravels is the only feasible means to enhance habitat. These actions are not anticipated to occur regularly under the Plan and would only be used as a temporary action to maintain habitat until the reach can be restored.

Reducing the Entrainment of Juvenile Fish and Improving Fish Passage

Barriers to fish passage include beaver dams, seasonal flashboard dams, pipeline crossings, concrete dams, and natural waterfalls. Due to the modified flow regime in western Placer County, juvenile steelhead (both rearing and emigrating stages) and adult, fall-run Chinook salmon are the most vulnerable salmonid life stages to barriers to passage. These life stages are most likely to suffer mortality during low-flow conditions or unscreened water diversion intakes, and temporary flashboard dams.

The PCA will identify, prioritize, and modify diversion facilities to reduce juvenile salmonid entrainment in Auburn Ravine, Coon Creek, Doty Ravine, Bear River and Dry Creek. Modification may include screening intakes and/or reducing attractive habitat at the diversion site. The PCA will collaborate and support the efforts of conservation partners to identify and eliminate barriers to passage for all salmonid life stages in Auburn Ravine, Coon Creek, Doty Ravine, Bear River and Dry Creek.

Restoring and Enhancing Native Vegetation

Revegetating banks is important for improving bank stability, managing physical process, and ensuring a variety of successional stages of riparian forest. Riparian systems are often capable of rapid regeneration after floods. In areas that have been heavily impacted by grazing livestock, exclusionary fencing may be used to provide protection for naturally regenerating vegetation and planted vegetation. Fencing should be set back far enough to allow the stream-course to meander naturally and to prevent damage during high flows (Circuit Rider Productions 2004).

Current techniques to restore riparian vegetation are to plant cuttings, seedlings and/or seeds of native overstory and understory riparian species in the floodplain and banks to promote continuity with conservation lands, create structural diversity, moderate water temperature, and enhance hydrological functions. Plantings and seeds should be collected locally to ensure that genetically appropriate plants are used on-site and to increase the probability of survival (Circuit Rider Productions 2004). Plantings may be protected from browsing by plastic tubes, fencing or other devices to increase their likelihood of survival. Plants may also be watered with drip irrigation where necessary (e.g., in riparian zones that are not regularly flooded), and protected from over-growth and competition by non-native species (e.g., through mowing, hand-pulling, and the select use of herbicides).

Revegetation projects will be designed to establish a diversity of native plants, provide habitat for fish and wildlife, reduce erosion, and require minimal annual management once vegetation has established. The PCA will develop a management plan for riparian communities to ensure that a diverse cross section of successional stages is fostered in the riparian corridor to promote natural stream functions. This management strategy will be incorporated into reserve management plans.

Where grazing is used to manage riparian vegetation (e.g., fuel loads, control of invasive species), it will be limited in frequency and intensity to ensure that complex vegetation structure with a well developed understory is restored and maintained (see section on livestock grazing below for further discussion).

Invasive Plant and Wildlife Management

When possible, the PCA will reduce the cover, biomass, and distribution of non-native invasive plants (e.g., Himalayan blackberry) and reduce the number and distribution of non-native, invasive animals to enhance natural communities and habitat for covered species within the Reserve System. Invasive, non-native plant species often out-compete native plant species for resources such as nutrients, light, and space. Invasive plants will be controlled using techniques appropriate to site conditions and species. Methods that may be used include hand removal, mowing, mechanical removal, mastication, spot-burning, tarping and selective use of herbicides. Invasive plant control will be conducted to minimize impacts to native species.

Invasive, non-native animals often out-compete native animals for food and habitat and/or decrease the native population by direct predation. In western Placer County riverine habitats, the most ubiquitous invasive, non-native fish species bluegill, sunfish, carp, and bullhead (Bailey 2003). Methods to remove or reduce populations of invasive, non-native aquatic animals include trapping and electrofishing. The need to control invasive species and methods to be used will be site-specific and evaluated within a monitoring and adaptive management framework. The PCA will develop an Invasive Species Control Program for the Reserve System and each reserve management plan will include a section on management of invasive plant and animal species (Section 5.2.5).

Livestock Grazing

Within the Vegetation Management section of reserve management plans, the PCA will include a livestock grazing management component to manage grazing on Reserve System lands and to minimize impacts to habitats and covered species. In many cases, grazing will provide ecosystem services that will benefit natural communities and covered species (i.e. reducing cover of invasive plants and enhancing habitat for native plants). However, grazing can also have negative impacts on riverine and riparian systems through trampling and overgrazing. Livestock access to creeks can cause excessive vegetation removal, bank instability, and ultimately sediment and fecal deposition into local waters.

The following conservation actions may be used to manage livestock grazing to protect riverine and riparian habitats within the Reserve System:

- Livestock access to targeted river and stream segments will be restricted by using exclusion fences and by providing alternative water sources.

- Sediment suspension at livestock crossings will be reduced by armoring stream crossings (e.g., rock fords).

- Where grazing is used to manage riparian vegetation (e.g., fuel loads, control of invasive species), grazing will be limited in riparian woodland to low enough levels to ensure that complex vegetation structure with a well developed understory is restored and maintained.

- Restrict grazing from riparian woodland during the bird breeding season (March 15 – Aug 15) to help protect nests from direct damage from cattle.

Conducting Outreach to Private Landholders

The PCA will develop Stream Management and Riparian Land Use Guidelines for private landowners, including an educational program and small grants program to assist in the management of riparian habitats to improve riparian and stream conditions. Relevant topics include the use of vegetative buffers, the reduction of fuel loads, and the utility of seasonal, off-channel wetlands and meadows.

Other outreach programs may include free short courses on water quality, field demonstrations of innovative capture and treatment technologies, and small grant awards for implementing best management practices (BMPs) and low-impact development (LID) strategies for runoff treatment. The PCA, in collaboration with the Wildlife Agencies, may conduct public outreach to provide help to modify, consolidate, and/or remove private, in-stream water diversion structures, such as flashboard dams, to meet specifications set forth by CDFG (2009) and NMFS (2001). One priority is to conduct outreach to private landowners to reduce entrainment of juveniles on Auburn Ravine.

The PCA will also provide outreach to the agricultural community to develop and implement projects with willing participants to reduce pollutant levels in runoff for the purposes of achieving long-term improvements to water quality and compliance with the Basin Plan (2007).

Threats and Uncertainties

The future volumes and flows of water deliveries from the American, Yuba, and Bear Rivers are uncertain. As agricultural land is converted to urban development, the continued delivery of irrigation water is likely to diminish over time. Dry Creek, Auburn Ravine, and Coon Creek all receive some level of extra-watershed delivery in the spring and summer. Bear River, below the Camp Far West Reservoir, relies entirely upon water releases from the South Sutter Irrigation District and the Camp Far West Irrigation District. The fisheries in each of these systems, particularly Auburn Ravine, benefit from these deliveries/releases. If these deliveries were to significantly diminish or cease, the consequences could negate many of the PCCP efforts to protect habitat for covered fish and other species.

The impacts of future ocean and climatic conditions on populations of Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon populations in Plan area streams are unknown. Oceanic conditions can impact the population of adults returning to spawning grounds. In 2008, approximately 66,200 Sacramento River fall-run Chinook adults returned to spawn in the Sacramento River Basin. This was the lowest return of Sacramento River fall Chinook since records began in 1970 (Pacific Fishery Management Council Salmon Technical Team 2009). A National Marine Fisheries Service (NMFS) work group found poor ocean conditions to be the probable cause of Chinook population declines (NMFS 2009). Although the status of the steelhead run is unknown, the fishery is presumed to suffer similar consequences to that of the Chinook fishery because they too rely upon productive ocean conditions for survival.

Federal and state decisions regarding operation of water deliveries and withdrawal to and from the Sacramento Delta could further impair adult and/or juvenile salmonid migration to western Placer County streams. Continued operation of the Nimbus Fish Hatchery is likely to reduce genetic diversity and therefore population viability of western Placer County runs (NMFS 2009).

5.6.5 Wetland and Pond Conservation and Management

Biological Goals and Objectives

The main goal for conservation and management of wetlands is to protect, maintain, enhance, restore, and create (fresh emergent wetlands only) fresh emergent wetlands and springs and seeps, and the hydrologic processes that support them to benefit covered species and promote native biodiversity. Management of vernal pool and seasonal wetland types is discussed above in Section 5.3.3, Grassland and Vernal Pool Complex Conservation and Management.

The following objectives are designed to achieve this goal:

- Protect fresh emergent wetlands within the Reserve System.
- Protect contiguous tracts of natural and semi-natural upland habitats between wetland habitats to allow native species to move between aquatic and upland habitats (e.g., overwintering sites, movement corridors).
- Restore and/or create fresh emergent wetlands to mitigate in-kind and out-of-kind for take of wetland habitats at a ratio of 1.25:1 (in addition to acquisition at 1:1 ratio).

- Enhance hydrological functions, native biodiversity, and habitats for populations of covered species in fresh emergent wetlands within the Reserve System.

The main goal for conservation and management of pond habitats is to protect, maintain, and enhance pond habitats and the hydrological processes that support them to benefit covered species and promote native biodiversity. The following objectives are designed to achieve this goal:

- Protect and restore ponds in the Reserve System. Up to 40 percent of the compensatory mitigation for take of vernal pools can be used for out-of-kind acquisition of other wetland habitats.

- Protect contiguous tracts of natural land cover (e.g., oak woodlands) surrounding ponds and ponds linked to other wetland habitats (when available) to provide upland habitats for covered species (e.g., overwintering sites, nesting sites for northwestern pond turtles), corridors to move between habitats and to protect hydrological functions.

- Enhance hydrological functions, native biodiversity and habitats for populations of covered species within all pond habitats protected as part of the Reserve System.

Acquisition, Restoration, Creation, and Enhancement

Acquisition

The PCA will place a high priority on the acquisition of high quality fresh emergent wetlands and ponds in the Valley and the Foothills. The PCA will establish at least one large (2,500 acre) wetland reserve in the Valley that will be managed for over-wintering migrant birds and to provide habitat for giant garter snake. The wetlands that are acquired for protection of water-oriented birds will be adjacent to uplands that are acquired for the protection of upland-oriented birds and upland habitats for giant garter snake and other covered species. Priority will be given to acquiring existing natural wetland, but rice lands managed for use by overwintering birds may be part of the strategy to achieve this goal. In such cases, managed rice/fresh emergent wetland reserves will include summer water to provide habitat for birds and covered species such as giant garter snake and northwestern pond turtle. Ponds will be acquired to mitigate for take of pond habitat, and will be enhanced to provide habitat (e.g., fresh emergent wetlands and basking sites around the perimeter of ponds) for covered species including tricolored blackbird, Modesto song sparrow, California red-legged frog, and northwestern pond turtle.

As stated above, one of the objectives for wetland and pond communities is to focus on protecting places where fresh emergent wetlands and upland habitats are connected. To accomplish this, the PCA will acquire land between ponds, other wetlands, and upland habitats that provide a linked matrix of wetland and upland habitats.

Restoration and Creation

Wetlands will be restored on suitable soils and in areas where wetlands historically occurred. Restoration of fresh emergent wetlands and ponds will generally involve manipulating hydrology, recontouring basins to provide suitable depth and size, and planting native freshwater emergent and aquatic plants. Seasonal wetlands may be restored along floodplain benches of intermittent streams or in grassland swales. Wetland and riparian restoration projects within the floodplain can be designed to have multiple benefits including water quality, flood management, and covered species habitat enhancement.

There are several wetland restoration projects that have occurred within and adjacent to the Plan area, and these projects may be used as models to inform ongoing wetland restoration.

Thousands of acres of managed wetlands have been created from rice fields in the Butte, Colusa, and Sutter Basins (Silveira 2007). In Placer County, the Sundance Properties Wetlands Restoration Project which is initiated by the Placer County as part of a plan to enlarge the riparian corridor along Coon Creek into adjacent areas formerly used as agricultural land. The overall plan includes construction of seasonal and perennial wetlands, re-contouring specific areas to improve natural drainage patterns, and improving on-site infrastructure to provide year-round water to perennial wetlands. Work started in summer 2008, and has included a 60-acre parcel north of Coon Creek. The overall scope of work has encompassed 20-acre riparian restoration within a setback levee as well as 2,527 linear feet of stream restoration. In addition, a 0.6 acre duck pond has been constructed in an upland terrace, as well as a 4.0 acre wetlands complex.

Wetland and pond creation may occur in limited circumstances when suitable land is not available for restoration. The purpose of wetland and pond creation is to contribute to the recovery of covered species that rely on these habitats (e.g., California red-legged frog, northwestern pond turtle, California black rail and tricolored blackbird).

Guidelines for Selecting Restoration and Creation Sites

Potential restoration and creation sites will be identified and selected based on their hydrologic, geomorphic, and soil conditions to ensure the success of restoration and to minimize the need for long-term management of geomorphic and hydrologic conditions. Suitable sources

of water must be available to restore or create desired hydrologic conditions and to provide habitat for desired plants and animals.

Restoration sites will occur on suitable soils and in areas where wetlands occurred historically. Restoration sites will also be selected based on their ability to support covered species and to meet species-specific biological goals and objectives. For example, sites selected to provide nesting habitat for tricolored blackbird must be situated with a matrix of suitable foraging habitat. Sites selected to provide habitat or covered amphibians and northwestern pond turtle must have suitable upland habitat adjacent to the restored wetland or pond to provide habitat for aestivation, nesting (for northwestern pond turtle), and corridors for movement to other habitats. In accordance with the California red-legged frog recovery plan, ponds created to provide habitat for California red-legged frogs should incorporate the Appendix D Guidelines for Voluntary Pond Management for the Benefit of California Red-legged Frog (USFWS 2002). This includes locating ponds at least 0.6 miles from ponds inhabited by bullfrogs, and locating restored or created ponds close enough to known occurrences of California red-legged frog to increase the likelihood of dispersal to the restored or created habitat.

Enhancement

Wetlands and ponds in the Reserve System will be managed to enhance habitat features for covered species that are resident or that may colonize these habitats. Enhancement of wetland and pond habitats will involve:

- Increasing vegetative cover for native wildlife;
- Providing artificial cover and basking sites, such as large woody debris;
- Protecting wetlands from livestock as appropriate and necessary;
- Reducing impacts from recreation;
- Reducing the cover of invasive plants;
- Improving water quality;
- Enhancing hydraulic function;
- Maintaining consistent supplies of water to avoid fluctuating water levels while covered species (i.e., California black rail and northern harrier) are nesting;
- Maintaining appropriate water depths and hydrological cycles for particular covered species (i.e., northwestern pond turtle, giant garter snake, California black rail);

- Reducing the cover of annual grass cover and thatch in wetlands; and,
- Reducing predation by invasive animals on wetland wildlife.

Management Tools and Techniques

Wetland and Pond Restoration and Creation

Restoration will occur on suitable soils and may include creating wetland or pond topography by grading the site or creating depressions to hold water. Native plants appropriate for site-specific soil and hydrologic conditions will be in restored and created wetlands and ponds. When available, the plants will be grown from soil, seed, or plant stock from local wetland sites. Invasive, non-native plants that invade restored/created sites will be removed or controlled to allow native vegetation to develop and to manage desired conditions for covered species.

Wetlands will be designed for specific covered species including giant garter snake, tricolored blackbird, and California black rail. For example, fresh emergent wetlands will be restored or created in grasslands or open oak savannas in the Foothills for California black rail. Water levels will be maintained year-round at depths suitable for California black rail (stable at less than 1.2 inches year-round). Wetlands will be planted with and managed to support rush, cattail and other associated species that create the vegetative structure suitable for California black rail. Wetlands restored and managed for giant garter snake will be in the located Valley. Water of sufficient depth must be maintained during the snake's active season (early spring through mid-fall) to maintain an adequate prey base. Wetland vegetation will be restored with emergent species such as cattails and bulrushes to provide escape cover and foraging habitat.

Ponds will not be created or restored within a 100-year floodplain in streams to avoid impacts to streams and to prevent stranding of fish in ponds. Ponds will be created so that they can be drained if necessary to control bullfrogs and other non-native invasive animals.

Created and restored vernal pools sites should be required to provide reasonable assurances that natural and/or restored hydrologic conditions exist to support restored/created/enhanced wetlands and that, where necessary to achieve vegetative performance standards, other sources of water are available during the establishment period.

Created and restored vernal pools must be able to function based upon existing hydrology without augmentation. Whereas riparian and other associated flood plain wetland functions may require supplemental water through a primary or secondary backup source to meet vegetative performance as they're typically planted in the dry season and cannot rely solely upon nature for root establishment. Their design should allow

these wetlands to be inundated multiple times throughout the wet season with inundation occurring regularly depending upon the precipitation amount and duration of each storm cycle.

It may be difficult to have a surface water supply (e.g., irrigation water) guarantee available, therefore a back-up supply with on-site wells or other sources is also something that should be encouraged but is not necessary in every instance.

Vegetation Management

Vegetation (and maintenance of open water conditions) is an important feature of wetland and pond habitats for covered species. Vegetation provides cover from predators, shade, habitat for foraging and breeding, and is the primary base of the food chain for covered species and their prey. Wetland and pond vegetation will be managed based on site-specific conditions to provide habitat for the species or groups of species targeted for benefit. Vegetation management actions include removing and/or controlling invasive plant species and enhancing habitat to facilitate the restoration, establishment, and/or maintenance of appropriate native vegetation and vegetative structure.

Native vegetation appropriate to the site will be used to re-vegetate wetlands and ponds where invasive, nonnative vegetation has been removed. Emergent species such as cattails, bulrushes, and willows provide habitat and cover for California red-legged frog and northwestern pond turtle in deepwater portions (i.e., greater than three feet deep); however, shallow areas should be kept clear and remain unshaded to provide habitat for California black rails and rearing California red-legged frog tadpoles (USFWS 2002).

Vegetation may need to be removed from ponds where little open water remains to improve open water habitat for northwestern pond turtle and California red-legged frog. Vegetation can be removed by limited grazing by livestock. Grazing to control vegetation (including non-native invasive species) in wetlands and ponds will be managed and monitored closely to ensure that impacts caused by overgrazing (e.g., excessive trampling of native vegetation, soil compaction and erosion, eutrophication caused by excessive deposition of cattle urine, and bank destabilization) are minimized or avoided. Fencing of wetlands and ponds and rotational grazing are two methods that can be used to manage sustainable grazing in these habitats. Limited access to ponds by livestock will also help to prevent excessive plant growth that can lead to rapid sedimentation of ponds.

Other techniques, where feasible, such as prescribed burns, herbicide application (using products that have been approved for aquatic communities), and hand and mechanical removal will be used to remove or control invasive, non-native plant species. Vegetation management

that may impact covered species and breeding birds will occur after the breeding season for wetland- and pond-dependent wildlife (e.g., March 1 – July 31 for songbirds). If surveys identify the presence of California red-legged frog at a site, vegetation management will be restricted to between August 30 and October 15. When covered species are dependent on non-native vegetation (e.g., tricolored blackbird nesting in Himalayan blackberry), the removal of non-native vegetation will be phased over a three to five year period, with concurrent re-vegetation with native species.

While limited grazing may be used to manage vegetation in wetlands and ponds, overgrazing by livestock and rooting by feral pigs can degrade wetland and pond habitats. Wetlands and ponds may be fenced to prevent inappropriate grazing or access by feral pigs. The need for, and location of, fencing will be site-specific and determined on a case-by-case basis.

Invasive Animal Control

Bullfrogs and several species of bass are known to prey on the eggs or tadpoles of the California red-legged frog, as well as northwestern pond turtle hatchlings or juveniles (Moyle 1973; Holland 1991, as cited in JSA 2004). Hatchlings of wood ducks, mallards, and even Canada geese often fall prey to largemouth bass. Techniques that may be used to control invasive animals generally include trapping programs such as those used to control bullfrogs.

Water Quality Improvement

Wetlands and ponds acquired into the Reserve System may be in disrepair. Repairs could be made to improve water retention to improve habitat for covered species. Sediment removal may be needed to improve habitat for covered species. Where necessary and feasible, the PCA will remove or reduce point and non-point sources of pollution on Reserves and divert point and non-point sources of pollution from outside Reserves away from wetland and pond habitats.

Enhancement of Basking Sites for Wildlife

Mowing is useful for enhancing habitat structure by reducing standing biomass, and it can be used prior to seed ripening to reduce the production of invasive species (Silveira 2007). Mowing and disking are especially useful in managed wetlands to create openings in emergent and other marsh vegetation, which improves wildlife use and aids in wildlife viewing and disease monitoring (Mensik, 1990; Mensik and Reid, 1995, cited in Silveira 2007). Mowing and disking can also be used to prepare loafing islands and levees for wintering waterfowl in managed wetlands (Silveira 2007). Coarse woody debris or anchored basking

platforms will be installed in wetlands and ponds to improve habitat for covered species.

Outreach to Private Landowners

The PCA will work with private landowners who own wetlands and ponds to provide technical assistance and to secure funding to improve and maintain their wetlands and ponds as habitat for covered species. The PCA will help landowners apply for existing grants (e.g., North American Wetlands Conservation Act Small Grants Program [USFWS]). A program could be developed by the PCA modeled after the successful Alameda County Conservation Partnership in Alameda County. This program provides technical assistance, funding, and permit streamlining to private landowners wishing to maintain and enhance stock ponds to benefit endangered species.

Threats and Uncertainties

Modifications to areas outside the Plan area may contribute to the decline of wetlands within the Plan area. Such modifications include hydrologic changes that lead to channel incision, changes in channel runoff, hydrologic disconnections between channels and floodplains, and groundwater reduction. Water to some small wetlands may be provided by leaks in canals. Repairs to leaks may impact wetlands by reducing water availability.

Enhancement of pond and wetland habitats must be balanced with the need to minimize mosquito production. Encouraging adequate populations of mosquito predators, such as frogs, swallows, and bats, offers an approach to mosquito control that is compatible with management for covered species. The PCA will also provide access for staff of the Placer Mosquito and Vector Control District to monitor and control mosquitoes at wetland and pond sites when warranted (see Chapter 6, Condition 14, Mosquito and Vector Control)14, Mosquito and Vector Control).

Finally, the success of wetland restoration and enhancement is partly dependent on rainfall rates. Rainfall rates can, in turn, be affected by periods of drought and long-term climate change.

5.6.6 Agricultural Land Conservation and Management

Goals and Objectives

Agriculture is an important component of the economy and culture of Placer County and the PCCP seeks a sustainable balance of agriculture

and conservation within the landscape. This matrix of natural and semi-natural communities comprises a "working landscape", where agricultural land uses such as row cropping and ranching, when conducted in a wildlife-compatible manner, provide habitat for covered species such as Swainson's hawk, tricolored blackbird, and vernal pool invertebrates. In selected instances, the PCA will protect agriculture land and land uses through acquisition and easements. The ecological value of agricultural land is highest where wildlife-friendly agricultural practices, habitat connectivity (e.g., along riparian buffer strips), and buffers between Reserves and existing resources and urban/suburban development are protected.

The main goal for conservation and management of agricultural land is to preserve agricultural land-uses that support habitat for covered species and other wildlife (e.g., migratory waterfowl and shorebirds, raptors) and enhance connectivity between natural communities. The following objectives are designed to achieve this goal:

- Within the Reserve System, encourage production of wildlife-compatible crops such as rice, alfalfa, row crops, and pasture on the. The PCA will avoid obtaining easements on vineyards and orchards unless land with orchards or vineyards are to be restored to native habitat.
- Manage ricelands to provide aquatic habitat for giant garter snake during their active season (e.g., flooded from early spring – mid fall) and for overwintering waterfowl and shorebirds (fall – spring).
- Maintain and/or plant patches of emergent vegetation in canals, irrigation ditches, sloughs, ponds, and borders of rice fields to provide habitat for covered species (e.g., giant garter snake, tricolored blackbird, Modesto song sparrow).
- Maintain and enhance patches of grassland along the borders of waterways (e.g., canals, irrigation ditches) and rice fields to provide basking sites for giant garter snake.
- Enhance habitat conditions for covered species and wildlife, enhance connectivity between natural communities, and improve water quality on agricultural lands within the Reserve System, within the limitations of economically viable agricultural operations.
- Promote agricultural practices and land use management that supports and enhances habitat for covered species and biodiversity on privately owned agricultural lands.

Acquisition, Enhancement, and Restoration

Acquisition

Agriculture land protected under easements that allow agricultural practices to continue will include conditions to protect covered or other native species and actions to enhance their habitats. Agricultural management plans will be prepared by the PCA, in cooperation with the landowner. They will outline land management practices that are consistent with the needs of covered species likely to use the site (e.g., tricolored blackbird, Swainson's hawk, vernal pool plants and animals).

The PCA will also acquire agricultural lands from willing sellers to maintain agricultural activities and/or to enhance and restore them (or portions of the site) to natural communities such as vernal pool grasslands, valley oak woodland, valley foothill riparian, or fresh emergent wetlands. The PCA will prepare agricultural management plans for such sites that designate what agricultural activities can occur on the site, where they can occur, and where natural communities will be enhanced and/or restored.

The PCA will seek easements on working size farms (at least 80 acres). The PCA will also seek easements on agricultural lands that contain habitat suitable for covered species and other native wildlife. The PCA will not obtain easements on vineyards and orchards unless sites with orchards and vinyards will be restored to native habitat (e.g., to restore valley oak woodland, or enhance connectivity between natural communities). In contrast, the PCA will place a high priority on acquisition of rice fields because of the importance of rice for winter migrant birds (Wildlife Agencies 2005), the potential to provide habitat for giant garter snake, and because of the potential for rice fields to be restored to fresh emergent wetlands.

The PCA will also place a high priority on acquisition of pasture with potential to provide habitat for vernal pool grassland species (e.g., tricolored blackbird, vernal pool invertebrates and plants) or to be restored to vernal pool grassland complex. The PCA will use historical vernal pool data when evaluating the potential for restoration to vernal pools (Glazner 2004).

Restoration

In some cases the PCA will acquire agricultural lands in fee title, provided there are willing sellers, and restore them to a natural or semi-natural condition that supports valley foothill riparian, valley oak woodland, fresh emergent wetlands, or vernal pools. Restoration techniques are discussed above, in the Restoration section associated with each natural community.

Land restored to a natural community will be managed to achieve the PCCP biological goals and objectives for the restored natural community. In many cases, intensive agriculture (e.g., row crop) will no longer be possible on land that is restored to natural communities, such as grasslands and vernal pools.

Agricultural Land Enhancement

Reserves managed for agriculture will be enhanced for covered species within the limitations of economically viable agricultural operations. Management actions to enhance agricultural habitat for covered species are addressed in Section 5.4 (Benefits of Conservation Actions for Covered Species). In most cases, these lands will be protected under easements that allow agricultural practices to continue, with conditions that will protect covered or other native species.

Regardless of the farm location or crops grown, there are some general management techniques that can be applied to improve habitats for covered species and other wildlife on agricultural land. For most farmers, improvements will only require minor modifications to current practices, and fall into the following five areas of agricultural operation (Audubon 2009):

- Nutrient management;
- Tillage management;
- Integrated Pest Management (IPM);
- Harvest management;
- Flooding and water depth management; and
- Field border and edge management.

Management Techniques and Tools

To integrate farming and ranching practices with biodiversity conservation, the PCA will:

- Maintain crop diversity where such diversity maintains or improves biodiversity;
- Protect/restore patches of natural vegetation including native trees and shrubs that may be used by covered species (e.g., nest sites for Swainson's hawk and tricolored blackbird);

- Delay the harvesting of hay and grain crops until as late as possible to increase the reproductive success of ground-nesting birds that nest in agricultural fields and to extend the period of forage availability;
- Establish a seasonal or permanent buffer zone around aquatic habitats to reduce runoff and disturbance to aquatic habitats and to improve breeding and foraging habitat for species such as tricolored blackbird, Modesto song sparrow, and giant garter snake;
- Apply herbicides, pesticides, and chemical fertilizers minimally and cautiously;
- Use water efficiently and effectively;
- Conduct species inventories of the land and promote utilization by natives and discourage non-natives;
- Plant winter cover crops, where appropriate, to provide food and cover for native birds;
- Plant cover strips, hedgerows and shelterbelts along field margins, ditches, canals, roads, and other infrastructure to encourage use by beneficial insects and wildlife;
- Install nest boxes to encourage use by birds that control pest insect and rodent populations (e.g., western bluebirds and American kestrel);
- Install bat roost boxes, where appropriate, to control pest insect populations; and
- Restore riparian habitat and maintain buffer widths whenever possible.

The following is a discussion of these and other techniques that may be used to enhance agricultural land for covered species.

Nutrient Management

Before making site-specific recommendations for nutrient management, it is important to utilize soil testing and manure analysis so that crops receive only the nutrients that they need. Nutrients should be applied where and when they can be most effectively used by crops. In many cases, a split application system that allows maximum use by the crop will benefit yield as well as waterbird habitat.

Nutrient management should focus on all important nutrients, not just nitrogen. Phosphorous and potassium, as well as micronutrients need to be part of a nutrient management plan, especially since excessive phosphorus can impair surface water quality. Several management practices can prevent movement of nutrients into ground or surface

waters; these practices include filter and buffer strips, as well as following wellhead protection procedures.

Finally, nutrient management practices that harm earthworms and other soil invertebrates should be avoided whenever feasible.

Tillage Management
Tillage systems vary widely across most production systems and crops. However, any tillage practice that leaves crop residue, reduces erosion, and maintains and protects wetlands will benefit waterbirds, soil and water quality. When possible, farms should consider using a no-tillage system that will reduce trips in the field and soil disturbance, as fewer trips across the field will reduce erosion. When tillage is necessary, farms may consider tillage systems that leave residue and waste grains; the residue will protect the soil, and the grains can be eaten by wildlife. Additionally, farms should defer the tilling of grain fields until later in the fall and winter to improve foraging conditions for waterfowl and shorebirds.

Integrated Pest Management (IPM)
Integrated pest management involves using the best pest management practice that will benefit not only the cropping system, but also the environment. In many cases, IPM utilizes multiple methods of control that are based on economic and pest thresholds. Prudent use of agrichemicals that are part of an IPM plan will not only benefit the economics of production, but waterbirds and the overall environment.

Harvest Management
There are a few simple practices that a producer may consider that can benefit waterbirds and wildlife, as well as improve agronomics. An important consideration for many cropping systems is to increase crop harvest height (the distance from the soil surface to the height at which the combine header is run) so that more residue remains during overwintering and early nesting. If a portion of a field is damaged by flood, drought, weeds, etc., and the grain is difficult to harvest or is of poor quality, it may be appropriate to leave some of this crop for wildlife, especially when crop insurance increases the feasibility of leaving crops unharvested.

Flooding and water depth management
Waterbirds and rice plants both require good water management. Water depth is especially critical, as variable water depth in the field provides for bird diversity. When flooding a field, it is important to vary depth across the field. Shallower depths benefit shorebirds, while depths of 4-6 inches benefit many waterfowl species. It is also important to maintain flood duration as long as possible throughout the winter months and early spring. Fields should be flooded to provide habitat suitable for covered species. For example, giant garter snakes are active from early spring through late fall and require water in rice fields, canals, or irrigation ditches for foraging and other uses. In contrast, overwintering shorebirds

and waterfowl utilize flooded ricelands from late summer/early fall through spring. The PCA will develop a planting and water management strategy that ensures that a network of fresh emergent wetlands, vernal pool grassland complexes, winter flooded agriculture fields, and flooded ricelands provide suitable aquatic habitat for covered species and biodiversity throughout the year. Proper water management will benefit the environment as well as reduce costs, so it is important to conserve water wherever possible. When feasible, it is recommended to improve water control structures to capture as much runoff water as possible and to develop a system for tailwater recovery.

Field Border and Edge Management
Rice field ditches should be managed to provide shelter and species diversity. Allowing emerging marsh vegetation (e.g., cattails) and other vegetation (e.g., native blackberry) to become established will provide nesting substrate, food sources and protection to species such as Modesto song sparrow, tricolored blackbird, and giant garter snake. Edges of canals, irrigation ditches, and agricultural fields can also be maintained or planted with grassland (preferably native grass species) to provide open basking sites for giant garter snake. In addition, rotations with crayfish aquaculture, pasture, or summer fallow increase the attractiveness of a site to waterbirds.

Threats and Uncertainties

The distribution of agricultural land-cover types in Placer County is at least partly dependent on economic drivers of crop production. Changes in crop production may be unavoidable, and may lead to substantial declines in habitat quality. One potential consequence of this may be the conversion of ricelands to other crop-types (such as alfalfa or row crops). This could, in turn, result in a dramatic decrease in surface water available for migratory bird species, as well as the giant garter snake.

5.7 Benefits of Conservation Actions for Covered Species

Most species-specific conservation is accomplished by protecting, restoring, and managing natural communities, as described above. Some species-specific actions were presented within these natural community management sections. The following section describes the biological goals and objectives for covered species and summarizes the benefits of the conservation actions for each species. When applicable, conservation actions in this Plan are related to federal recovery plan actions.

5.7.1 Bald Eagle and American Peregrine Falcon

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of bald eagle and American peregrine falcon habitats to maintain or increase breeding habitat and the sizes of the overwintering populations of these species in the Plan area. Bald eagle and American peregrine falcon use similar habitats for breeding and overwintering in the Plan area, so conservation actions to benefit these species are discussed together.

The following objectives are designed to achieve this goal:

- Protect valley foothill riparian, fresh emergent and seasonal wetlands, vernal pool grassland complexes and winter-flooded agriculture (i.e., rice) to provide suitable overwintering habitat as part of the Reserve System within the Plan area;
- Protect wooded habitats, particularly those with mature trees, adjacent to large bodies of water to provide perching, roosting, and potential nesting habitat (for bald eagles); and,
- Enhance foraging, perching, roosting, and potential nesting habitat for bald eagle and American peregrine falcon within the Reserve System.

Acquisition

The PCA will acquire sites that contain valley foothill riparian woodland, fresh emergent and seasonal wetlands, vernal pool grassland complexes, and winter-flooded agriculture (i.e., rice) that provide suitable overwintering habitat as part of the Reserve System. In particular, the PCA will focus on sites that support overwintering bald eagles and/or American peregrine falcon. Bald eagles need large trees and snags for perching and roosting near foraging habitat. The PCA will seek to acquire potential roost and nest sites within ½ mile of suitable foraging habitat. These include wooded sites near Camp Far West Reservoir (primarily for bald eagle), as well as those adjacent to the winter-flooded rice fields.

The PCA will seek to acquire (through fee title and/or conservation easement) a large (>2,000 acres) reserve, or network of closely connected reserves, supporting a matrix of vernal pool grasslands, winter-flooded rice fields, and fresh emergent wetlands to manage for covered species (e.g., bald eagle, peregrine falcon, giant garter snake, vernal pool species), migratory waterfowl, and shorebirds.

Management Techniques and Tools

The management techniques and tools that will be used to enhance and restore riverine and valley foothill riparian communities (Section 5.3.5, Riverine and Riparian Conservation and Management), vernal pool grassland (Section 5.3.3., Grassland and Vernal Pool Grassland Complex Conservation and management), wetlands (5.3.6., Wetland and Pond Conservation and Management), and to manage wildlife-compatible agriculture (Section 5.3.7., Agricultural Land Conservation and Management) will also benefit bald eagle and American peregrine falcon. Overwintering bald eagles and American peregrine falcons forage for waterfowl, shorebirds, and fish (bald eagles) on large reservoirs such as Camp Far West and in wetlands and flooded rice fields in the western part of the Plan area. Portions of agricultural reserves in the Valley will be managed for rice production to provide foraging habitat in winter flooded-fields for these species. In addition, wildlife-compatible agricultural conservation easements will be used to protect and secure compatible agricultural practices that provide foraging habitat for bald eagles and American peregrine falcon.

Bald eagles tend to be sensitive to human-related disturbance, though sensitivity varies considerably between individuals and populations (Buehler 2000). The PCA will monitor bald eagles and their sensitivity to human-related disturbance on the Reserve System to develop buffers to minimize disturbance around important overwintering habitat.

The PCA will manage potential roost and nest sites within ½ mile of suitable foraging habitat by protecting and maintaining mature stands of oaks, conifers, and large snags and enhancing the regeneration of oaks and conifers. Techniques to enhance regeneration of oak woodlands are discussed in Section 5.3.4 and include thinning stands and clearing undergrowth using mechanical and manual methods.

Uncertainties and Threats

The factors that led to declines of bald eagles and American peregrine falcon (e.g., widespread use of DDT) have been curtailed. Within the Plan area, bald eagles and American peregrine falcon are potentially threatened by predator-control projects, which reduce the availability of prey. Changes in the commercial value of agricultural products could lead to the conversion of agricultural land from crops and agricultural practices that are compatible with bald eagle and American peregrine falcon habitat requirements (e.g., flooding of rice fields) to those that are incompatible (e.g., orchards and monoculture row-crops), causing a reduction in the amount of habitat.

5.7.2 Swainson's Hawk

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of Swainson's hawk foraging and nesting habitats to maintain and potentially increase the abundance of nesting Swainson's hawks in the Plan area.

The following objectives are designed to achieve this goal:

- Protect natural communities and agricultural habitats that provide foraging habitat for Swainson's hawk in large, contiguous reserves (greater than 900 acres) within 10 miles of nesting habitat. Suitable foraging habitat will be acquired to replace foraging habitat taken by covered activities at a ratio of 1:1 (see Chapter 6, Species Condition 3, Condition to Minimize Impacts on Swainson's Hawk);
- Protect natural communities that provide nesting habitat for Swainson's hawk;
- Enhance Swainson's hawk foraging habitat within the Reserve System; and,
- Restore Swainson's hawk nesting and foraging habitat.

Acquisition and Restoration

Landscapes targeted for acquisition and restoration will support a mosaic of grassland and agricultural land for foraging and sparsely distributed trees and riparian woodlands for nesting. Swainson's hawks require extensive foraging habitat within a 10 mile radius of their nest. Agricultural uses that provide higher quality foraging habitat are those that support large populations of prey species that are accessible to Swainson's hawks.

Acquisition of annual grassland, vernal pool grassland complex, oak woodland savanna, fresh emergent wetland, seasonal wetland, and agricultural land used for growing alfalfa, row crops, and as pasture and irrigated pasture will provide foraging habitat for Swainson's hawk. These habitats also provide nesting habitat where scattered trees are found. Acquisition of valley foothill riparian and valley oak woodland within the Valley (less than 200 ft elevation) will also provide nesting habitat for Swainson's hawk. The PCA will focus on acquiring foraging habitat that is within 10 miles of active or recently active nest sites, nesting habitat (e.g., valley foothill riparian) and sites that regularly support foraging Swainson's hawks. Restoration of valley foothill riparian and valley oak woodland within the Valley will restore nesting habitat for Swainson's hawks.

Management Techniques and Tools

Swainson's hawk requires large, flat, open, undeveloped landscapes of grassland or agricultural land suitable for foraging and sparsely distributed trees in open landscapes or valley foothill riparian for nesting.

Many of the restoration and enhancement actions for enhancing and restoring Swainson's hawk habitat are discussed above in the sections on community-level conservation actions for vernal pool grassland complex, agricultural land, valley foothill riparian, valley oak woodland, and oak woodland savanna. The following is a discussion of specific tools to enhance and restore nesting habitat for Swainson's hawk.

Enhancing Populations of Prey Species

The PCA will implement actions to enhance foraging habitat on the Reserve System by minimizing pest control practices that reduce populations of prey species, and by using agricultural practices that provide suitable foraging habitat (on reserves with agriculture operations). Swainson's hawks depend on abundant populations of accessible prey, including small mammals such as ground squirrels, mice, and voles. Minimizing rodent control practices on reserve lands where rodent populations have previously been controlled may be sufficient to increase ground squirrel and other prey populations. Some rodent control may be appropriate, however, in certain areas such as buffers for private lands, and those that contain structures such as levees, stock pond, or dams which often require rodent control in order to protect structural integrity. If prey populations do not increase in response to reduction in control practices, active measures will be implemented, such as creating soil or debris piles to provide habitat for prey species. The response of prey populations to management actions will be monitored and management techniques revised as necessary through adaptive management.

While prey populations may increase in response to management actions, their availability to foraging Swainson's hawks may not increase if vegetation is not managed properly. For example, invasive plants such as thistle and other weedy vegetation may form dense stands in fallow fields that prevent Swainson's hawks from capturing prey. The PCA will manage invasive vegetation cover and structure to enhance foraging habitat for Swainson's hawks with mechanical removal techniques and other methods (e.g., low levels of grazing).

Restoring Nesting Habitat

Within the Central Valley, Swainson's hawks nest primarily in riparian systems, lone trees, oak groves, and roadside trees. Restoration of valley foothill riparian woodland and valley oak woodland (below 200 feet elevation) will provide nesting habitat for Swainson's hawk. Within suitable foraging habitat on the Reserve System, the PCA will also plant small stands of trees, where ecologically appropriate, to provide additional nesting habitat for Swainson's hawk. Species that will be planted include those commonly used for nesting, such as valley oak,

Fremont cottonwood, sycamore and willow. Within the Reserve System, nesting habitat will not be restored within reserve buffers, to minimize potential impacts to Swainson's hawks caused by activities outside the Reserves. Because Swainson's hawks sometimes abandon their nests when disturbed by construction activities and changes in landscape, optimal restoration sites must not be adjacent to private lands that are subject to large-scale construction.

Management of Agricultural Lands
Certain agricultural practices provide suitable foraging habitat for Swainson's hawks. Reserve lands with compatible agriculture practices (below 200 feet elevation) will be managed to provide suitable foraging habitat for Swainson's hawk. Agricultural uses that provide suitable foraging habitat include alfalfa, dry pasture and grasslands with light grazing, and disked fields. Crops not generally used for foraging by Swainson's hawks such as vineyards, orchards, and rice will not be credited as suitable Swainson's hawk foraging habitat.

Threats and Uncertainties

The primary threats to Swainson's hawk are loss of nesting habitat in mature riparian forest, loss and degradation of high quality foraging habitat surrounding suitable nest sites, and mortality caused by pesticides a over-wintering and migratory stop-over sites. Potential mortality caused by pesticides at over-wintering and migratory stop-over sites may limit the ability of Swainson's hawks to respond to management efforts within the Plan area (and throughout their breeding range). Although suitable nest trees will be maintained on reserves and new trees planted, it is not certain if breeding pairs will utilize the trees.

5.7.3 California Black Rail

Biological Goals and Objectives

The PCA will work to protect and increase the extent of California black rail habitats in order to maintain, and potentially increase, the distribution and abundance of California black rail in the Plan area.

The following objectives are designed to achieve this goal:

- Protect fresh emergent wetlands at least one acre in size between 100 – 1,150 feet elevation within an upland complex of grassland or oak savanna to provide suitable nesting habitat for California black rail within the Reserve System;

- Enhance and maintain fresh emergent wetlands to provide suitable habitat for California black rail; and,

- Restore and/or create fresh emergent wetlands at least one acre in size in foothills between 200 – 1,150 feet elevation located within an upland complex of grasslands or open oak savanna to provide suitable nesting habitat to facilitate the expansion of the California black rail metapopulation within the Reserve System.

Acquisition

The PCA will acquire fresh emergent wetlands (> 0.5 acres) and surrounding upland habitat, focusing on sites that support or recently supported California black rail.

Unoccupied wetlands that provide suitable habitat, or could provide suitable habitat (after restoration and/or enhancement), will also be acquired to facilitate the expansion and persistence of the Sierra Nevada foothill metapopulation of California black rails. Suitable wetlands will be restored between 100 – 1,150 feet elevation, on gently sloped lands, and will have a consistent year-round source of water to support suitable hydrological conditions. The PCA will work to identify wetlands within the Plan area for acquisition into the Reserve System that can potentially support California black rail using a combination of remote sensing, GIS, and on-the-ground assessment (where feasible). Where access is permitted, the PCA will survey these wetlands for presence California black rail using established protocol.

Management Techniques and Tools

The management techniques and tools that will be used to enhance and restore wetlands (5.3.6, Wetland and Pond Conservation and Management) will also benefit California black rail. California black rail have specific habitat requirements (see Appendix D, Species Accounts) and management actions designed to enhance and restore habitat for California black rail will be tailored to their specific habitat requirements for wetlands in the Foothills.

California black rail require a consistent supply of water to provide suitable hydrological conditions (i.e., maintain water depths of less than 1.2 inches that do not fluctuate during the year). Irrigation water is an important source of water for Sierra Nevada foothill wetlands that support California black rail (Richmond et al. 2008). If water sources are removed or altered (i.e., leak in irrigation canal that provided water is fixed), the PCA will negotiate with the appropriate water district to purchase enough water to maintain suitable hydrological conditions. If wetland is lost, the project proponent will be required to mitigate for take.

Grazing can impact California black rail when livestock trample wetlands, and/or nests or chicks. Wetlands may be particularly vulnerable during the dry months, when livestock are attracted to such areas for water. On reserves with California black rail or unoccupied wetlands suitable for

California black rail, wetlands will be protected by restricting grazing to adjacent grassland when the grassland is green. This will not only reduce trampling of wetland vegetation, but also allow the wetland to rebound before the breeding season. Marsh sites should be protected from livestock with fences if monitoring efforts indicate that other methods do not adequately protect California black rail wetland habitat.

Wetlands that support or could potentially support California black rail will be revegetated, where necessary, with native plants to provide suitable habitat structure and species composition. Re-vegetation techniques include planting seeds, or propagating and planting mature plants, of native emergent vegetation. Suitable emergent wetland species include *Juncus effusus* and *J. balticus* and cattails (*Typha latifolia* and *T. domingensis*), as well as other associated plants such as *Scirpus acutus*, *Eleocharis macrostachya*, *Paspalum dilatatum*, *Epilobium ciliatum*, and *Leersia oryzoides*. In some wetlands, limited livestock grazing may be used to manage vegetation (see Section 5.3.6, Wetland and Pond Conservation and Management). Although the removal of non-native plants will improve the overall health of occupied wetlands, it may be necessary to minimize the short-term impacts of such removal. Techniques include manual removal that minimize disturbance to rails, and limiting activities during the nesting season. . Where grazing is used to manage vegetation in wetlands occupied by California black rail, grazing will be closely monitored to ensure that impacts to California black rail are minimized.

Pollutants in runoff and can impact California black rails and their habitat. The PCA will work to minimize point and non-point source pollutants from surface flows that provide water to habitat within the Reserve System. Examples of techniques include using filter and buffer strips and following wellhead protection procedures. Where agriculture is practiced on Reserves that have California black rail habitat, other techniques include utilizing soil testing and manure analysis when making nutrient recommendations so that crops receive only the nutrients that they need, applying nutrients when they can be most effectively used by the crop, and utilizing split application systems that allow maximum use by the crop. Because pesticides, including herbicides, can adversely impact water quality, the PCA will minimize the use of herbicides within the Reserve System, especially near aquatic habitats where California black rail occur.

Threats and Uncertainties

It is expected that it will be relatively feasible to successfully restore and create habitat for California black rail in the Sierra Nevada foothills (Jerry Tecklin, personal communication 2009). Habitat restoration is often experimental in nature, however, because environmental variables are different (if even slightly) at each site, and the likelihood exists that restored habitat will never become occupied by nesting California black

rails. Furthermore, the possibility exists that the California black rail metapopulation to the north in Butte, Nevada, and Yuba counties will not expand southward into the Plan area, even if suitable habitat is available.

As demands for water continue to grow in California, there will be increasing pressure to increase efficiency and thereby reduce water loss (both intentional and unintentional) from agricultural delivery systems (e.g., canals). California black rail habitat will be lost when a consistent source of water is eliminated due to water conservation measures and repair of water infrastructure. When occupied habitat is threatened by water conservation measures, the PCA will work to purchase water to protect habitat.

5.7.4 Bank Swallow

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of bank swallow nesting and foraging habitats within the Plan area.

The following objectives are designed to achieve this goal:

- Protect riverine, valley foothill riparian, and adjacent uplands to protect bank nesting and foraging habitat; and,
- Enhance foraging and nesting habitat for bank swallows within the Reserve System.

Acquisition, Restoration, and Enhancement

The primary factor that limits the bank swallow population in the Plan area is the availability of suitable nesting habitat. Bank swallows are aerial insectivores (they catch insects in flight) and forage over many land-cover types, particularly those near nest colonies, so foraging habitat is widely available. Bank swallows dig nest burrows in nearly vertical banks/cliff faces and require substrates comprised of soft soils such as fine sandy loam, loam, silt loam, and sand (Garrison et al. 1987). Rivers with natural water flow and seasonal flooding provide the best habitat, as this helps to erode banks and create or maintain suitable nest sites. Within the Plan area, the only known bank swallow nest colony occurs on the north bank of the Bear River on the Patterson Sand & Gravel property, downstream of Camp Far West Reservoir. The Bear River supports hydrological processes (and large enough banks) that provide suitable habitat. (Bank swallow may also nest along Folsom Lake and the American River in the Plan area. However, the PCA will not acquire land in this area because it is already under public ownership). Bank swallows may breed on other stream systems in the Plan area if suitable habitat becomes available. If

so, any site supporting a bank swallow colony should be targeted for acquisition.

The PCA will seek to acquire and protect riverine and riparian habitat along the Bear River (particularly downstream of Camp Far West Reservoir), when willing sellers are available, to maintain and possibly increase the extent of bank swallow nesting and foraging habitat within the Plan area. Acquisition and management of land adjacent to colony sites will help to protect nest habitat from human-related degradation (e.g., climbing on banks) and will protect and enhance foraging habitats. In addition, riverine and riparian acquisition, restoration, and enhancement actions on other stream systems within the Plan area (e.g., Auburn Ravine, Coon Creek) will protect banks that may become suitable for nesting. Riverine, riparian, and adjacent grassland communities that are acquired by the PCA will also provide foraging habitat for bank swallows.

Management Techniques and Tools

Many of the actions for enhancing and restoring riverine and riparian habitat (see Section 5.3.5, Riverine and Riparian Conservation and Management) will also enhance habitat for bank swallows. The following is a discussion of specific tools to enhance and restore nesting habitat for bank swallows.

Erosive forces are required to maintain the vertical banks that are suitable for nesting. Flood control and bank stabilization projects (e.g., rip-rap) lead to loss of habitat because they reduce or eliminate the natural flooding and erosion regimes that create new nest colony habitat. The PCA will set-back levees and remove existing bank stabilization structures to help restore suitable nesting habitat. It will minimize the use of bank stabilization projects, wherever possible, to restore hydrologic processes that create nesting habitat.

Artificial banks have been constructed, and natural banks have been enhanced, on the Sacramento River as mitigation for loss of colony sites from flood control projects (Garrison 1991). These nest sites were used with nest success rates similar to those at natural sites; however, artificial and enhanced sites were abandoned within three years due to lack of maintenance. Creation and enhancement of natural colony sites offer short-term solutions to habitat loss. Artificial and enhanced nest sites, however, do not provide cost-effective, long-term solutions to habitat loss due to the high cost of construction and maintenance and the small area that can be created and enhanced. Therefore, artificial and enhanced colony sites are not recommended by the CDFG Recovery Plan as a primary means to compensate for lost habitat (CDFG 1992) and will not be employed as part of the PCCP bank swallow conservation strategy.

Threats and Uncertainties

The primary threats to bank swallows are flood-control and bank protection projects that eliminate nesting habitat in river banks. High spring floods that can scour colonies along riverbanks also pose a threat. Large-scale environmental change, such as gradual, statewide loss of natural riverbanks, may negatively impact bank swallows and result in population declines across California. This could limit colonization of suitable and restored habitat within the Plan area.

5.7.5 Western Burrowing Owl

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of burrowing owl habitat in the Plan area to support overwintering burrowing owls and facilitate the expansion of a breeding population of burrowing owls into the Plan area.

The following objectives are designed to achieve this goal:

- Protect vernal pool grassland complexes, annual grassland, valley oak woodland, and agricultural lands in production suitable for use by western burrowing owl (i.e., alfalfa, rice, row crops, and irrigated pasture) in the Valley; and,

- Enhance and restore western burrowing owl habitats within the Reserve System.

Acquisition and Restoration

Acquisition of vernal pool grassland complexes, annual grassland, valley oak and oak woodland savanna (open oak woodlands with a significant grassland component), and agricultural lands in production suitable for use by burrowing owl (i.e., alfalfa, rice, row crops, and irrigated pasture) in the Valley into the Reserve System will help protect overwintering and potential breeding habitat for burrowing owls. The PCA will acquire sites that recently supported burrowing owls and sites that support extant populations of ground squirrels. Restoration of vernal pool grassland complexes and valley oak woodland will also provide habitat for burrowing owl.

Management Techniques and Tools

Many of the actions for enhancing and restoring vernal pool grassland complex, annual grassland (Section 5.3.3, Grassland and Vernal Pool Complex Conservation and Management), and agricultural land (Section

5.3.7, Agricultural Land Conservation and Management) will enhance and restore habitat for burrowing owl. The following is a discussion of specific tools to enhance and restore overwintering and nesting habitat for burrowing owls.

Sites specifically managed to provide habitat for burrowing owls will be grazed by livestock to maintain a short-grass vegetation structure, as short vegetation is an important feature of burrowing owl habitat. Without grazing, annual grasslands often become dominated by tall, dense stands of grasses such as ripgut brome and wild oats that are unsuitable for burrowing owls. Mowing and careful use of controlled burns can also be used to manage grasslands to maintain short vegetation; however, mowing is impractical for large sites. If undertaker, mowing should be completed before February 15, and should not occur until fledglings are independent of their parents.

The PCA will encourage colonization by California ground squirrels in grasslands within the Reserve System. Ground squirrels and other animals create and maintain the burrows used by burrowing owls. To facilitate the expansion of ground squirrel populations, the PCA will minimize the use of rodenticides except when needed to protect the integrity of structures such as levees, stock pond dams or to prevent nuisance (as defined in the Fish and game Code Sections 4150 and 4152) populations on adjacent private lands.

In areas where ground squirrels are not present, but the habitat is otherwise suitable, artificial burrows may be installed to create breeding and over-wintering habitat. Artificial burrows can be costly to maintain and have had mixed success. Therefore, the use of artificial burrows to encourage colonization of sites by western burrowing owls should be used only as a temporary measure while measures to restore ground squirrel populations are developed and implemented.

Threats and Uncertainties

There are no recent occurrences of breeding burrowing owls in the Plan Area (CNDDB 2010; Pandolfino pers. comm. 2009) and burrowing owls are rarely seen during the non-breeding season. It is uncertain whether individuals will colonize sites and breed within the Reserve System, even if suitable habitat is enhanced and restored. The likelihood of dispersal of breeding individuals to the Plan area depends in part on the size and growth of regional populations, as more individuals tend to disperse from large, growing populations.

5.7.6 Cooper's Hawk

The PCA will work to maintain or increase the extent of Cooper's hawk habitat within the Plan area.

The following objectives are designed to achieve this goal:

- Protect valley foothill riparian woodland, oak woodland and savanna that provide suitable breeding and foraging habitat for Cooper's hawk as part of the Reserve System; and,
- Enhance and restore habitats for Cooper's hawk within the Reserve System.

Acquisition

The PCA will acquire valley foothill riparian and oak woodland as part of the Reserve System, with emphasis on nest sites and areas that provide suitable breeding and foraging habitat for Cooper's hawk .

Management Techniques and Tools

Many of the actions for enhancing and restoring oak woodlands (Section 5.3.4, Oak Woodland Conservation and Management) and valley foothill riparian (Section 5.3.5, Riverine and Riparian Conservation and Management) will benefit Cooper's hawk. Those management efforts include enhancing and restoring riparian habitats to promote structural diversity and enhancing the regeneration of oak woodlands.

Threats and Uncertainties

Habitat loss and degradation are primary threats to Cooper's hawk, especially in the oak woodlands and savannas of the foothill region. The protection and enhancement of oak woodland and riparian woodlands in the Reserve System and project-level avoidance of the stream-zone will protect Cooper's hawk from these threats in the Plan area.

5.7.7 Loggerhead Shrike

The PCA will work to maintain or increase the extent of loggerhead shrike habitat within the Plan area.

The following objectives are designed to achieve this goal:

- Protect the diversity of land-cover types that provide habitat for loggerhead shrike. These include grasslands with scattered shrubs and trees, shrubby or open woodlands with a fair amount of grass cover, and edges of riparian woodland; and,
- Enhance and restore habitat for loggerhead shrike within the Reserve System.

Acquisition

The PCA will acquire sites that support breeding loggerhead shrike and areas that include loggerhead shrike habitat. .

Management Techniques and Tools

Many of the actions for enhancing and restoring annual grasslands, vernal pool grassland complexes (Section 5.3.3, Grassland and Vernal Pool Complex Conservation and Management), valley oak woodland, oak woodland savanna (Section 5.3.4, Oak Woodland Conservation and Management), and agricultural land (Section 5.3.7, Agricultural Land Conservation and Management) will benefit loggerhead shrike.

In addition to community-level management actions, the PCA will plant and seed native shrub and tree species at low densities in habitat suitable for loggerhead shrike to provide low-growing, thorny and thick shrubs and trees for perching, nesting, and impaling prey. This is particularly appropriate along fence lines and throughout otherwise open pastures and fields and along the edge of valley foothill riparian woodland. To enhance populations of prey species (e.g., arthropods, amphibians, small to medium sized reptiles, small mammals and birds), the PCA will minimize the use of pesticides within the Reserve System.

Threats and Uncertainties

The threats to loggerhead shrike in California are poorly understood, though they likely involve habitat loss and degradation, collisions with vehicles, and possibly poisoning by pesticides (summarized in Yosef 1996; and Humple 2008). Chlorinated hydrocarbons (e.g., DDT) have been found in high concentrations in loggerhead shrikes, though the role of pesticides and other contaminants in the decline of loggerhead shrike populations remains unclear because the concentrations required to reduce populations are unknown (Yosef 1996; Herkert 2004). The decline of loggerhead shrike coincides with the introduction and increased use of pesticides containing chlorinated hydrocarbons in the 1940s-1970s (Yosef 1996), but continued in some populations (i.e., Illinois) through the 1990's despite a large reduction in the level of pesticides in loggerhead shrike eggs (Herkert 2004). Persistence of these chemicals in the environment could potentially impact loggerhead shrike.

5.7.8 Northern Harrier

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of northern harrier habitat within the Plan area.

The following objectives are designed to achieve this goal:

- Protect suitable habitat for breeding and foraging;
- Enhance northern harrier breeding and foraging habitats within the Reserve System; and,
- Restore and/or create fresh emergent and seasonal wetland breeding habitat within a landscape matrix of suitable foraging habitat.

Acquisition

Acquisition and restoration of vernal pool grassland complexes, annual grassland, wetlands, and suitable agricultural land (e.g., alfalfa, row crop, rice, irrigated pasture) will protect breeding and foraging habitat for northern harrier in the Reserve System. The PCA will seek to acquire acquiring sites that support breeding northern harrier.

Management Techniques and Tools

Many of the management techniques and tools that will be used to enhance and restore grasslands and vernal pool grassland complexes (Section 5.3.3, Grassland and Vernal Pool Complex Conservation and Management), wetlands (5.3.6, Wetland and Pond Conservation and Management), valley foothill riparian (5.3.5, Riverine and Riparian Conservation and Management), and agricultural land (Section 5.3.7, Agricultural Land Conservation and Management) will enhance and restore foraging and nesting habitat for northern harrier. The PCA will implement specific actions to protect nests and nest sites. Northern harrier nests in open grassland and wetland habitats with thick vegetation and in agricultural fields. Within the reserve system, nest sites will be fenced to limit access by livestock or protected by curtailing grazing during the nesting season (March 15 – July 31). Nest sites will also be protected from vegetation management activities (e.g., mowing and hand removal of invasive vegetation) by limiting these activities at and around nest sites from occurring during the nesting season. To protect nests from flooding, the PCA will avoid raising water levels in wetlands, where managed, during the nesting season.

Threats and Uncertainties

The primary threats to breeding and overwintering northern harrier throughout its range, and within the Plan area, include the loss, degradation, and fragmentation of foraging and breeding habitat, nest failure from human disturbance, predator-control projects, and agricultural practices. Changes in the commercial value of agricultural products could lead to the conversion of agricultural land from crops that are compatible with northern harrier habitat requirements (e.g., alfalfa) to those that are

incompatible (e.g., orchards and monoculture row-crops), causing a reduction in the amount of northern harrier habitat.

5.7.9 Ferruginous Hawk

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of habitats for overwintering ferruginous hawks within the Plan area.

The following objectives are designed to achieve this goal:

- Protect large tracts of grassland, vernal pool grassland complex, and pasture suitable for overwintering ferruginous hawks within the Reserve System; and,
- Enhance foraging habitat for overwintering ferruginous hawks.

Acquisition

Acquisition of annual grassland, vernal pool grassland complexes, and pasture will protect habitat for ferruginous hawks. The PCA will also seek to acquire sites that support overwintering ferruginous hawks.

Management Techniques and Tools

Many of the actions for enhancing and restoring grasslands, vernal pool grassland complexes (Section 5.3.3, Grassland and Vernal Pool Complex Conservation and Management), and pasture (Section 5.3.7, Agricultural Land Conservation and Management) will enhance habitat for ferruginous hawk. Management actions that will benefit ferruginous hawk include those that will enhance prey populations (e.g., small mammals) and manage vegetation structure in grasslands.

Threats and Uncertainties

Population declines of ferruginous hawks have been attributed to habitat degradation and mortality on breeding and wintering grounds. Factors contributing to habitat degradation include cultivation, grazing, fire, and control of small mammal prey species. Habitat loss has been caused primarily by development and land use changes. In areas where ferruginous hawks subsist on ground squirrels, poisoning of ground squirrels may reduce hawk numbers through secondary poisoning. Factors causing mortality of ferruginous hawks on their breeding grounds (outside the Plan Area) may limit the number of over-wintering

ferruginous hawks in the Plan area potentially and limit the effectiveness of management actions on the Reserve System.

5.7.10 Yellow Warbler and Yellow-breasted Chat

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of breeding and migratory stopover habitat for yellow warbler and yellow-breasted chat in the Plan area. Yellow warbler and yellow-breasted chat use similar natural communities in the Plan area, so conservation actions to benefit these species are discussed together.

The following objectives are designed to achieve this goal:

- Protect large patches of contiguous valley foothill riparian woodlands and surrounding upland oak woodland in the Foothills to buffer nesting sites from predators and brood parasites and provide stopover habitat.

- Enhance and restore valley foothill riparian woodlands to improve breeding and migratory stopover habitat for yellow warbler and yellow-breasted chat.

Acquisition

Acquisition and restoration of valley foothill riparian woodlands will protect breeding and migratory stopover habitat for yellow warbler and yellow-breasted chat. To provide suitable buffers from predators and brood parasites that thrive in the agricultural and urban/suburban matrix, the PCA will acquire oak woodlands that are sufficiently large (>300 feet wide) and that are adjacent to protected valley foothill riparian habitat in the Foothills.

Management Techniques and Tools

The management techniques that will be used to enhance and restore valley foothill riparian communities (Section 5.3.5, Riverine and Riparian Conservation and Management) will also benefit yellow warbler and yellow breasted chat. Those management actions include

- Restoring and enhancing riparian understory vegetation to promote early successional and complex vegetative structure; and

- Managing grazing livestock to minimize damage to understory vegetation (e.g., fencing off portions of riparian woodland to reduce grazing pressure).

Threats and Uncertainties

Loss, fragmentation, and degradation of riparian habitat are the major factors contributing to the historic decline of breeding yellow warblers in the Central Valley. Intense grazing by cattle, especially where willow growth is removed or reduced, can severely degrade habitat. Restoration programs are beginning to yield success, however, as yellow warblers have recently returned in small numbers to breed at restored sites at the San Joaquin River National Wildlife Refuge, where they had been previously extirpated.

Brood parasitism and predation of nest contents (i.e., eggs, nestlings) can reduce reproductive success of individual yellow warblers and yellow-breasted chats; however, impacts to populations of these species is variable and not well understood (Heath 2008; Comrack 2008). For example, densities of yellow warbler at Mono Lake restoration sites are high, and steadily increasing, despite relatively high rates of parasitism and no cowbird management (PRBO unpubl. data, as cited in Heath 2008).

Monitoring reproductive success (and sources of nest predation) is time and labor intensive (nests can be difficult to find, and must be monitored frequently to determine the outcome [e.g., fledged or depredated]). The PCA will consider conducting a directed study to assess brood parasitism and nest predation rates on yellow warbler, yellow-breasted chat, and Modesto song sparrow nesting in riparian habitats if future data from other sources indicate that nest predation is threatening populations of these species in the Plan area. If nest predation and/or parasitism rates are contributing to population decline, the PCA will consider controlling non-native nest predators (e.g., feral cats) and/or brown-headed cowbirds at sites where monitoring indicates that nest predation rates by non-native species and/or brood parasitism are high. Control methods (e.g., trapping) can be costly, controversial, and must be continued in perpetuity to maintain benefits; therefore the PCA will evaluate the use of brown-headed cowbird and nest predator control methods in collaboration with the Wildlife Agencies before implementing a program to control nest predators and brown-headed cowbirds. Furthermore, the PCA will use a pilot trapping study to determine the effectiveness of control in improving reproductive success of target bird species before implementing a control program.

5.7.11 Modesto Song Sparrow

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of Modesto song sparrow habitat within the Plan area.

The following objectives are designed to achieve this goal:

- Protect large patches of contiguous valley foothill riparian woodland and surrounding upland oak woodland in the Foothills to buffer nesting sites from predators and brood parasites. Acquire valley oak woodland, and wetlands to support habitat for Modesto song sparrow;
- Enhance riparian and wetland habitats to support Modesto song sparrow; and,
- Restore and/or create fresh emergent and seasonal wetland, valley foothill riparian woodland, and valley oak woodland breeding habitat for Modesto song sparrow.

Acquisition

The PCA will acquire valley foothill riparian woodland, fresh emergent and seasonal wetland, and valley oak woodland that provide suitable habitat for Modesto song sparrow. In addition, the PCA will emphasize acquisition of potential nesting sites that are adjacent to protected oak woodland that can provide buffers between nests and the forest edge and help reduce rates of nest predation and brood parasitism by species that thrive in the agricultural and suburban matrix.

Management Techniques and Tools

Many of the actions for enhancing and restoring valley foothill riparian woodland (Section 5.3.3, Riverine and Riparian Conservation and Management), wetlands (5.3.6, Wetland and Pond Conservation and Management), valley oak woodland (5.3.4, Oak Woodland Conservation and Management), and agricultural land (5.3.7, Agricultural Land Conservation and Management) will enhance and restore habitat for Modesto song sparrow.

Techniques discussed in the above mentioned community-level sections that will be directed to manage habitat for Modesto song sparrow include:

- Restoring the native species composition and structural diversity of understory in valley foothill riparian woodland and wetlands;
- Minimizing impacts to Modesto song sparrow (particularly during the nesting season [March 1 – August 15]) that may be caused by vegetation management;
- Reducing populations of invasive plants and non-native wildlife (including nest predators); and,
- Protecting nests from livestock damage.

Reserves with agricultural uses will be managed to provide nesting and foraging habitat for Modesto sparrow in vegetated buffer strips, hedge rows, shelterbelts, and ditches with riparian vegetation.

Threats and Uncertainties

High predation rates of nest contents (eggs, nestlings) associated with increased habitat fragmentation is a potentially serious threat to populations (Gardali 2008). Brown-headed cowbird parasitism rates are not considered to be a large influence on reproductive success (Gardali 2008); however, grazing by cattle appears to degrade habitat by changing vegetation structure and, exposing nests to higher levels of brood parasitism (Larison et al. 1998) and possibly predation. (See discussion on controlling nonnative nest predators and brown-headed cowbirds in Section 5.5.10, Threats and Uncertainties). Destruction and degradation of habitat is more important now than in historical times because 95 percent of the habitat has already been lost (Humple and Geupel 2000; Gardali 2008). The possibility exists that restored and enhanced sites may not be colonized; however, regional populations of Modesto song sparrow appear robust enough to supply dispersing individuals to colonize restored and enhanced sites.

5.7.12 Grasshopper Sparrow

The PCA will work to maintain or increase the extent of habitats for grasshopper sparrow to facilitate the expansion of a breeding population into the Plan area.

The following objectives are designed to achieve this goal:

- Protect large tracts of short herbaceous annual grassland, vernal pool grassland complex, and pasture land with scattered trees and shrubs for perches. Land-cover types that will be protected within the Reserve System that will provide habitat for grasshopper sparrow include annual grassland, vernal pool grassland complex, pasture and irrigated pasture;
- Enhance grassland habitats to facilitate the expansion of breeding pairs of grasshopper sparrows into the Reserve System; and,
- Restore grasslands with native species.

Acquisition

Acquisition of annual grassland, vernal pool grassland complex, oak woodland savanna (where trees are sparse and adjacent to grasslands), and irrigated pasture will protect habitat for grasshopper sparrow. The

PCA will also seek to acquire sites that support or recently supported grasshopper sparrow.

Management Techniques and Tools

Many of the actions for enhancing and restoring grasslands, vernal pool grassland complex (Section 5.3.3, Grassland and Vernal Pool Complex Conservation and Management), oak woodland savanna (Section 5.3.4, Oak Woodland Conservation and Management) and pasture (Section 5.3.7, Agricultural Land Conservation and Management) will enhance habitat for grasshopper sparrow.

Large patches of grassland will be managed to provide suitable habitat for grasshopper sparrow by maintaining grasslands at short to middle-height with patches of bare ground, short litter depth and cover, and scattered shrubs using burning, grazing, and/or mowing. Grazing and other grassland management practices for grasshopper sparrow habitat will be scheduled on a rotational basis to allow patches to grow to middle-height and to create a diversity of grassland structural types within the landscape. Where controlled burns are used to manage grasslands, burns will be conducted during fall through late winter and on a rotational basis to provide a mosaic of burned and unburned areas to ensure the availability of suitable habitat for management-sensitive species and to avoid impacts to nesting birds. Similarly, haying and mowing in grasslands will be restricted during the nesting season (March 1 – July 31) to minimize disturbance and destruction of nests, their contents, and fledglings.

Threats and Uncertainties

Loss and fragmentation of suitable grassland habitat is the primary threat to grasshopper sparrow in California. Intensive grazing also can make habitat unsuitable for grasshopper sparrow by altering vegetation structure. The relationship between grazing intensity and habitat quality in California is unknown. Intensive grazing may reduce vegetation height below suitable levels, whereas lack of grazing may promote invasion by exotics and allow woody vegetation to encroach into grasslands. The PCA will monitor the relationship between grazing practices and the distribution and abundance of grasshopper sparrow to develop management practices that are compatible with, and enhance, habitat for grasshopper sparrow.

5.7.13 Tricolored Blackbird

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of tricolored blackbird habitat within the Plan area to potentially increase the abundance and distribution of breeding tricolored blackbirds within the Plan area.

The following objectives are designed to achieve this goal:

- Protect at least five tricolored blackbird breeding sites that support, recently supported, or could support (once restored) tricolored blackbird colonies. Breeding habitat will be at least two acres and within 1,600 feet of open water. Land-cover types that will be protected within the Reserve System that will provide breeding habitat for tricolored blackbird include fresh emergent and seasonal wetlands, and grassland that support large patches of blackberry;

- Protect at least 200 acres of suitable foraging habitat for tricolored blackbird within three miles of protected and occupied breeding sites as part of the Reserve System. Land-cover types that will be protected within the Reserve System that support suitable foraging habitat include: vernal pool grassland complex, annual grassland, valley foothill riparian, and agricultural land with alfalfa, irrigated pasture, rice, and row crops.

- Enhance wetland breeding habitat to support tricolored blackbird nesting colonies.

- Restore and/or create fresh emergent wetlands within the Reserve System to expand the extent of tricolored blackbird breeding habitat within the Plan area.

- Enhance and/or restore suitable foraging habitat within three miles of protected, occupied, and potentially occupied breeding sites within the Reserve System.

Acquisition and Restoration

Land-cover types that will be protected and restored within the Reserve System, and that will provide breeding habitat for tricolored blackbird, include fresh emergent and seasonal wetlands, grassland and riparian areas that support large patches of Himalayan blackberry. Most recently, colonies were noted at the following locations where suitable habitat exists: Caperton and Sterling Parkway; Dowd and Waltz Roads; Gladding and Highway 65; Gleason Ranch on Sunset Boulevard West; Little Ben; Twelve Bridges and Highway 65 West. The sites that support the largest colonies (greater than 2,000 individuals averaged over the

previous three years) will receive top priority for acquisition. Furthermore, sites that support active or recently active colonies will receive priority over restoring, or protecting former colony sites. Breeding sites should be, at a minimum, two acres to support a large colony (e.g., 25,000 birds) (Hamilton and Meese 2005).

For active breeding sites that cannot be acquired within the Reserve System, the PCA may offer financial incentives to private landowners to protect and enhance suitable breeding pond and wetland habitat. Emphasis should be placed on providing suitable nesting habitat away from crop fields (Tricolored Blackbird Working Group 2007).

Colonies must have suitable foraging habitat within three miles of breeding sites. The PCA will focus acquisition efforts to protect and restore suitable foraging habitat within three miles of breeding sites. Foraging habitat can be composed of a matrix of native habitats and agricultural land uses. Tricolored blackbirds forage in native habitats such as wet and dry vernal pools and other seasonal wetlands, riparian habitats, and open marsh borders. Targeting vernal pool complex habitat for protection and restoration within three miles of breeding sites will help to maximize allocation of resources to protect covered species and habitats. Agricultural lands also provide valuable foraging habitat, including crops such as rice, alfalfa, irrigated pastures, ripening or cut grain fields (e.g., oats, wheat, silage, and rice), as well as annual grassland (e.g., grazed and ungrazed grassland), cattle feedlots, and dairies (Hamilton and Meese 2005). Row crops, nut tree crops, and vineyards do not provide foraging habitat for tricolored blackbirds.

Management Techniques and Tools

Many of the enhancement and restoration actions discussed above in the community-level conservation and management sections for wetlands and ponds (Section 5.3.6, Wetland and Pond Conservation and Management), vernal pool grassland complexes (Section 5.3.3, Grassland and Vernal Pool Complex Conservation and Management), valley foothill riparian (Section 5.3.5, Riverine and Riparian Conservation and Management), and agricultural land (Section 5.3.7, Agricultural Land Conservation and Management) will enhance habitat for tricolored blackbird. The following is a discussion of specific tools to enhance and restore nesting habitat for tricolored blackbird.

The PCA will manage invasive vegetation in all natural communities. In the Plan area, tricolored blackbirds nest predominantly in exotic Himalayan blackberry. Himalayan blackberry stands on the Reserve System currently or recently used by tricolored blackbirds for nesting will not be removed unless the colony site has been abandoned for at least three breeding seasons. Where stands of Himalayan blackberry are to be removed, those that supported tricolored blackbird colonies will be removed gradually, over three to four years, to transition from non-native

vegetation to native vegetation that is structurally similar. Furthermore, removal of non-native vegetation that supported a nesting colony will be restricted during the nesting season (March 1 – August 15). After invasive plant removal, wetland nesting habitat will be restored with native vegetation suitable for nesting substrates, such as dense stands of cattail and bulrush. Cattails may need to be burned occasionally (every 2-3 years) to maintain suitable vegetation (Hamilton and Meese 2005).

Tricolored blackbirds tend to forage in habitats with low-growing vegetation and a natural flooding cycle (Beedy 2008). Livestock grazing will be used in vernal pool grassland complexes and irrigated pasture to maintain vegetation height and structure suitable for foraging tricolored blackbirds. Where necessary to protect wetlands and tricolored blackbird colonies from being trampled by livestock, wetlands or other colony sites will be fenced during the nesting season to restrict access by livestock.

Colonies nesting in cattail marshes may be vulnerable to predation of nest contents by black-crowned night herons (Hamilton and Meese 2005). It may be necessary to develop a non-lethal predator management plan (e.g., repeated flushing of black-crowned night heron colonies to encourage relocation away from tricolored blackbird colonies), especially at sites where monitoring indicates that colonies nesting in wetland habitats are suffering high levels of nest predation.

Threats and Uncertainties

Changes in agricultural uses (e.g., due to changes in market demand, new techniques, etc.) and management may reduce the quality and quantity of foraging habitat within a three mile radius of nesting colonies if these habitats are not protected by easements or acquisition. For example, the conversion of annual crops to perennial grapes and nut trees consequently eliminates foraging habitat since the latter is not potential foraging habitat.

Habitat restoration is often experimental in nature, particularly because environmental variables are different (if even slightly) at each site, and the likelihood exists that restored habitat will never become occupied by a nesting colony of tricolored blackbirds.

5.7.14 Vernal Pool Invertebrates (Conservancy Fairy Shrimp, Vernal Pool Fairy Shrimp, and Vernal Pool Tadpole Shrimp) and Plants (Bogg's Lake Hedge Hyssop, Dwarf Downingia, Legenere, Ahart's Dwarf Rush, and Red Bluff Dwarf Rush)

Biological Goal and Objectives

Because the covered vernal pool invertebrates and plants inhabit the same or similar habitats, frequently co-occur, and are subjected to the same or similar management actions, they are discussed together in this section.

The PCA will work to maintain or increase the extent of vernal pool grassland complexes and to maintain, or facilitate the expansion of, the populations and distributions of covered vernal pool invertebrates (Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp) and plants (Bogg's Lake hedge hyssop, dwarf downingia, legenere, Ahart's dwarf rush, and Red Bluff dwarf rush) in the Plan area.

The following objectives are designed to achieve this goal:

- Protect vernal pool grassland complexes and other seasonal wetlands in large, contiguous blocks (greater than 1,000 acres) to support hydrological and ecosystem function, representative biodiversity, and covered species within the Reserve System;
- Protect contiguous tracts of grasslands and other upland habitats surrounding vernal pool complexes to protect hydrological (e.g., surface and sub-surface flows) and ecological processes (e.g., movement of species such as western spadefoot and pollinators between habitats) as necessary to sustain viable vernal pool ecosystems within the Plan area;
- Enhance individual vernal pools and vernal pool complexes by promoting regeneration and recruitment of representative species, controlling invasive, non-native species, and promoting hydrological and other natural processes to support native biodiversity and populations of covered species;
- Enhance grasslands and pastures to promote native biodiversity and populations of covered species within the Reserve System; and,
- Restore vernal pool complexes on rice-fields and other lands that once supported vernal pools.

Acquisition

To protect covered vernal pool crustaceans and plants, the PCA will acquire vernal pool grassland complexes based on the acquisition criteria described in Section 5.3.3, Grassland and Vernal Pool Grassland Complex Conservation and Management.

In addition, the PCA will acquire (and subsequently enhance) contiguous tracts of upland and non-vernal pool wetland habitats that surround vernal pool complexes to buffer vernal pools and provide habitat for upland species, including pollinators of vernal pool plants. Such tracts may contain fresh emergent and other types of seasonal wetlands, valley foothill riparian woodland, oak woodland, and annual grassland. Agricultural land-cover types such as irrigated pasture may be acquired and restored to provide upland habitat suitable for buffering vernal pool complexes.

Management Techniques and Tools

The covered vernal pool invertebrates and plants are generally threatened by habitat destruction, fragmentation, invasion by non-native species, and alterations to hydrological functions. Furthermore, many of these species co-occur. Therefore, all species will benefit from the landscape and community-level conservation actions discussed in Section 5.3.2, Landscape Conservation and Management, and Section 5.3.3, Grassland and Vernal Pool Grassland Complex Conservation and Management. The community-level management actions discussed in Section 5.3.3 will:

- Maintain and restore the hydrology of vernal pools and vernal pool grassland complexes;
- Maintain and enhance vernal pool water quality;
- Restore vernal pools and vernal pool grassland complexes;
- Remove and/or control invasive, non-native vegetation and animals;
- Re-introduce native vernal pool species, where necessary and appropriate; and
- Enhance habitat for native populations of plants and animals.

In many cases, management has been focused on vernal pool systems, rather than species, and effective habitat management and restoration techniques have not been developed specifically for the vernal pool invertebrates and plants covered in this Plan (USFWS 2005). The status of covered vernal pool invertebrates and plants, and the effects of vernal pool management actions on populations of covered vernal pool invertebrates and plants, will be monitored. The PCA will monitor

populations of covered vernal pool species in the Reserve System, and their responses to management actions, to develop and refine species-specific management actions (see Chapter 7, Monitoring and Adaptive Management).

Threats and Uncertainties

Although habitat suitable for Conservancy fairy shrimp, vernal pool tadpole shrimp, Bogg's Lake hedge hyssop, legenere, Red Bluff dwarf rush, and Ahart's dwarf rush occurs in the Plan area, the distribution of these species in the Plan area is generally unknown. (There are three known occurrences of vernal pool tadpole shrimp, one known occurrence of Conservancy fairy shrimp, four known occurrences of Bogg's Lake hedge-hyssop, three known occurrences of legenere, one known occurrence of Red Bluff dwarf rush, and one known occurrence of Ahart's dwarf rush in the Plan area). Uncertainty in the distribution of these species will limit the ability of the PCA to acquire occupied habitat, to monitor populations, and to develop species-specific restoration and management actions. Furthermore, because many of the known populations of Ahart's dwarf rush and Red Bluff dwarf rush in California have not been observed in at least 15 years, very little information exists on their ecology to inform management strategies.

Vernal pool management actions are expected to benefit vernal pool communities and potentially, covered species by enhancing hydrological function and native biodiversity. There is some uncertainty in this regard. For example, control of invasive plants through grazing will benefit the vernal pool community by enhancing the biodiversity of native species but some covered plant species may be negatively impacted by trampling or may be consumed by livestock if stocking rates are too high. The effects of restoration and management actions on vernal pool plants and invertebrates will be monitored, and management actions improved, through the adaptive management process.

Because many of the vernal pool covered plant species are annuals that do not bloom every year, it may be difficult to determine whether a site is potential habitat for one or more of the covered species. If a species has not been seen recently at a particular vernal pool, it is difficult to know whether that is due to lack of seed bank, lack of pollinators, inhospitable hydro-period, inhospitable soil conditions, or temporary fluctuations in climate. For instance, populations of Bogg's Lake hedge-hyssop fluctuate in abundance from year-to-year; estimates of some populations have varied from no plants in a dry year to thousands in a wet year.

Vernal pool invertebrates and plants may colonize existing or restored pools where they currently do not exist. However, the dispersal abilities of the covered vernal pool species may be limited, particularly in the fragmented landscape of the Plan area. When protected existing and

restored pools remain unoccupied by covered species, translocation of cysts and seeds from local sites may be used to inoculate them.

5.7.15 Western Spadefoot Toad

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of western spadefoot toad habitats within the Plan area.

The following objectives are designed to achieve this goal:

- Protect large tracts (greater than 1,000 acres) of vernal pool grassland complex, riverine, valley foothill riparian woodland, fresh emergent wetlands and upland habitats (e.g. grassland, pasture, and oak woodland) suitable for breeding and foraging, providing cover during dormancy, and facilitating movement between populations and between terrestrial and wetland breeding habitats within the Reserve System. Wetland breeding habitat should be surrounded by upland habitat that extends at least 1,200 feet from the wetland habitat (USFWS 2005).

- To enhance the likelihood of long-term persistence of western spadefoot metapopulations in the Plan area, protect habitat corridors between suitable breeding habitat areas to allow colonization (and re-colonization after possible extinction) of unoccupied habitat and gene flow between metapopulations.

- Enhance habitats to provide suitable wetland and terrestrial habitat for western spadefoot toad in the Reserve System.

- Restore suitable habitat to promote the recovery and long-term conservation of western spadefoot toad.

Western spadefoot toad will benefit from landscape and vernal pool grassland complex community-level conservation actions, as vernal pool grassland complex is the primary habitat for western spadefoot toad in the Plan area.

Acquisition and Restoration

To protect western spadefoot toad, the PCA will acquire vernal pool grassland complexes based on the acquisition criteria described in Section 5.3.3, Grassland and Vernal Pool Grassland Complex Conservation and Management. The vernal pool grassland complex acquisition strategy is designed to acquire and restore landscapes of vernal pool grassland complexes that provide substantial amounts of

suitable aquatic breeding and upland habitat (for movement, foraging, cover during dormancy, and other ecological functions) for western spadefoot toad. Acquisition of other wetland types (e.g., fresh emergent wetlands, riverine and riparian) and surrounding upland habitats (e.g., valley oak and other oak woodland) will also provide suitable habitat for western spadefoot toad.

Management Techniques and Tools

Many of the enhancement and restoration actions discussed above in the community-level conservation and management section for grasslands and vernal pool grassland complexes (Section 5.3.3) will enhance and restore habitat for western spadefoot toad. The following is a discussion of specific management actions to benefit western spadefoot toad.

Depending on the hydroperiod of the particular vernal pool, as much as 75 percent of spadefoot toad larval mortality can be due to the pool drying before larvae have metamorphosed (Feaver 1971, as cited in Jones and Stokes 2004). It is important to maintain inundation periods of vernal pools (within limits determined by environmental and climatic conditions) because otherwise the vernal pools can become dry before spadefoot toad juveniles have adequately matured (USFWS 2005). Grazing will be used to maintain vernal pool hydrology, as grazing decreases the abundance of vegetation, and therefore reduces evapotranspiration from pools during the spring (Marty 2004). Grazing can also negatively impact western spadefoot toads, however, as livestock may crush or even consume egg clusters and trample and kill adults and juvenile toads. Overgrazing in vernal pool grasslands may deplete water levels in pools, preventing complete metamorphosis of tadpoles, or in some cases, cause accelerated metamorphosis to occur (USFWS 2005). The effects of grazing on vernal pool ecosystems and western spadefoot toads will be monitored. Livestock grazing intensity and duration/timing will be improved within an adaptive management framework to maximize the benefits of livestock grazing for vernal pool communities and covered species, while minimizing negative impacts.

Western spadefoot toads are frequently killed in collisions with automobiles and other motorized vehicles. Furthermore, road construction can result in direct mortality of western spadefoot toads, and can cause the direct loss and fragmentation of habitat (USSFWS 2005). To minimize the impacts of roads on western spadefoot toads, road (dirt and paved) construction will be limited on the Reserve System (see Section 5.2.3) and roads will be removed or decommissioned, where possible. When new roads are constructed within western spadefoot toad habitat, they passageways designed to allow safe movement of wildlife under roads at important corridors for movement between sites. Existing portions of roadway that are problematic for western spadefoot toads may be retrofitted with such passageways within the Reserve System (see Chapter 6, General Condition 6, Design and Construction Requirements

for Covered Transportation Projects). Additionally, when new development occurs at the interface of (or within) the RAA and adjacent to existing reserves, roads will be placed on the interior of the development away from the edges of reserves, to minimize impacts to wildlife that moves off of reserves (see Chapter 6, General Condition 1, Reserve Acquisition Area Interface Design Requirements).

Predation on adults, larvae, and eggs by invasive, non-native predators such as bullfrogs (*Rana catesbeiana*), crayfish (e.g., *Procambarus clarkii*), and fish (e.g., mosquitofish [*Gambusia affinis*]) has likely been a factor in the decline of populations of western spadefoot toad (USFWS 2005). The PCA will conduct invasive animal control on the Reserve System. Techniques for reducing or eliminating predation by invasive and non-native animals on adult stages of western spadefoot toad include trapping invasive animals such as bullfrogs, periodic draining of wetlands to remove bullfrogs and mosquitofish, and avoiding stocking vernal pools with mosquito fish.

Threats and Uncertainties

Amphibians are particularly susceptible to exposure to chemicals. Western spadefoot toad is exposed to a variety of toxins throughout its range, but the sensitivity of this species to pesticides, fertilizers, heavy metals, air pollutants, and other contaminants is largely unknown (USFWS 2005). Contaminants from road materials, leaks, spills and polluted non-point source runoff also could adversely affect western spadefoot toads by contaminating the water in wetlands. Some of these chemicals are extremely toxic to aquatic organisms such as amphibians and their prey. The PCA will minimize the application of pesticides and herbicides in the Reserve System and direct polluted sources of runoff away from vernal pool habitat. It will also restore riparian habitats and vegetate buffer strips to filter runoff before it enters waterways. In addition, numerous General Conditions (see Chapter 6) require BMPs to minimize the likelihood of water pollution.

The migratory and spatial requirements of western spadefoot toad are not well understood. Although the species relies on vernal pools for breeding, it is difficult to predict how far western spadefoot toad adults disperse from vernal pools to find burrows and/or sandy soil that is suitable for hibernating.

The spread of emerging infectious diseases, particularly chytridiomycosis (caused by *Batrachochytrium dendrobatidis*, a chytrid fungus that kills amphibians) is an increasing threat to amphibian populations worldwide (e.g., Skerratt et al. 2007; Crawford et al. 2010). Currently, there is little information on the impacts of chytrid fungus on western spadefoot toad. Some amphibian disease vectors can be carried accidentally by biologists and natural resource professionals who are working to conserve amphibians. To counter this problem, biologists, reserve managers, and

technicians will follow guidelines for minimizing disease transmission when they are conducting field work with western spadefoot toad and other covered amphibians (i.e., California red-legged frog and foothill yellow-legged frog). The PCA, with assistance from the Wildlife Agencies, will develop and adopt guidelines for minimizing the risk of spreading infectious diseases that may affect amphibians, within the Reserve System. If ponds, wetlands, and the native amphibian populations that they support become infected with chytrid fungus or other diseases, the PCA will use the best scientific information available to manage and stop the spread of the epidemic.

The suitability of restored and created vernal pools for western spadefoot toad remains unknown. Western spadefoot toads readily use restored and created vernal pools for reproduction, foraging, and rearing of larvae; however, the reproductive success of spadefoot toads in restored and created pools has not been evaluated (USFWS 2005). If spadefoot toads are able to successfully reproduce in restored and created vernal pools, such pools can provide a valuable contribution to the recovery of this species. However, it also is possible that western spadefoot toads are attracted to such wetlands, but that reproductive success is poor compared to that in natural wetlands. In this situation, restored and created pools could be acting as population “sinks.” To evaluate the relative value of restored and created vernal pools for western spadefoot toads, the PCA will monitor and compare the relative use and reproductive success of western spadefoot toads in natural vs. restored and created vernal pools. Data collected from this research will inform future restoration and management of vernal pools to benefit western spadefoot toads.

5.7.16 Valley Elderberry Longhorn Beetle

Biological Goals and Objectives

The PCA will work to maintain or increase the extent of valley elderberry longhorn beetle habitat within the Plan area.

The following objectives are designed to achieve this goal:

- Protect valley foothill riparian woodland and valley oak woodland that have large stands of elderberry shrubs supporting valley elderberry longhorn beetles;
- Enhance and restore habitat suitable for valley elderberry longhorn beetle; and,
- Reintroduce and/or introduce population(s) of valley elderberry longhorn beetle to restore viable populations of valley elderberry longhorn beetle within the Reserve System.

Acquisition and Restoration

To protect habitat for valley elderberry longhorn beetle, the PCA will acquire valley foothill riparian woodland and valley oak woodland. The PCA will focus acquisition efforts on sites occupied by valley elderberry longhorn beetle and/or sites with large populations of elderberry shrubs. The acquisition strategy for valley foothill riparian woodland and valley oak woodland are described in Section 5.3.5, Riverine and Riparian Conservation and Management and Section 5.3.4, Oak Woodland Conservation and Management, respectively. Because populations of valley elderberry longhorn beetle tend to be denser on larger and older restored sites (Holyoak and Koch-Munz 2008), larger sites will be selected over smaller sites for restoration and planting projects.

Management Techniques and Tools

Many of the actions for enhancing and restoring valley foothill riparian woodland (Section 5.3.5, Riverine and Riparian Conservation and Management) and valley oak woodland (Section 5.3.4, Oak Woodland Conservation and Management) will enhance and restore habitat for valley elderberry longhorn beetle. The following specific management actions are designed to enhance and restore habitat for valley elderberry longhorn beetle.

Restoring and Enhancing Host-plant Abundance

Studies indicate that individual valley elderberry longhorn beetles disperse along the riparian corridor within their home range (Collinge et al. 2001, as cited in Jones and Stokes 2004). Most remaining elderberry habitat and riparian vegetation exists in small isolated patches; consequently, the distances between valley elderberry longhorn beetle populations and unoccupied valley elderberry longhorn beetle habitat appear to limit the taxon's ability to successfully colonize new sites (Jones and Stokes 2004). The PCA will restore valley foothill riparian woodland to reconnect isolated patches of habitat and will transplant elderberry shrubs occupied by valley elderberry longhorn beetle to increase the likelihood of successful colonization of unoccupied sites. Plantings should occur adjacent to existing stands of riparian woodland, or restored stands to avoid creating small, isolated elderberry patches.

Elderberry shrubs and seedlings will be planted in suitable sites as part of riparian restoration to restore habitat for valley elderberry longhorn beetle. All restored and unoccupied sites that are being enhanced with elderberry plantings will be planted with some mature elderberry shrubs occupied by valley elderberry longhorn beetle, when available, because sites planted only with seedlings are less likely to be colonized (Holyoak et al. 2009). Mature elderberry transplants may come from sites being impacted by a covered activity (see Chapter 6, General Condition 10, Valley Elderberry Longhorn Beetle), from a nearby occupied "donor site" on the Reserve System (one that will not be impacted by covered activities), or from horticultural stock. Ideally, transplants will come from the same

watershed where planting will occur to avoid disrupting potential genetic population structure (Holyoak et al. 2009). Sites will be evaluated for suitability as source of transplants based on the size and density of its population of elderberry shrubs and valley elderberry longhorn beetles, and the likelihood that donating occupied elderberry shrubs could impact the donor population. In addition to mature elderberry transplants, sites may also be restored by planting seedlings and cuttings. Transplanting should occur when the plants are dormant, approximately November through the first two weeks in February, after they have lost their leaves, as transplanting during the non-growing season will reduce shock to the plant and increase transplantation success (USFWS 1999). Elderberry shrubs tend to grow more rapidly in sites closer to riparian areas (Holyoak and Koch-Munz 2008), so elderberry should be planted in or close to the riparian zone to enhance the success and rate of establishment of elderberry shrubs and valley longhorn elderberry beetle populations.

To expand the extent of habitat for existing populations, the PCA will restore and enhance populations of elderberry shrubs in suitable areas adjacent to sites that are already occupied by valley elderberry longhorn beetle. The PCA will also enhance and restore native understory and overstory vegetation in riparian habitats to maintain dense, complex vegetation structure at a diversity of successional stages, as studies have found that the beetle is more abundant in dense native plant communities with a mature overstory and a mixed understory (USFWS 1999). Techniques to manage stand structure and density include controlled and restricted grazing, control of invasive species, and allowing natural disturbances to occur (e.g., by setting back levees to allow more flooding on the Reserve System).

Invasive vegetation often competes with elderberry seedlings and mature plants for light, space, and other resources. The PCA will focus control of invasive vegetation in elderberry habitat to enhance survivorship and regeneration of elderberry and other native species. Techniques to manage invasive vegetation include prescribed grazing, prescribed burning, manual, and mechanical techniques.

Flood control activities appear to be responsible for reduced occurrences of elderberry shrubs and valley elderberry longhorn beetles at some sites outside of western Placer (Talley et al. 2006, as cited in USFWS 2006). As part of an adaptive management framework, levees may be set back on the Reserve System to allow more frequent flooding in riparian zones. Restoring a more natural flood regime to riparian habitats may help to enhance natural recruitment of elderberry and associated riparian vegetation.

Managing Invasive Insect Predators

At some sites, it may be possible to reduce and control populations of Argentine ants and other invasive animal species that threaten valley elderberry longhorn beetle. Techniques may include employing bait stations, integrated pest management, and the use of re-vegetation and

erosion control materials that do not contain Argentine ants. Careful application of irrigation to limit the amount of moist habitat available for Argentine ants should be employed.

Pesticide Control

Commonly used pesticides within the range of the beetle include insecticides, most of which are broad-spectrum and likely toxic to the beetle; herbicides, which may harm or kill its host elderberry plants; and broad-spectrum pesticides (USFWS 2006). Given the proximity of agriculture and developed areas to riparian vegetation in the Central Valley, it appears that pesticides may be affecting the beetle and its elderberry habitat (USFWS 2006). However, there has been no specific evaluation of exposures or responses of the beetle to any specific pesticide (USFWS 2006). Depending on adjacent land use, buffer areas will be maintained and enhanced between areas occupied by valley elderberry longhorn beetles and adjacent lands to buffer occupied habitat from pesticide drift. The PCA will also minimize the use of pesticides and herbicides (except where needed to control invasive species that threaten covered species), where possible, within 100 feet of elderberry stands within the Reserve System, except when needed to protect the integrity of structures such as levees, stock pond dams or to prevent nuisance populations on adjacent private lands.

Threats and Uncertainties

Invasive Argentine ants may threaten valley elderberry longhorn beetle by preying on it (Huxel 2000). Argentine ants may colonize restored and native sites occupied by valley elderberry longhorn beetle on their own, or by being transported to restored sites in the soil of potted plants (Talley et al. 2006). Furthermore, irrigation may promote ideal conditions for the growth and survival of Argentine ants (Talley et al. 2006). The effects of Argentine ants on populations of valley elderberry longhorn beetle need to be further studied to inform management.

Restoration is an experimental science. The success of re-establishing elderberry plants can depend on site location, micro site conditions, planting methods, irrigation methods, and numerous other factors (e.g., Holyoak and Koch-Munz 2008). Restoration of riparian and elderberry habitats will be monitored to evaluate the success of various methods to improve future restoration efforts.

Successful colonization of restored and unoccupied sites, and establishment of viable populations, remains uncertain. A study of 30 mitigation sites found that valley elderberry longhorn beetle colonized 53 percent of the mitigation sites (Holyoak and Koch Munz 2008); another found that 43percent of mitigation sites were occupied (Holyoak et al. 2009). Populations of valley elderberry longhorn beetle were denser on larger and older mitigation sites (Holyoak and Koch-Munz 2008). Furthermore, valley elderberry longhorn beetle exist in metapopulations –

linked by dispersal. Populations exist in isolated patches (e.g., drainages), and can go extinct. Vacant patches are subsequently re-colonized by individuals dispersing from other populations. Like with restored sites, there is uncertainty about how vacant patches will be re-colonized in highly fragmented systems. Restored sites will be monitored to determine whether they have been colonized by valley elderberry longhorn beetle. If successful colonization has not occurred seven years after restoration, the PCA will assess whether additional translocations of occupied elderberry shrubs are necessary for successful colonization. (It takes about seven years for elderberry shrubs to have multiple stems large enough to support valley elderberry longhorn beetle.)

Planting elderberry and restoring riparian habitat may not be enough to restore populations of valley elderberry longhorn beetle. For example, valley elderberry longhorn beetle occupies less than 25percent of apparently suitable elderberry shrubs (Collinge et al. 2001; Talley et al. 2007), indicating that factors other than the abundance of elderberry is limiting the distribution and abundance the species (Holyoak and Koch-Munz 2008). These factors may include habitat fragmentation, poisoning by pesticides, predation by and competition from invasive species, and habitat destruction. Long-term monitoring of existing and restored valley elderberry longhorn beetle habitat will be used to evaluate the success of conservation and management efforts in the protection and recovery of valley elderberry longhorn beetle on the Reserve System, and will be used to inform and improve future management actions.

5.7.17 Giant Garter Snake

Biological Goals and Objectives

The PCA will work to protect, enhance and restore habitat for giant garter snake to facilitate the expansion of a population of giant garter snakes into the Plan area.

To achieve this goal, the objectives of the PCCP are to:

- Protect aquatic and adjacent upland habitat for giant garter snakes;
- Enhance wetlands and adjacent uplands to provide suitable foraging habitat and vegetation for escape cover (e.g., from predators) and basking within the Reserve System;
- Manage rice fields, canals, and irrigation ditches on the Reserve System to provide aquatic and upland habitat suitable for giant garter snake (see Section 5.3.7, Agricultural Land Conservation and Management for more details);

- Restore and/or create wetland and associated upland habitat to facilitate the expansion of giant garter snake populations into the Reserve System; and

- Encourage private land owners to conserve and manage potentially suitable habitat on agricultural land to help promote the recovery and long-term conservation of giant garter snake.

Acquisition

To protect active season habitat, the PCA will acquire, restore, and create wetlands that provide adequate water during the snake's active season (early spring – mid fall); emergent, herbaceous wetland vegetation for escape cover and foraging habitat; and adjacent upland habitat for cover and basking. To protect dormant-season habitat, the PCA will acquire adjacent, higher elevation upland habitats that provide cover and refuge during the snake's inactive season in the winter. The PCA will also acquire agricultural land suitable for flooded rice production to grow rice and manage aquatic and upland habitats for giant garter snake, other covered species, and biodiversity.

Land-cover types that will be protected within the Reserve System that will provide wetland habitat include: fresh emergent and seasonal wetlands, riverine (i.e., low-gradient streams), lacustrine, and agricultural land (i.e., flooded rice). Land-cover types that will be protected within the Reserve System that will provide upland habitat include: annual grassland, vernal pool grassland complex, and agricultural land (i.e., uplands adjacent to flooded rice, alfalfa, irrigated pasture, and row crop).

The PCA will acquire sites that support giant garter snake from willing sellers, if found within the Plan area. In addition, the PCA will attempt to acquire sites that provide giant garter snake habitat in western and southwestern areas of western Placer County that are close to known giant garter snake populations and within the Southern American Basin recovery unit (which includes the snake's historic geographic range).

Management Techniques and Tools

Many of the actions for enhancing and restoring wetland (Section 5.3.6, Wetland and Pond Conservation and Management) and agricultural (Section 5.3.7, Agricultural Land Conservation and Management) communities will enhance and restore habitat for giant garter snake. The following summarizes major actions designed to enhance and restore habitat for giant garter snake.

- **Provision of summer water.** Giant garter snakes require water and vegetative cover during the active phase of their life cycle in the summer. Summer aquatic habitat is essential because it supports the frogs, tadpoles, and small fish which the giant garter snake preys

upon. Protection and restoration of fresh emergent wetlands within the range of giant garter snake will provide a stable source of summer water and can decrease the reliance of snakes on adjacent rice fields for summer water. This can result in possible decreased exposure to risk factors such as traveling greater distances and crossing roads (Wylie et al 2006, as cited in USFWS 2006a). In addition to protecting, enhancing, and restoring wetlands, rice production on the Reserve System will be managed to provide water during the giant garter snake's active season (see Section 5.3.7, Agricultural Land Conservation and Management) and will be managed to provide suitable habitat conditions (see Species Account, Giant Garter Snake, Appendix D).

- **Increase vegetative cover.** Giant garter snake requires emergent vegetation such as cattails and bulrushes for escape cover and foraging habitat. The PCA will plant and maintain appropriate wetland species along the edges of lands used for flooded rice production, in canals, and irrigation ditches. Open, grassy areas will also be maintained to provide basking sites. Upland habitats above flood stages will be protected and maintained to provide habitat for the overwinter dormancy period.

- **Non-native fish and bullfrog control.** Permanent water that provides suitable giant garter snake habitat can frequently support populations of largemouth bass or non-native fish that prey upon giant garter snakes. Brood areas free of predatory fish may be important as these areas allow juvenile giant garter snakes to grow large enough to avoid predation by game fish (G. Hansen pers. comm. 1998, as cited in USFWS 2006a). Bullfrogs prey on young giant garter snakes (Tenor 1983, as cited in Jones and Stokes 2004), and they also compete with garter snakes for amphibious prey. The PCA will develop an invasive species control program for the Reserve System, including monitoring populations of invasive species and their impact on covered and other native species. Eradication of bullfrogs is recommended, especially in reserve areas where colonization by giant garter snakes is likely. Bullfrogs and other invasive aquatic species that impact giant garter snake will be controlled using methods such as trapping and electrofishing.

- **Increase prey and burrowing mammal populations.** Rodent eradication indirectly eliminates the occurrence and abundance of underground burrows and retreats for giant garter snakes in upland habitat adjacent to aquatic habitat. Giant garter snakes depend upon rodent burrows to thermoregulate, to provide cover while they are shedding their skin, and for over-wintering. The coexistence of burrowing mammals greatly benefits giant garter snakes (Wylie et al 1996 and Wylie et al 1997, as cited in USFWS 2006a). The PCA will minimize rodent control on the Reserve System, which will help to increase populations of burrowing mammals on the Reserve System.

Threats and Uncertainties

Invasive species may compete with and prey on giant garter snake. Domestic cats have been observed hunting and killing giant garter snakes (USFWS 1993, as cited in USFWS 2006a), even as far away as two miles from the closest urban development. Stitt et al. (2005, as cited by USFWS 2006a) identified the southern water snake as a potential threat to the giant garter snake because there is the possibility that the introduced, invasive species may out-compete the endemic giant garter snake to the point of competitive exclusion. Southern water snake has not yet been found within giant garter snake populations, but this threat will be continually monitored.

Toxic contamination, particularly from selenium, and impaired water quality have been identified as threats to some populations of giant garter snake (Ohlendorf et al. 1986; Saiki and Lowe 1987, as cited in Jones and Stokes 2004). Preliminary studies have documented potential bioaccumulative effects on giant garter snakes or their prey species caused by agriculturally derived contaminants (Saiki et al. 1992, as cited in Jones and Stokes 2004). General Conditions 2, Maintain Hydrological Conditions and Protect Water Quality; 3, Stream System Avoidance; and 4, Stream System Impact Minimization will help to improve water quality in Reserve System and throughout the Plan area.

5.7.18 Central Valley Steelhead - evolutionarily significant unit and Central Valley fall/late fall-run Chinook salmon

Biological Goals and Objectives

The PCA will work in concert with other conservation partners to maintain or increase the availability and quality of Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon habitat to improve the reproductive success and survival of all life stages of these fish in the Plan area.

The following objectives are designed to achieve this goal:

- Protect spawning and rearing habitat for covered fish on stream reaches along the Bear River (downstream of Camp Far West Reservoir), Coon Creek, Doty Ravine (a major tributary to Coon Creek), and Auburn Ravine,

- Protect valley foothill riparian woodland habitat within the Reserve System because of its important role in creating and sustaining rearing and spawning habitat for covered fish; and

- Enhance and restore riverine and riparian habitats in stream systems occupied by covered fish to improve spawning and rearing habitats for Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon within the Reserve System;

Acquisition (and Protection through Avoidance)

The acquisition strategy described in Section 5.3.5, Riverine and Riparian Conservation and Management, will protect riverine and riparian habitats for Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon. The PCA will target stream segments with high quality spawning and rearing habitat for covered fish adjacent to intact riparian and upland forests to retain hydrologic and ecological processes and conserve and restore connectivity.

In addition to protecting riverine and riparian habitats through acquisition by fee title or conservation easements, the PCCP provides project-level conditions to avoid and minimize impacts to riverine and riparian habitats. The riverine and riparian set-back distances for development projects (General Condition 3 Chapter 6) are especially wide for streams within the Plan area that are occupied by Central Valley steelhead and Fall-run Chinook salmon. This is to ensure that steelhead and salmon habitats are protected through avoidance as well as through acquisition. Other conditions (see Chapter 6) that will benefit Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon include General Condition 2, Maintain Hydrological Conditions and Protect Water Quality; General Condition 4, Stream System Impact Minimization; and General Condition 5, Placer County Water Agency Operations and Maintenance. Together, the avoidance and minimization measures in Chapter 6, acquisition of riverine and riparian habitat into the Reserve System, and stream zone restoration and enhancement actions described in Section 5.3.5 will aid the efforts of other conservation partners in the recovery of Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon.

Management and Techniques and Tools

The riverine and riparian community-level restoration and enhancement actions are designed in part to improve in-stream and riparian habitat for Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon. See Section 5.3.5, Riverine and Riparian Conservation and Management for a discussion of the restoration and enhancement actions that will benefit salmonid species.

Uncertainties and Threats

There are many unknowns that make management difficult. The factors limiting Central Valley steelhead and Central Valley fall/late fall-run Chinook salmon productivity in each of the various watersheds are only partly known. Water pollution (including sediment), unnatural stream flow regimes, channelization, and passage barriers all contribute to impaired habitat and low fisheries productivity. In particular, the health of Central

Valley steelhead and Central Valley fall/late fall-run Chinook salmon populations in Plan area streams depend on the availability of sufficient water in the stream systems at specific times of the year. The major streams potentially supporting anadromous fish populations are affected by inter-basin water transfers, reservoir releases based on downstream agricultural and domestic water demands, diversions for hydropower production and other operations that may or may not be supportive of fisheries. Increased demand for water for human consumption and climate change (e.g., changes in the amount and timing of precipitation) could further impact the amount and timing of stream flow in the Plan area.

Along with the overwhelming influence of streamflow regimes on fisheries, there is the modification and degradation of habitat by human activities. The major streams have migration barriers, unscreened diversions, reaches with limited or no riparian cover, excessive summertime temperatures, nonnative predators, excessive sediment loads, limited spawning and rearing habitat and channelized reaches. The PCCP can address some of these problems through implementation of the CARP. However, the PCA will have limited powers to have a substantive impact on anadromous fisheries. Through supporting the efforts of conservation partners and implementing positive management within reserves the PCA can play a role in re-establishing viable populations of Central Valley steelhead and Central Valley Chinook salmon in at least some of Placer County's streams.

The covered fish spend much of their lives outside the Plan area and are long distance migrants. Therefore, actions taken to improve habitat in upper watersheds and stream reaches will have uncertain results since conditions in the ocean and along migratory corridors outside the Plan area may ultimately limit their populations.

5.7.19 Foothill yellow-legged frog

Biological Goals and Objectives

The PCA will work to protect, enhance, and restore habitat for foothill yellow-legged frog to facilitate the expansion of a foothill yellow-legged frog population into the Plan area.

The following objectives are designed to achieve this goal:

- Protect riverine habitats and adjacent valley foothill riparian woodland and upland oak woodland habitats to protect breeding, foraging, and movement corridors for foothill yellow-legged frog as part of the Reserve System; and,

- Enhance and restore riverine and riparian habitats for foothill yellow-legged frog within the Reserve System.

Acquisition

There are no known populations of foothill yellow-legged frog in the Plan area. Potential habitat for foothill yellow-legged frog occurs in the stream and riparian habitat of the Bear River, Coon Creek and its upper tributaries, Auburn Ravine, Pleasant Grove Creek, and Dry Creek and its upper tributaries (see Species Account, Foothill Yellow-legged Frog, Appendix D). Riverine and riparian habitat of these stream systems will be incorporated into the Reserve System, as described in Section 5.3.5, Riverine and Riparian Conservation and Management. Project-level avoidance of the stream system, as specified by General Condition 3, Stream System Avoidance (see Chapter 6) will help to protect foothill yellow-legged frog habitat throughout the Plan area. Rocky, gravelly stream segments that contain sunny banks, nearby open vegetation in a variety of habitats with consistent, gentle flows from mid-March through May, may provide high quality habitat for foothill yellow-legged frog. If foothill yellow-legged frogs are found within the Plan area, the PCA will attempt to acquire occupied sites since foothill yellow-legged frog uses the same sites for breeding year-after-year. In addition, riverine and riparian habitats will be protected within large reserves that protect adjacent uplands comprised of oak woodland and grassland that will provide movement habitat for foothill yellow-legged frog.

Management Techniques and Tools

Foothill yellow-legged frogs require permanent streams, but not swift flowing water. The enhancement and restoration actions discussed above in the community-level conservation and management sections for riverine and riparian habitats (Section 5.3.5) and oak woodlands (Section 5.3.4) will enhance aquatic and upland movement habitat for foothill yellow-legged frog. Channel restoration and enhancement actions will increase the amount of stream habitat in the Plan area by removing anthropogenic features such as concrete or rip-rap. Reducing the extent of channelization in stream segments will allow more gravel bars to form, behind which foothill yellow-legged frog lays eggs. In some segments, the PCA may add rocky substrate to stream channels to restore in-channel habitat for foothill yellow-legged frog and covered fish. The PCA will also restore and enhance channel and riparian vegetation, which will create structural diversity, provide cover, basking sites (e.g., downed trees) and moderate water temperature. Segments with sunny banks will be maintained to provide basking sites.

Threats and Uncertainties

The greatest management uncertainty within the Plan area is the lack of survey data to confirm the absence or presence of foothill yellow-legged frogs. Much of the suitable habitat within the Plan area has not been systematically surveyed for occurrence of the species. This makes the targeting of specific areas for conservation difficult. Furthermore, there is limited information on the specific causes for the apparent absence of foothill yellow-legged frog within the Plan area. Potential causes include habitat loss, degradation, and fragmentation; introduced predators; disease; water management; pesticides; and streamside grazing. The conservation actions address these threats; however, it is uncertain whether foothill yellow-legged frog will re-colonize restored and enhanced habitat. The known occurrences closest to the Plan area are three or more miles from the eastern border of the Plan area. Monitoring and adaptive management will play an important role in assessing the status of foothill yellow-legged frog on the Reserve System (and potentially on stream segments outside of the Reserve System in the Plan area, where feasible), the effectiveness of conservation actions in their efforts to expand and/or increase populations of foothill yellow-legged frog into the Reserve System, and improving these actions based on monitoring data.

The spread of emerging infectious diseases, particularly chytridiomycosis is an increasing threat to amphibian populations worldwide (e.g., Skerratt et al. 2007; Crawford et al. 2010). If ponds, wetlands, and the native amphibian populations that they support become infected with chytrid fungus or other diseases, the PCA will use the best scientific information available to manage and stop the spread of the epidemic.

The quality of habitat and success of restoration and management efforts, for foothill yellow-legged frog depend on the continued availability of perennial water in the stream systems. This issue has already been discussed above in relation to covered fish.

5.7.20 California Red-legged Frog

Biological Goals and Objectives

The PCA will work to protect, enhance, and restore habitat for California red-legged frog to facilitate the expansion of California red-legged frog into the Plan area.

The following objectives are designed to achieve this goal:

- Protect aquatic breeding and non-breeding habitats, as well as upland habitats that provide habitat for dispersal, cover, aestivation, and foraging for California red-legged frog;

- Enhance aquatic and terrestrial habitats suitable for California red-legged frog; and,

- Restore and/or create fresh emergent wetlands and stock ponds within an upland complex of grasslands or agricultural lands to provide suitable habitat to facilitate the expansion of a California red-legged frog population within the Reserve System.

Acquisition

The PCA will acquire and protect aquatic and associated upland habitats to provide for dispersal, cover, aestivation, and foraging for California red-legged frog as part of the Reserve System (see Species Account, California red-legged Frog, Appendix D). There are no known populations of California red-legged frog within the Plan area. If California red-legged frog is found within the Plan area, occupied sites will be sought for acquisition. Project-level avoidance of stream systems, as specified by General Condition 3, Stream System Avoidance (see Chapter 6) will help to protect California red-legged frog stream habitat throughout the Plan area.

Management Tools and Techniques

Many of the actions for enhancing and restoring wetlands and ponds (Section 5.3.6), riverine and riparian (Section 5.3.5), grasslands (Section 5.3.3), oak woodland (5.3.4), and managing wildlife compatible agriculture (Section 5.3.7) will improve aquatic and upland habitats for California red-legged frog. The community-level management actions that will enhance habitat for California red-legged frog and other covered species are:

- **Controlling invasive plants.** Eradicating or reducing the cover, biomass, and distribution of non-native invasive plants will enhance California red-legged frog habitat assuming that native vegetation will be established in its place.

- **Re-vegetating wetlands and ponds.** Re-vegetation efforts will provide California red-legged frogs with foraging habitat and enhanced cover to hide from predators. Revegetation techniques include planting seeds, or propagated mature plants of wetland species (e.g., *Juncus* spp., *Typha* spp.) around the perimeters of wetland and pond habitats.

- **Reducing invasive predators.** Techniques to reduce or eliminate invasive predators of California red-legged frogs (e.g., bullfrogs) may include trapping, electrofishing, and other control methods.

- **Reducing impacts from grazing.** Fencing will be installed around portions of wetlands and ponds, where necessary, to protect emergent vegetation and water quality.

- **Creating artificial basking sites and cover.** Woody debris and rocks will be installed in suitable areas around the perimeters and in submerged banks of wetlands to create basking habitat and cover for native amphibians and turtles.

- **Managing water depth.** Sediment and vegetation may be removed from the interior of ponds to provide open water habitats for amphibians and northwestern pond turtle. Areas of open, shallow water will also be maintained to provide rearing habitat for northwestern pond turtle hatchlings.

- **Reducing the risk of spreading infectious disease.** If ponds, wetlands, and native amphibian populations that they support become infected with chytrid fungus or other diseases, the PCA will use the best scientific information available to manage and stop the spread of the epidemic. Furthermore, biologists, reserve managers, and technicians will follow guidelines for minimizing disease transmission when they are conducting field work with western spadefoot toad and other covered amphibians (i.e., California red-legged frog and foothill yellow-legged frog). The PCA, with assistance from the Wildlife Agencies, will develop and adopt guidelines for minimizing the risk of spreading infectious diseases within the Reserve System.

- **Enhancing populations of burrowing mammals.** California red-legged frog use burrows of small mammals for refuge. The PCA will enhance populations of burrowing species such as ground squirrel by eliminating the use of pesticides, where possible, within the Reserve System, except when needed to protect the integrity of structures such as levees, stock pond dams or to prevent nuisance populations on adjacent private lands.

- **Protecting dispersal corridors.** California red-legged frog disperses between aquatic habitats and to upland habitats. Human made barriers such as fences may limit the dispersal ability of California red-legged frog, potentially resulting in reduced survivorship. The PCA will identify potential dispersal corridors on the Reserve System and remove barriers to dispersal (e.g., fences), when feasible.

Threats and Uncertainties

As with foothill yellow-legged frog, California red-legged frog is not known to occur in the Plan area. Much of the suitable habitat within the Plan area has not been systematically surveyed for the occurrence of California red-legged frogs. This makes the targeting of specific areas for conservation difficult. Furthermore, there is limited information on the specific causes for the apparent absence of California red-legged frog within the Plan area. Potential causes include habitat loss, degradation, and fragmentation; introduced predators; disease; water management;

pesticides; and overgrazing in aquatic habitats. The conservation actions address these threats; however, it is uncertain whether California red-legged frog will re-colonize restored and enhanced habitat. The closest known occurrences are approximately 14 miles east of the Plan area. Monitoring and adaptive management will play an important role in assessing the status of California red-legged frog on the Reserve System (and potentially on stream segments outside of the Reserve System in the Plan area, where feasible), evaluating the effectiveness of conservation actions to expand and/or increase populations of California red-legged frog into the Reserve System, and improving these actions based on monitoring data.

5.7.21 Northwestern Pond Turtle

Biological Goals and Objectives

The PCA will work to protect, enhance, and restore habitat for northwestern pond turtle to potentially increase its abundance and distribution in the Plan area.

The following objectives are designed to achieve this goal:

- Protect aquatic and upland habitats to provide habitat for foraging, reproduction, thermoregulation, avoidance of predators, dispersal, and other functions;
- Enhance aquatic and terrestrial habitats suitable for northwestern pond turtle; and,
- Restore and/or create fresh emergent wetlands and stock ponds within an upland complex of oak woodland and grassland.

Acquisition (and protection through co-operation)

The PCA will acquire and protect aquatic and associated upland habitats (see Species Account, Northwest Pond Turtle, Appendix D) for northwestern pond turtle as part of the Reserve System. The PCA will identify and if feasible, acquire upland breeding sites for northwestern pond turtle because of the high fidelity of their use from year to year. The PCA will focus on sites along Coon Creek and Auburn Ravine where high-quality breeding and dispersal habitat for western pond turtle exists.

Adjacent upland habitats comprised of valley foothill riparian woodland, annual grassland and oak and conifer woodlands provide suitable upland habitat for the species. As with other covered amphibians, it is ideal to protect large, contiguous patches of upland habitat surrounding aquatic habitat (at least 0.5-mile radius around aquatic habitat). Upland habitat

should support patches of open, sunny, gently sloping sites) for nesting and north-facing, well-vegetated sites for refuge and overwinter habitat.

Reserve lands that have the proper aquatic habitat for northwestern pond turtles – rivers, lakes, ponds, reservoirs, and wetlands with basking structures and adjacent to suitable upland habitat – will be restored if necessary and considered for reintroduction. The acquisition of lands for the conservation of salmonids has the potential to also benefit northwestern pond turtles, as they often inhabit the same rivers and benefit from the same habitat features, e.g. woody debris, deepwater pools, and healthy, intact riparian and upland communities.

Management Tools and Techniques

Many of the actions for enhancing and restoring wetlands and ponds (Section 5.3.6), riverine and riparian (Section 5.3.5), grassland (Section 5.3.3), and oak woodland (5.3.4) will improve habitat for northwestern pond turtle. Since northwest pond turtle has habitat requirements similar to California red-legged frog (see Section 5.4.20), the community-level benefits for California red-legged frog apply to northwestern pond turtle.

Northwestern pond turtle prefer to nest at open sites (i.e., terrestrial, open, south-facing, sunny sites) with low vegetation height. In addition to the actions discussed above, ground-level vegetation on uplands surrounding suitable aquatic habitat will be managed to maintain vegetation at low height (e.g., with grazing before the nesting season [May-July]) to provide nesting habitat.

Threats and Uncertainties

The greatest management uncertainty within the Plan area is the lack of information regarding extant populations and their reproductive status, particularly on private lands. This makes the targeting of specific areas for conservation, developing specific habitat enhancement actions, and the assessment of population status difficult.

Threats to existing populations of northwestern pond turtles include habitat loss, degradation, and fragmentation; introduced predators and competitors; disease; water management; pesticides; and streamside grazing. Roads, development, and other barriers have fragmented habitat, likely disrupting dispersal between aquatic habitats and movement from aquatic to upland breeding habitats. Streamside grazing tramples upland and streamside vegetation, which provides basking, over-wintering, and nesting habitat. The conservation actions address these threats; however, it is uncertain whether northwestern pond turtle will re-colonize restored and enhanced habitat.