

Chapter 6

Conservation Strategy

Note to reader: This document is the first draft of the conservation strategy and proposed alternatives for the East Contra Costa County Habitat Conservation Plan (HCP)/Natural Community Conservation Plan (NCCP). This document represents an intensive effort by technical staff over the past few months on a very rapid schedule. As a result, this document is a partial draft. This draft strategy presents the outline, concepts, and some of the details that will be included in the final conservation strategy. Given the time constraints, we made decisions as to which sections were the highest priority and which sections we would not include because sufficient information was not available at this time or more guidance was needed from the HCPA. Our goal was to provide you with the greatest amount of quality material possible as early in the process as possible to allow for substantive review and discussion. Please keep this in mind when reviewing this document.

As in previous major deliverables, the document has been formatted as the relevant chapter of the HCP/NCCP, with all tables and figures at the back of the document. This conservation strategy is based on Impact Analysis Scenario 2, described in the accompanying memorandum on the preliminary impact analysis dated January 23. We strongly suggest that you read the memo before you read this conservation strategy. The preliminary nature of the impact analysis is one reason that the conservation strategy is a partial draft. See the memo for a discussion of this issue.

Under our current scope, we will revise and expand this document and produce another draft conservation strategy for review. The conservation strategy will be revised yet again before it is included in the administrative draft HCP/NCCP. We are putting this document out today for your review and comment and fully expect to make changes throughout based on the input we receive from you.

Summary of Conservation Strategy

This chapter presents the conservation strategy that will be implemented to minimize and mitigate the impacts of the covered activities, contribute to the recovery of listed covered species, and help avoid the listing of nonlisted covered species. The conservation strategy is a program of specific conservation

measures that, when implemented in concert, will achieve the biological goals and objectives outlined in Chapter 1.

The conservation strategy combines measures at three ecological scales: landscape, vegetation community (or habitat), and species. Landscape-level conservation measures will be applied at a geographically broad scale to achieve multiple goals and objectives. These measures relate to overall design of the HCP/NCCP Preserve System (Preserve System) and are structured to benefit all covered vegetation communities and species, as well as to foster the conservation of biodiversity. Landscape-level measures address such parameters as preserve location, size, shape, composition, and connectivity. Parameters used to support these landscape-level measures are determined by the spatial needs of covered vegetation communities and species.

Community-level measures apply to each vegetation community and address goals and objectives for each vegetation community that are not addressed by the landscape-level measures. Community-level measures address such parameters as land and vegetation management and habitat restoration. Parameters used to support these community-level measures are determined by the habitat needs of covered species and by the resource management activities necessary to maintain healthy vegetation communities.

Species-level measures provide additional conservation tailored to each covered species at the individual or population level necessary to augment the landscape-level and community-level measures. Species-level measures address such parameters as direct (i.e., not habitat-related) population management and population augmentation requirements.

The heart of the conservation strategy is a system of new preserves linked to existing protected lands to form a network of protected areas outside the permit area (the area where impacts will be permitted under the HCP/NCCP). The conservation strategy provides for the establishment, enhancement, and long-term management of these preserves for the benefit of covered vegetation communities, covered species, and overall biodiversity and ecosystem functions. The preserves will also serve to achieve other complementary goals such as recreation, grazing, and crop production, as long as the primary biological goals of the HCP/NCCP are met and not compromised. The conservation strategy includes requirements for:

- design of covered activities to avoid or minimize impacts on covered species and covered vegetation communities,
- preservation of covered vegetation communities,
- preservation of covered species populations and habitats,
- restoration of species habitat and vegetation communities to compensate for direct and indirect impacts on particular species and vegetation communities,
- restoration of species habitat to contribute to the recovery of listed covered species and help prevent the listing of nonlisted covered species, and

- management of preserves to maximize the functions of habitats for covered species.

Methods

Approach to the Conservation Strategy

The conservation strategy was designed using an ecosystem approach in accordance with principles of conservation biology. Conservation measures were first developed at the landscape level to address all covered vegetation communities and covered species' spatial requirements. Community-level measures were added as needed to address the specific needs of covered vegetation communities not addressed at the landscape level; these measures particularly involved restoration and management of vegetation and species habitat. Likewise, species-level measures were added to address the remaining needs of covered species; these focused mainly on specific measures for protection of individuals and populations.

The conservation strategy was designed to meet the regulatory requirements of ESA, CESA, NCCPA, Section 404 Clean Water Act, and Section 1601 California Fish and Game Code (see discussion in Chapter 1). The conservation strategy provides full mitigation for impacts on covered species based on species and habitat needs (see Appendix A for species profiles and models of species habitat). The conservation strategy provides mitigation for loss of functions resulting from impacts on waters of the United States and waters of the State. The conservation strategy contributes to species recovery and the prevention of listing of nonlisted species through the acquisition and restoration of species habitat beyond agency-mandated mitigation requirements.

The conservation strategy is based on the best available scientific data available at the time of its preparation. It takes into account the limitations of the baseline data available for the inventory area. The conservation strategy ensures that covered species populations, covered species habitat, and important small-scale landscape features that have not been mapped during the planning process will be adequately identified and conserved during implementation through a defined process. This process includes site-specific surveys in impact areas and preserves and a site-specific approach to mitigation and contribution to recovery.

Most of the conservation measures are designed to apply to the entire inventory area wherever resources covered by the plan are found, not to a specific site or sites; in this sense, they are programmatic in nature. Conservation measures provide principles to be followed and goals to be achieved. In most cases, these measures do not prescribe specific techniques to be used because such specificity will depend on the final configuration, location, and site conditions of the preserves. Implementation of some measures will require the preparation of management plans or site-specific implementation documents (e.g., plans and

specifications for wetland creation). These plans will be prepared during HCP/NCCP implementation after land is acquired and specific restoration and management needs are determined. Management plans are intended to guide activities within a preserve or within the entire Preserve System. These plans are beyond the scope of this HCP/NCCP and cannot be prepared until a preserve or the Preserve System is fully assembled. All conservation measures will be implemented using an adaptive management approach (see Chapter X).

Design of the Preserve System

Preserve Design Process

The proposed Preserve System was designed using an iterative and hierarchical approach. The first iteration of the development process for the Preserve System was conducted to meet biological goals and objectives, maximizing conservation benefit with the minimum amount of land. The second iteration of the development process for the Preserve System was conducted to take into account relevant land use and financial considerations. [*Note to reader: The current Preserve System does not fully consider all land use and financial issues; the system will be refined as these issues are analyzed.*] Large, core preserves were designed to address major vegetation communities and the needs of covered species with large geographical ranges and specific habitat needs. Existing public lands were linked by proposed new preserves to achieve habitat linkage goals and objectives and to meet preserve design principles (see below). For resources not protected by the core preserves or the habitat linkages, smaller, “satellite” preserves were developed to protect isolated but important resources such as populations of covered plants.

Land acquisition requirements were based on four fundamental goals: to fully mitigate the impacts of covered activities¹, to contribute to the recovery of covered species, to maintain ecosystem processes, and to conserve biodiversity.

Preserve Design Principles

Scientifically accepted tenants of conservation biology theory were applied to designing preserves for this HCP/NCCP. Science-based approaches for regional conservation planning make use of the best available biological data for conservation planning and decision making (Noss et al. 1997). Information on species (e.g., population biology, genetics, distribution, and life history characteristics) and information on habitats (e.g., functions and values), can provide important direction for preserve design. Relevant ecological data for

¹ The Natural Community Conservation Planning Act requires that covered activities and projects be “fully mitigated”. The federal ESA requires that covered activities and projects be “mitigated to the maximum extent practicable.”

covered species are summarized in the species profiles in Appendix A. Detailed biological data are lacking for the majority of the covered species.

To be successful, a preserve system must be designed considering multiple ecologically-relevant spatial scales. For example, at a small scale, a preserve system must contain the microhabitats necessary for target species (e.g., covered species) to survive. At a medium scale, habitat patches must be large enough to support populations or important portions of populations of covered species and the seasonal movement of species (e.g., aquatic habitat for winter breeding of amphibians and upland habitat for summer aestivation [hibernation]). At a larger scale, preserves must be linked to allow movement of wide-ranging species for genetic exchange and for recolonization following a local extinction. At the largest scale (landscape or regional scale), preserves must be able to support ecological functions (e.g., watershed functions) and conserve regional biodiversity within a matrix of urban development, agricultural land, and other land use features. Small- and medium-scale considerations will be driven by the needs of covered species and natural communities. Larger-scale issues will be guided by the conservation principles for preserve design, landscape-level ecological functions, biological goals for natural communities, and biological goals for wide-ranging covered species.

The following principles of conservation biology (Soule and Wilcox 1980; Soule 1986; Primack 1993; Meffe and Carroll 1997; Noss et al. 1997) were used to guide the design criteria for the Preserve System. These principles will be used to guide the assembly of the Preserve System during implementation:

- **Maximize Size.** The Preserve System should be as large as possible within funding and management limits. The Preserve System must be large enough to fully mitigate impacts of covered activities and to contribute to the recovery of covered species. A large preserve system is important to ensure viable populations or portion of populations of covered species, to maximize protection of species sensitive to disturbances from adjacent land use, and to maximize the protection of biodiversity. Large preserves tend to support more species for longer periods of time than small preserves.
- **Minimize the Number of Preserve Units.** The Preserve System should have as few units (individual preserve “islands” separated by non-preserve land) as possible to reduce management costs and increase habitat integrity and connectivity, while balancing the need to link preserves (see below) and maximizing preservation of covered species and natural communities. A single large preserve is generally better than several small preserves of equal area in the context of maintaining viable populations of species. In some cases, however, small and isolated preserves are necessary to protect isolated features or populations with high biological importance (e.g., covered plant species populations, unique or especially diverse land cover types such as alkali wetlands and serpentine grassland/scrub).
- **Link Preserves.** The system should link existing and proposed preserves inside and outside the inventory area to maximize the ability of organisms to move between preserves; facilitate the exchange of genetic material, species

migration, dispersal, and colonization; and increase the integrity of the network of preserves (e.g., reducing the extent of preserve edge that is in contact with adjacent land uses).

- **Include Urban Buffer.** The Preserve System should include urban buffers: undeveloped lands at the urban edge to ensure a fixed and adequate buffer between urban development and natural communities. The size of the buffer depends on the intensity of urban development, the natural community being buffered from the development, and whether covered species may be present near this buffer.
- **Minimize Edge.** The Preserve System should have the minimum amount of edge with non-preserve land (i.e., the maximum amount of preserve area-to-perimeter ratio), especially urban development to minimize the indirect effects of adjacent land uses on the preserve resources and to minimize management costs. For example, preserves should tend towards round or square configurations rather than long and narrow ones. In some cases, however, preserves with low area-to-perimeter ratios may be appropriate to protect linear features with high biological value such as streams or riparian woodland.
- **Maximize Environmental Gradients.** The Preserve System should include a range of environmental gradients (e.g., topography, soil types, slopes, and aspects) to allow for shifting species distributions in response to catastrophic events (e.g., fire, prolonged drought) or anthropogenic change such as global warming.
- **Consider Watersheds.** The Preserve System should include, when possible, entire watersheds, subwatersheds, and headwater streams that are not already in protected status; this approach can help to maintain ecosystem function and aquatic habitat diversity.
- **Consider Full Ecological Range of Communities.** The Preserve System should include the full ecological range of natural communities in the inventory area in order to maintain sufficient habitat diversity, species and population interactions, and natural disturbance regimes such as fire.

Requirements of Key Covered Species

Early in the development of this HCP/NCCP, it was recognized that two covered species, San Joaquin kit fox and Alameda whipsnake, would greatly influence the design of the Preserve System. To ensure that the habitat needs of these species would be met in the Preserve System, the first step in the preserve design process was initiated with both species in mind.

San Joaquin Kit Fox

San Joaquin kit fox is largely restricted to annual grassland (see the species profile in Appendix A for more details and citations). Annual grassland is the

dominant natural land cover type in the inventory area and the natural land cover type with the greatest potential impacts from covered activities.

San Joaquin kit foxes occupy home ranges of 1–12 square miles (Knapp 1978, Spiegel and Bradbury 1992, White and Ralls 1993) and move up to 20 miles in a season for foraging or dispersal (Girard 2001). San Joaquin kit foxes have been observed in 53 locations in the inventory area (Duke et al. 1997, U.S. Fish and Wildlife Service 1998), including Black Diamond Mines Regional Park and the Los Vaqueros Watershed. These existing protected lands are probably not large enough to support separate viable populations of kit fox. Therefore, in order for kit foxes to persist in these protected lands and in the inventory area as a whole, the existing protected lands must be expanded, connected to each other, and connected to the larger populations of kit fox in the San Joaquin Valley. In order to measurably contribute to the recovery of San Joaquin kit fox in the inventory area, it is critical to create these two kit fox habitat linkages.

To ensure the successful movement of San Joaquin kit fox between Black Diamond Mines Regional Park and the Los Vaqueros Watershed (and the other protected lands connected to it), it was assumed that a movement route with a 0.5-mile minimum width of modeled core habitat for kit fox would be required. No studies investigating minimum corridor widths for kit fox have been conducted. This value was chosen to be consistent with previous studies in the inventory area (Jones & Stokes Associates 1996) and because it is the approximate minimum width of movement routes of suitable habitat in the inventory area that are likely being used at the present time, based on the habitat model for the species developed for this HCP/NCCP.

Alameda Whipsnake

Alameda whipsnake is restricted to chaparral, coastal sage scrub, and habitats immediately adjacent to them. The species is highly restricted to the western and central portions of Alameda and Contra Costa Counties. Due mostly to urban development, its range is now fragmented into five distinct populations (U.S. Fish and Wildlife Service 1997, 2000). The HCP/NCCP inventory area encompasses approximately 75% of the Mount Diablo–Black Hills critical habitat unit (U.S. Fish and Wildlife Service 2000), which supports one of these five populations. Moreover, 19 of the 48 records of the species (40%) are from within the inventory area. Because the range of this species is so small, and because the inventory area contains a large proportion of the species' range and known occurrences, a goal of the HCP/NCCP is to contribute substantially to Alameda whipsnake recovery.

The core habitat for this species, chaparral/coastal sage scrub, is not shared with any other covered species except Mount Diablo manzanita. Chaparral/coastal sage scrub is relatively uncommon in the inventory area (2,862 acres, or 2%) and is naturally fragmented into many patches that are highly variable in size. In order to maintain Alameda whipsnake in the inventory area, it is critical to link these patches of chaparral and coastal sage scrub with suitable movement habitat

for whipsnakes. These unique habitat and linkage requirements and the need to contribute substantially to the species' recovery were considered in the overall design of the Preserve System.

Acquisition Analysis Zones

To develop priorities and identify potential locations for preserve acquisition, the inventory area was subdivided geographically into five *Acquisition Analysis Zones*. Acquisition Analysis Zones (Zones) were further divided into subzones as necessary to distinguish between important landscape features. Acquisition priorities for each zone were developed primarily on the basis of the ecological opportunities and constraints for collectively achieving the biological goals and objectives for covered species and natural communities. The purposes of identifying Acquisition Analysis Zones and subzones were to:

- describe the specific areas in which land preservation (through fee title or conservation easements) will occur without identifying individual parcels;
- focus the conservation strategy into geographic areas within the inventory area while still maintaining the flexibility to acquire different parcels that would meet the same acquisition goals;
- ensure that conservation measures are applied throughout the inventory area;
- provide a mechanism for impacts to be tied to land acquisition geographically;
- provide a mechanism to apply land acquisition requirements at several spatial scales (e.g., within a Zone, within a combination of subzones, or within a single subzone); and
- highlight key regional conservation priorities in a spatially explicit manner.

General Description

Zones (Figure 6-1) incorporate all undeveloped land outside of the major urban areas of Bay Point, Pittsburg, Antioch, Oakley, and Brentwood that is not already protected in large preserves (i.e., Black Diamond Mines Regional Preserve, Mount Diablo State Park, Morgan Territory Regional Preserve, Round Valley Regional Preserve, Los Vaqueros Watershed lands, Cowell Ranch State Park, or Vasco Caves Regional Preserve). Most of this undeveloped land occurs outside the Urban Limit Line (ULL). Large undeveloped areas within the ULL were included in the Zones if they had potential conservation value and were connected to undeveloped lands outside the ULL. Rural public facilities were included within preserve zones because their protection status for conservation is uncertain. The five Zones include some areas of small and isolated public lands (e.g., Byron Airport conservation easements) and small and isolated patches of development. These areas would not be acquired as part of the HCP/NCCP Preserve System and are excluded from all calculations of Zone size. With these

exclusions, the Zones represent all undeveloped and unprotected land in the inventory area with regional conservation value and from which conservation priorities can be developed.

Zone boundaries were determined on the basis of physical and biological features at the landscape level, such as watersheds, ridgelines, and major breaks in land cover types or vegetation communities. Subzones were created on the basis of smaller watershed boundaries; landscape position; land cover dominance; conservation value within a Zone; and, in some cases, function as a potential movement route for San Joaquin kit fox. Subzones are at least 250 acres in size to maintain some flexibility in meeting acquisition requirements within each subzone. The boundaries of each Zone are described below and illustrated in Figure 6-1. Table 6-1 lists the land cover types and vegetation communities found within each Zone.

Zone 1: Pittsburg Hills

Zone 1 (7,411 acres) was created to encompass all of the undeveloped and unprotected lands in the northwest corner of the inventory area with the potential for conservation value. The northern boundary of Zone 1 follows the boundary between undeveloped grassland and the urban development of Bay Point and Pittsburg, but it excludes the large areas of designated open space south of Pittsburg. The western boundary of Zone 1 follows the inventory area boundary. The eastern boundary of Zone 1 abuts Black Diamond Mines Regional Park; a disjunct and undeveloped area between urban development in Antioch and the northern boundary of the park is also included in Zone 1. The southern boundary of Zone 1 follows the boundary between the Kirker Creek and Mount Diablo Creek watersheds.

Zone 2: Watersheds of Northern Tributaries of Marsh Creek

Zone 2 (14,680 acres) was created to encompass the area dominated by annual grassland with oak savanna and oak woodland land cover types in the lower elevations of the center of the inventory area. This Zone covers the key habitat linkages between Cowell Ranch/Los Vaqueros in the east and Black Diamond Mines Regional Park and the Concord Naval Weapons Station (outside the inventory area) in the west. Zone 2 also includes a key linkage between Black Diamond Regional Preserve and Mount Diablo State Park.

The northern boundary of Zone 2, from west to east, follows the boundary between the Kirker Creek and Mount Diablo Creek watersheds, the southern boundary of Black Diamond Mines Regional Preserve, and the urban boundary of Antioch. The eastern boundary follows the urban boundary (and ULL) of Brentwood and the northwestern corner of Cowell Ranch State Park. The southern boundary of Zone 2 follows the Briones Creek/Marsh Creek watershed line to Clayton Ranch (EBRPD). The southern boundary of Zone 2 is completed in the west by Keller Ridge, which separates Irish Canyon from the main stem of Mount Diablo Creek. Zone 2 includes an isolated unprotected area of mostly annual grassland between Cowell Ranch State Park and the southern boundary of Brentwood's urban development (the portion of the Cowell Ranch property not

purchased by the Trust for Public Land). Zone 2 excludes the large conservation easements in and near the Roddy Ranch golf course.

Zone 3: Clayton Area, Mount Diablo Foothills

Zone 3 (1,763 acres) includes the undeveloped land in the watershed of the main stem of Mount Diablo Creek at the eastern edge of the City of Clayton. Zone 2 is bounded on the north by Zone 2, on the east by the Clayton Ranch (EBRPD), on the south by the Mount Diablo State Park boundary, and on the west by the inventory area boundary.

Zone 4: Mount Diablo Foothills and Main Stem Marsh Creek Watershed

Zone 4 (14,846 acres) was designed to incorporate the area at the moderate elevations of the Mount Diablo foothills dominated largely by mixed evergreen forest, dense oak woodland, chaparral, and coastal sage scrub. Although present, annual grassland is mostly restricted to small patches in valleys and on south-facing slopes. Zone 4 is bounded by Mount Diablo State Park, the inventory area boundary, Morgan Territory Regional Park, Round Valley Regional Park, Cowell Ranch State Park, and Zone 2. A private inholding between the Los Vaqueros Watershed, Round Valley Regional Park, and Cowell Ranch State Park is also included in Zone 4. Zone 4 excludes the 640-acre conservation easement over the Morgan Territory area ranch owned by Seeno Homes.

Zone 5: Byron Hills

Zone 5 (13,578 acres) includes all the unprotected lands dominated by annual grassland and alkali grassland between the Los Vaqueros Watershed lands and the Alameda/Contra Costa County line. This Zone incorporates all uncultivated areas in the southern portion of the inventory area with potential conservation value to the HCP/NCCP. The conservation easements surrounding the Byron Airport and the developed portions of the Byron Airport are excluded from Zone 5.

Zone 6: East County Cultivated Agriculture

Zone 6 (28,997 acres) was designed to include all cultivated agriculture outside the ULL. The northwest boundary of Zone 6 follows the eastern ULL of Oakley and Brentwood. To the southwest, Zone 6 borders Zone 5. To the east, the boundary is formed by the inventory area boundary and the Discovery Bay ULL. The urban areas of Knightsen and Byron (within the ULLs) are excluded from Zone 6.

Preserve Acquisition Priorities

Acquisition priorities within each Zone were developed. These priorities were based on the ecological and conservation opportunities within each Zone for achieving the biological goals and objectives for covered species and natural communities. Factors that affect conservation opportunities include land cover type, extent, and distribution; existing land use patterns; and planned future land use activities.

Habitat Enhancement, Restoration, and Creation

An important component of the conservation strategy is the replacement of some vegetation communities or land cover types that are lost to covered activities with the same or similar communities or land cover types. 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 adequately mitigate the loss of vegetation communities or land cover types and to contribute to the recovery or prevention of listing of covered species that they support. Depending on the resource, creation, restoration, or enhancement is allowed as part of the conservation strategy. Each of these terms is defined below.

Enhancement

Enhancement is the improvement of an existing degraded vegetation community. Enhancement involves improving one or more ecological factors, such as species richness, species diversity, overall vegetative cover, or wildlife habitat function. Enhancement activities typically occur on substrates that are largely intact. An example of enhancement would be planting blue oak seedlings in an existing stand of blue oaks to increase blue oak cover and density and improve the age-class structure of the blue oak population.

Restoration

Restoration is the establishment of a vegetation community in an area that historically supported it, but no longer does because of the loss of one or more required ecological factors. Restoration may involve altering the substrate to improve a site's ability to support the historic vegetation community. For example, alkali wetlands could be restored in a plowed field that historically supported alkali wetlands and that still supports alkali soils and a subsurface restrictive layer. In this case, restoration could include grading to restore depressional features, thereby restoring wetland hydrology. Habitat restoration is allowed in those vegetation communities or land cover types for which techniques are proven and where restoration would substantially enhance habitat for covered species and native biological diversity.

Creation

Creation is the establishment of a vegetation community in an area that did not previously support it. For example, ponds can be created as breeding habitat for California red-legged frog by grading and installing check dams in areas along streams that did not previously support ponds.

In-kind/like-function creation is the establishment of the same vegetation community as the vegetation community affected, and that would establish the same type of ecological functions over time. For example, creating an artificial vernal pool with species similar to those found in an affected vernal pool would be in-kind/like-function creation.

Out-of-kind/like-function creation is the establishment of a different vegetation community with some of the same ecological functions as the affected vegetation community. For example, it may not be feasible to create streams to replace the functions of those streams removed to make way for development. In this instance, ponds or seasonal wetlands may be created as out-of-kind mitigation for impacts on streams. Ponds and seasonal wetlands provide equal or greater function than streams as habitat for some wildlife species and less function for other species.

Wetland Mitigation

Note to reader: This section will summarize how conservation measures for resources regulated under Section 404 and Section 1601 are addressed in this chapter. Our recommended approach to integrating regional compliance with Section 404 of the Clean Water Act and Section 1601 of the California Fish and Game Code as components of the East County planning process is presented in a memo dated January 23, 2003. Once this approach has been approved by the HCPA and by the regulatory agencies, we will incorporate the summary of the approach into the HCP/NCCP. Conservation measures in this draft conservation strategy have been designed to address wetland mitigation needs assuming that our recommended approach is approved.

Sources

The primary sources of data for the conservation strategy were the ecological profiles of covered species (Appendix A), species distribution models, and the inventory of existing conditions summarized in Chapter 3. Other sources consulted to develop the conservation strategy include:

- species recovery plans, if available;
- species and natural community experts, including the Scientific Advisory Panel for the HCP/NCCP;
- the *East County Biodiversity Study* (Jones & Stokes Associates 1996)
- approved or in-process HCPs for adjacent or nearby areas with similar natural communities and covered species (e.g., San Joaquin County MSCP, Yolo County HCP); and
- management or mitigation plans for large-scale projects in the inventory area that address the biological goals and objectives (e.g., Los Vaqueros Reservoir)

project mitigation program [e.g., Contra Costa Water District and U.S. Bureau of Reclamation 1993]).

Conservation Measures

The conservation strategy is composed of a list of conservation measures divided into three categories based on spatial scale: landscape-level, natural community-level, and species-level. Conservation measures are given a three-digit numeric code according to their position in the hierarchy and their topic area. The first number denotes the scale level (1 for landscape level, 2 for natural community-level, or 3 for species-level). The second number denotes the topic. For example, each covered species is given its own number, in the order listed in Chapter 3. The third number references the specific measure. These codes are used in this chapter and subsequent chapters to reference, repeat, and track the conservation measures (e.g., in the monitoring and funding sections). Table 6-2 lists all the conservation measures and the biological goals and objectives to which each measure contributes.

Landscape-Level Conservation Measures

Landscape-level conservation measures are divided into three categories: conditions on development, preserve acquisition, and preserve management.

Conditions on Development

Conditions on development are conservation measures to avoid and minimize adverse effects on covered vegetation communities and covered species resulting from covered activities. These measures are guiding principles for projects in the HCP/NCCP permit area [*Note to reader: the HCP/NCCP permit area has not yet been determined. It is the area within which impacts on covered species and communities will be authorized under the ESA/NCCPA permits*]. It is the responsibility of project proponents to design and implement their projects in compliance with these measures. The Implementing Entity [*Note to reader: the Implementing Entity has not yet been determined. It is the agency/organization that will be responsible for implementing (or ensuring implementation of) the conservation measures prescribed in the HCP/NCCP.*] will evaluate all projects to ensure that they have adopted these conservation measures prior to issuance of a permit under the HCP/NCCP. In many instances, resource surveys will be required of project proponents under the HCP/NCCP. These survey requirements are listed in Vegetation Community-Specific Measures and Species-Specific Measures.

Measure 1.1.1. Minimize Development Footprint

Measure

Avoid and minimize direct impacts of new development on covered vegetation communities and covered species by encouraging project designs that cluster development, increase development densities within allowable zoning, reduce project footprints, and occur within in-fill areas (small vacant parcels surrounded by existing development), where practicable.

Rationale

- Some impacts on covered vegetation communities and covered species are inevitable within the inventory area due to the growth and development in HCP/NCCP permit area.
- However, the scale and magnitude of that impact will depend, in part, on the patterns of development that the cities and County allow.
- Project proponents are required to minimize their impacts on covered vegetation communities and covered species. One way to achieve this result on a large scale is for the cities and the County to encourage project designs that minimize their ground-disturbing activities while still achieving their project goals.

Measure 1.1.2. Urban-Wildland Interface Design Elements

Measure

Urban development that occurs adjacent to preserves or planned future preserves will incorporate design elements at the urban-wildland interface to minimize the indirect impacts of development on the adjacent preserve. Design elements to be considered and incorporated at the urban-wildland interface include but are not limited to:

- amphibian exclusion fencing;
- front-loaded lots (with appropriately designed fences) at the edge of development instead of roads (to reduce road-kill of wildlife exiting the preserve);
- backyard fences designed to prevent pets from entering preserves with sensitive habitat or covered species;
- cul-de-sacs or other potential access points sited away from sensitive habitats;
- drainage ditches to channel urban runoff away from preserves;
- low-glare or no lighting;
- fire-resistant, noninvasive landscaping to serve as a fire break; and
- access restrictions or informational kiosks to educate residents about the adjacent preserve.

Design elements to be considered are described in detail in the Urban-Wildland Interface Design Guidelines in Appendix X [*Note to reader: This appendix will be added later and will be based on similar guidelines developed by Jones & Stokes for the Vasco-Laughlin Resource Conservation Plan in Alameda County (Jones & Stokes 2001)*].

Rationale

- New preserves, particularly in Zones 1 and 2, will border existing and proposed urban development that includes (or will include) areas highly unsuitable for covered species including single-family homes with back or side yards, cul-de-sacs, residential streets, or parking lots. This situation presents a unique management challenge to preserving the covered species and habitats in the adjacent preserves.
- Adjacent residential land uses have the potential to adversely affect the sensitive resources in the preserves. Damaging activities include trampling, mountain bicycle use, off-road vehicle use; runoff from adjacent streets and landscaped areas containing lawn fertilizer, pesticides, and vehicle waste (petroleum byproducts); lights and noise from nearby development; unregulated movement of domestic animals; and a lack of barriers to covered species entering developed areas.
- Design features within development can be an effective means to reduce their indirect impacts on biological resources in California (Kelly and Rotenberry 1993).
- By incorporating design features into development to minimize indirect effects, the buffer zone needed within preserves will be narrower and more of the preserve can be dedicated to enhancing covered vegetation communities and covered species.

Measure 1.1.3. Maintain Hydrologic Conditions and Minimize Erosion

Note to Reader: This measure will be developed later, after Jones & Stokes completes its evaluation of the potential impacts of the covered activities on special-status fish in Marsh Creek (i.e., Chinook salmon and steelhead trout) and discusses the implications with the National Oceanic and Atmospheric Administration–Fisheries (formerly the National Marine Fisheries Service within NOAA). The intent of the measure is expected to be to minimize the impacts of covered activities on the local and regional hydrology (e.g., flow patterns, water quality) through measures such as minimizing permeable surfaces, onsite water detention, and features to filter urban runoff. Essentially, best management practices to reduce the changes in hydrology and water quality will be required for HCP/NCCP project proponents.

Measure 1.1.4. Avoid Direct Impacts on Extremely Rare Plants or Fully Protected Wildlife Species

Measure

Covered activities will avoid all impacts on extremely rare plant species listed in Table 6-3 as *no-take* species. These no-take plant species are all presumed extinct or extirpated from the inventory area (an artificially established population of Large-flowered fiddleneck is within the inventory area on EBRPD land), and the likelihood of discovery of new populations is low. If a new population of any of these species were found, its protection would be of highest importance to the conservation of the species.

Covered activities will avoid any take (as defined under Section 86 of the California Fish and Game Code) of Fully Protected wildlife species (Table 6-3).

Project proponents must conduct planning surveys for no-take plant species, as described in Conservation Measure 1.2.2. These surveys must be conducted by a qualified botanist using CDFG/USFWS–approved methods at the proper time of year. Project proponents must demonstrate that either:

- no-take plant species are absent from the project site, and the project will not result in indirect impacts if such plants are found adjacent to the project site; or
- if no-take plant species are found at a project site, all direct and indirect impacts on such plants that could result from the project are avoided.

A survey report demonstrating that these conditions have been met must be submitted to the Implementing Entity prior to project approval.

Rationale

- Several extremely rare plant species are known to have occurred (or are very likely to have occurred) historically in the inventory area. Several of these plant species are presumed extinct. The discovery of a population of any of these extremely rare plant species (especially those presumed extinct) within the inventory area would be a significant find, and preservation of that population would be of highest priority for species conservation.
- Any direct or indirect adverse effects on extremely rare species would likely jeopardize their continued existence. Although some of these extremely rare plants are not state- or federally listed, they may become so during the permit term.
- The California Fish and Game Code prohibits the taking of Fully Protected Species (Sections 3511 [birds], 4700 [mammals], 5050 [reptiles and amphibians], and 5515 [fish]). Take is defined by the Fish and Game Code as the action of or attempt to “hunt, pursue, catch, capture, or kill” (Section 86). CDFG includes in this definition of take any impacts on the species’ habitat that are sufficient to result in the death of individuals of that species. Any taking of Fully Protected species would violate these Code provisions.

Planning Surveys, Preconstruction Surveys, and Construction Monitoring

Three types of surveys are required to be conducted prior to or during construction of covered projects and implementation of covered activities: planning surveys, preconstruction surveys, and construction monitoring.

Planning surveys are surveys conducted by both project proponents and the Implementing Entity. Project proponents will conduct planning surveys for biological resources (e.g., wildlife, plants, habitats, vegetation, wetlands) during the planning phase of a covered activity/project and before the final project design or approach has been determined. These surveys will be used in the project planning process to identify constraints and determine which HCP/NCCP compliance requirements (conservation measures) are applicable. The Implementing Entity will conduct planning surveys on potential preserve lands to evaluate whether these lands will meet the requirements of the HCP/NCCP.

Preconstruction surveys are surveys conducted by project proponents for certain biological resources immediately prior to construction to ensure that species and habitat avoidance and minimization measures can be effectively implemented during construction of covered projects or implementation of covered activities.

Construction monitoring is the monitoring by biologists of biological resources in and around construction sites concurrently with project construction or other covered activities. Construction monitoring involves biological monitors being present during implementation of covered activities where resources that are protected under the HCP/NCCP have been identified in or near construction sites. Construction monitoring ensures that impact avoidance and minimization measures are properly implemented.

Measure 1.2.1. Planning Surveys for Suitable Habitat for Covered Wildlife in Impact Areas and Potential Preserves

Measure

Planning surveys will be conducted at proposed project sites and proposed Preserve System acquisition sites to facilitate project designs that avoid and minimize impacts on biological resources as required under the HCP/NCCP and to ensure preserve land acquisition that best meets HCP/NCCP goals and objectives.

Qualified biologists will conduct planning surveys on behalf of project proponents at sites being considered for covered activities to determine the likelihood for impacts on covered wildlife. Planning surveys will be conducted to assess the location, quantity, quality, and type of covered species habitat present on the project site. Results of planning surveys will provide information to determine which avoidance and minimization conservation measures should be applied to the project design (see Species-Level Conservation Measures) and

how they can be applied to avoid or minimize potential impacts of covered activities on covered wildlife. Results of planning surveys will also be used to identify the need for preconstruction surveys or construction monitoring (see Construction Measures 1.2.3 and 1.2.4). For example, if habitat is not present for a covered species, the project proponent would not be required to conduct preconstruction surveys or construction monitoring for the species. The Implementing Entity will review all planning survey reports before projects can be approved under the HCP/NCCP.

Once the Implementing Entity has entered into an agreement with a landowner interested in selling land for the Preserve System, qualified biologists will conduct a planning survey to determine the suitability of the site for the Preserve System. Types of information collected during these surveys will include an assessment of location, quantity, quality, and type of covered species habitat and natural communities present on surveyed lands, as well as other site conditions and infrastructure that would benefit or conflict with the preserve's goals and objectives. This information will help the Implementing Entity prioritize acquisition of preserve lands based on their relative contribution toward meeting the biological goals and objectives. Resources identified on these lands, in conjunction with an evaluation of existing or potential future adjacent land uses (e.g., development), will also be considered in determining the need for and extent of buffer zones (see Measure 1.3.2).

Rationale

- Information used to develop species habitat models are not sufficiently detailed to determine if habitat for some covered species (e.g., vernal pools) is present or, if present, to determine the quality of covered species habitat on lands considered for development or for preservation.
- Because of these limitations, site-specific information that would be collected from conducting planning surveys is required to guide design of developments to avoid and minimize impacts on covered species and to help ensure that lands preserved under the HCP/NCCP are those that will contribute most towards achieving the biological goals and objectives.

Measure 1.2.2. Planning Surveys for Plants in Impact Areas and Potential Preserves

Measure

A qualified botanist shall conduct planning surveys for all covered plants prior to projects receiving approval by the Implementing Entity. Surveys will be conducted using approved CDFG/USFWS methods during the appropriate season for identification of the species. Surveys will be floristic surveys (i.e., all plant species encountered will be identified to the taxonomic level necessary to determine status). To assess the phenological stage of plants in a given survey year, known locations of covered species will be visited within a week of the survey date to ensure that the timing of the site survey is appropriate. If covered species are found, the location, extent, and condition of all occurrences will be

documented in a survey report submitted to the Implementing Entity. Survey reports will include CNDDDB California Native Species Field Survey Forms for all special-status plants encountered on the site (including species not covered under this HCP/NCCP). Copies of these forms will be submitted to the CNDDDB.

Surveys for covered plants will be conducted at HCP/NCCP preserves. If impacts on covered plants resulting from covered activities cannot be avoided (see Conservation Measures 3.17.1 and 3.17.2), the Implementing Entity must ensure, through surveys of preserves, that preserves support populations of the covered species that are as healthy as or healthier than those populations that will be adversely affected by covered activities. The populations preserved (measured in terms of plant cover or number of individuals, whichever is most appropriate for the species and site) must always be at least as large as the populations of covered plants lost to covered activities. A “healthy” population of covered plants is defined as one that has a stable or increasing population growth rate. This value cannot be determined in the field based on one survey. For the purposes of this HCP/NCCP, the health of a plant population will be inferred in the field based on the characteristics listed below and the assessment of the qualified botanist.

- **Physical condition.** Individuals in good or excellent physical condition for the species (e.g., little or no signs of disease, viruses, severe herbivory, nutrient deficiencies, etc.) are more likely to survive, achieve an average or above-average lifespan, and reproduce more successfully than individuals in poor physical condition.
- **Average size of mature individuals.** Populations with individuals of an average or greater-than-average size for the species will be more likely to successfully reproduce and more likely to produce more seeds per plant than a population with individuals of below-average size. The measure of size will differ depending on the species. For example, size could be measured as the number of stems, plant height, maximum stem diameter, etc. A size measure should be chosen that is easy to measure but that appears correlated with plant biomass.
- **Age structure.** For perennial plants, having an age structure with many seedlings or juvenile plants relative to adults suggests a positive rate of population growth.
- **Reproductive success.** Populations with evidence of average or above-average reproductive success for the species (e.g., production of flowers per plant, seed production per flower or per plant, proportion of seeds that appear to be viable based on visual observations) are more likely to be increasing than populations with below-average reproductive success.
- **Suitable habitat.** In order for a plant population to remain stable or grow, enough suitable habitat must be present. Populations near unoccupied suitable habitat or without evidence of shrinking suitable habitat areas (e.g., exotic plants that may be expanding, native shrubs that may be advancing) will be considered more healthy than populations absent these indicators.

- **Long-term observation of population.** Where data exist that can verify the presence of a population at a site over a substantial number of years (e.g., occurrence reports from past botanical surveys), this information can be used to compare the health of the preserved population with that of the population adversely affected by covered activities.

Sites selected for preservation of healthy populations will be incorporated into Preserves to maximize the long-term viability of these plant populations. Preserves will contain adequate buffers between the plant population and adjacent land uses (i.e., outside the Preserve), sufficient suitable habitat for the covered plant to allow for population expansion and fluctuation, and a sufficient area in which to apply beneficial management techniques (see Conservation Measures 3.17.2 and 3.17.3). When practicable, all lands protecting covered plant populations will be connected to existing protected areas or HCP/NCCP Preserves. When not practicable, the minimum preserve size to protect covered plant populations will be determined based on site-specific conditions but shall not be less than 40 acres.

Rationale

- The location of all covered plants within the inventory area is not known due to survey and mapping limitations.
- General habitat distribution models were developed for seven of the 10 covered plant species. The habitat requirements of the remaining three species are not well known enough to develop a credible model at this time.
- Because of these limitations, project proponents must determine if impacts on covered plants could result from covered activities and, if so, must ensure that any impacts on covered plant species are mitigated as required by the HCP/NCCP.
- The great majority of known populations of covered plants are outside the impact area assumed under Scenario 2, so many populations are expected to be included incidentally in preserves as the Preserve System is established to meet vegetation community and wildlife goals and objectives. However, to ensure that covered plants are conserved, site-specific surveys for covered plants will be conducted in impact areas and in new preserves.

Measure 1.2.3. Preconstruction Surveys for Wildlife

Measure

Project proponents will conduct preconstruction surveys to detect the presence of covered wildlife on project sites before initiating ground-disturbing activities associated with covered activities. The Implementing Entity will conduct preconstruction surveys in preserves at construction sites prior to implementing habitat enhancement, restoration, or creation measures and preserve-related maintenance activities that could result in take of covered species. Results of preconstruction surveys will be used to identify site-specific measures (see Vegetation Community–Level Conservation Measures and Species-Level

Conservation Measures) that will be required to avoid and minimize take of covered species. The need for preconstruction surveys will be based on results of planning surveys conducted for covered wildlife (see Conservation Measure 1.2.1). For example, if planning survey results indicate that habitat for a species is not present or that disturbance of the type of covered species habitat present would not likely result in species take (e.g., golden eagle foraging habitat), then preconstruction surveys would not be required.

Techniques and specific requirements for preconstruction surveys for covered wildlife are found in the following species-specific Conservation Measures:

- 3.1.1: Townsend's big-eared bat
- 3.2.1: San Joaquin kit fox
- 3.5.1: Western Burrowing Owl
- 3.10.1: California tiger salamander

[Note to reader: additional species-specific survey protocols and techniques may be added in subsequent drafts of the conservation strategy]

Rationale

Preconstruction surveys are necessary to acquire the information needed to identify appropriate measures that must be implemented to avoid and minimize construction-related take of covered species. Although planning surveys identify the presence of species and habitat prior to final project design, preconstruction surveys are conducted in the year of construction and identify individuals and populations of species present immediately prior to construction.

Measure 1.2.4. Construction Monitoring

Measure

Project proponents and the Implementing Entity will undertake construction monitoring during project implementation to ensure that measures required to avoid and minimize impacts on covered species and natural communities are properly implemented. Resources identified in planning or preconstruction surveys (Conservation Measures 1.2.1 and 1.2.3) will be the focus of construction monitoring efforts. Construction monitoring will be conducted by qualified biologists. Before implementing a covered activity, the project proponent will develop and submit a construction monitoring plan to the Implementing Entity for approval. Elements of construction monitoring plans should include:

- results of planning and preconstruction surveys;
- a description of avoidance and minimization conservation measures to be implemented, including a description of project-specific refinements to the measures or additional measures not included in the HCP/NCCP;

- a description of monitoring activities, including monitoring frequency and duration, and specific activities to be monitored; and
- a description of the onsite authority of the construction monitor to modify implementation of the activity.

Construction monitoring is described in more detail in the monitoring chapter of the HCP/NCCP. [*Note to reader: The monitoring chapter has not been developed yet.*]

Rationale

Construction monitoring is necessary to ensure that avoidance and minimization measures are implemented in accordance with permit requirements

Measure 1.2.5. Planning Surveys for Vegetation Communities, Rare Vegetation Types, and Rare Landscape Features

Measure

All project proponents will conduct a survey of their site to determine if rare vegetation types or rare landscape features are present. Rare vegetation types are defined as those vegetation alliances or associations listed as rare or worthy of consideration by CDFG (California Department of Fish and Game 2002) and all waters, including wetlands, under CDFG jurisdiction (California Fish and Game Code Section 1600 *et seq.*) or USACE jurisdiction (Section 404 Clean Water Act). Rare landscape features are physical or hydrologic features that are rare in the inventory area and provide important habitat for covered species and biological diversity. These planning surveys will be conducted by qualified biologists and botanists at the time of year when features that could occur at the site would be visible and identifiable.

Rare vegetation alliances that occur in the inventory area and that must be identified (note that wetland vegetation types are addressed in Conservation Measure 1.2.6 below) include but are not limited to:

- purple needlegrass grassland,
- wildrye grassland,
- wildflower fields,
- squirreltail grassland,
- one-sided bluegrass grassland,
- serpentine grassland,
- saltgrass grassland (= alkali grassland),
- alkali sacaton bunchgrass grassland,
- [*Note to reader: others to be added*]

Rare landscape features that occur in the inventory area and that must be identified include but are not limited to:

- rock outcrops,
- springs and seeps,
- [*Note to reader: others to be added*]

Project proponents will avoid impacts on these features whenever possible. If impacts cannot be avoided, they will be minimized through the use of careful project siting and design, buffer zones between development and the features, best management practices, and other suitable means. Impacts on these features will not be allowed until surveys on preserve lands document that the number and extent of these features within acquired preserves is at least twice that of the cumulative impact on the features that result from covered activities. Moreover, impacts will not be allowed until surveys on preserve lands document that the ecological functions of the rare vegetation alliances are at least as high as the rare vegetation alliances lost to covered activities.

A survey report will be prepared that includes:

- descriptions of the types, condition, and extent of all vegetation communities, rare vegetation types, and rare landscape features that occur on the site;
- a map of these resources;
- the impact of the covered activity or project on these resources; and
- a description (and map, if appropriate) of avoidance and minimization measures.

Rationale

- Rare vegetation types and rare landscape features within the inventory area provide important habitat for many covered species and generally support unique suites of species. Because of their uniqueness, they may contribute disproportionately to the overall biological diversity of the area.
- Because of limitations in funding and site access, the small size of most of these features, and the inherent difficulty of observing these features from aerial photos or in the field, it was not possible to map all these features in the inventory area. Therefore, the impacts on these features that would result from covered activities cannot be evaluated with any certainty.
- To ensure that impacts on these features are minimized and a majority of these features are preserved in the inventory area, surveys during HCP/NCCP implementation will be necessary to determine their location, condition, and extent in the permit area and in preserves.

Measure 1.2.6. Delineation of Jurisdictional Waters

Measure

All project proponents will conduct a delineation of waters of the United States and waters of the State according to the accepted standards of USACE and CDFG. All jurisdictional delineations will be accompanied by a report containing information about the wetlands and other waters to the current standards of both agencies. The report will also document the avoidance and minimization measures integrated into the project and the expected impact on the wetlands and waters that would result from the project. The report will be submitted to the Implementing Entity prior to approval of the project under the HCP/NCCP. The project will not be approved until it has properly mitigated the impact on jurisdictional waters according to the terms of the Regional General Permit, the Programmatic Section 1601 agreement (Master Streambed Alteration Agreement), and this HCP/NCCP (see Conservation Measures 2.2.1, 2.2.2, and 2.2.3).

Rationale

- Jurisdictional delineations are necessary to identify regulated resources and support compliance with Section 404 of the Federal Clean Water Act and Section 1601 of the California Fish and Game Code. The Regional General Permit and Master Streambed Alteration Agreement developed in parallel with the HCP/NCCP will require the delineation of waters subject to both federal and state jurisdiction.
- A delineation of jurisdictional waters of the inventory area was not funded during HCP/NCCP development. In addition, USACE-verified jurisdictional delineations expire after 2 years. A delineation of the permit area during HCP/NCCP development would expire prior to implementation of most or all covered activities.
- Chapter 3, Physical and Biological Resources, quantifies the extent of wetlands and other waters that may be jurisdictional in the inventory area, but this estimate is certainly a substantial underestimate of the true extent of jurisdictional waters of the United States. The minimum mapping unit of 1 acre omits many wetlands, and the small streams and drainages were not discernable with the available imagery. Consequently, site-specific surveys will be necessary to document the true extent of wetlands and other waters affected by covered activities.
- Jurisdictional delineations provide a repeatable, consistent method of tracking the impacts on wetlands and other waters within the inventory area and ensuring that these impacts are mitigated properly.
- A jurisdictional delineation serves as documentation of the condition of wetlands and other waters removed as a result of covered activities. This documentation serves as a benchmark for the restoration of wetlands within preserves as compensation for such loss (see Conservation Measure 2.1.1 below).

Preserve Acquisition

Measure 1.3.1. Acquire Lands for Preserve System

The Implementing Entity will establish the Preserve System through acquisition of land in fee title or by conservation easement. Lands will be acquired from willing sellers in keeping with the patterns and procedures described below. Land will be acquired that supports functioning vegetation communities and covered species habitat and sites that are suitable for restoration or creation of covered vegetation communities and covered species habitat.

Land Acquisition Process and Sequence

The Implementing Entity will acquire land in the Acquisition Analysis Zones to establish the Preserve System in one of four ways:

- purchase of land in fee title from willing sellers;
- purchase of conservation easements from willing sellers;
- acceptance of land dedication in lieu of fee payment under special circumstances [*Note to reader: this method has been used in other HCPs but may or may not be used in this HCP/NCCP. We need to analyze this further to determine whether this mechanism will help the HCP/NCCP to succeed.*];
or
- acceptance of land dedication as a gift or charitable donation.

Conservation easements will be the primary acquisition mechanism used by the Implementing Entity in Zone 6 because lands in this Zone are mostly in intensive agriculture. The Implementing Entity will negotiate conservation easements with willing sellers. The terms of each easement will be tailored to each landowner, parcel, and agricultural operation but will be consistent with the general principles for easements outlined in this conservation strategy and with the guidelines in the Implementing Agreement. Conservation easements on cultivated lands in Zone 6 will help to meet the biological goals and objectives of the HCP/NCCP while maintaining economically viable agricultural operations.

Acquisition of land in fee title will be the primary mechanism used in Zones 1–5. A combination of acquisition in fee title and conservation easements is expected to be used in Zone 5 due to the prevalence of wind farms in that area. The Implementing Entity may also accept lands as gifts or charitable donations. The Implementing Entity will evaluate the conservation benefit of the lands donated relative to the goals, objectives, and requirements of the HCP/NCCP. Donated land that does not meet these goals, objectives, and requirements may be sold or exchanged to enable acquisition of land that does meet these goals, objectives, and requirements.

The land acquisition process will follow the steps listed below. They steps are also illustrated in Figure 6-2.

1. Identify sites that have the potential to meet acquisition requirements within a given Zone or Subzone.
2. Approach property owner with proposal to acquire land through conservation easement or fee title.
3. If property owner is willing, enter into agreement with property owner to conduct surveys of property for land cover types (including federal and state jurisdictional waters), covered species habitat, and covered species.
4. Conduct necessary resource surveys.
5. Determine if site meets acquisition requirements of HCP/NCCP and ensure that property encumbrances (e.g., existing easements, property title, presence of hazardous materials) do not conflict with HCP/NCCP goals and objectives.
6. Rank available sites based on their ability to meet HCP/NCCP requirements and goals and objectives.
7. For high-ranking site, make offer to property owner and develop easement conditions, if appropriate.
8. Negotiate price and/or easement conditions with owner and acquire site.
9. If site is purchased in fee title, the Implementing Entity will prepare a management plan for site based on site conditions. If conservation easement is purchased, the Implementing Entity will prepare a management plan with the landowner.
10. Initiate preserve management and conduct habitat restoration (if applicable).

“Jump Start” and “Stay Ahead” Requirements

The timing and sequence of land acquisition relative to impacts is critical to the success of the HCP/NCCP. Land acquisition or purchase of easements must stay ahead of any impacts on vegetation communities and covered species habitat resulting from covered activities. This sequence ensures that impacts do not occur before adequate mitigation is identified for them and secured. The sequence also ensures that at least some mitigation is in place and functioning prior to the impact occurring (however, some habitat restoration may not be functioning prior to impacts in cases where the habitat requires a longer time to develop). To meet this “stay ahead” provision at the beginning of HCP/NCCP implementation, some land must be acquired prior to any permits being issued under the HCP/NCCP to “jump start” the Preserve System.

Jump Start Requirements. The Implementing Entity will acquire at least 500 acres of land to meet the requirements of this HCP/NCCP within 6 months of receipt of state and federal ESA permits. This land will comprise at least 250 acres of annual grassland land cover type and 100 acres of cropland or pasture. The 250 acres of annual grassland must be suitable core habitat for San Joaquin kit fox. Table 6-4 lists all Jump Start requirements. Jump Start requirements for aquatic land cover types are approximately 10% of the expected preservation requirement (Table 6-5).

Stay Ahead Requirement. The proportion of the total acquisition goal achieved in land acquisition for each community must always be (at any give time) 5% higher than the proportion of the total allowable impacts on that community that have resulted from covered activities. For example, if covered activities have resulted in removal of 25% of the total expected loss of annual grassland, then at least 30% of the total acquisition goal for annual grassland must have been achieved. This Stay Ahead requirement will ensure that preserve acquisition is always ahead of impacts from covered activities. It will also ensure that the HCP/NCCP is always contributing to the recovery of covered species.

Note to reader: the funding mechanisms and structure of this HCP/NCCP have not yet been determined. The actual acreage trigger for when the Stay Ahead requirement takes effect will be determined on the basis of further analysis of funding needs during the first few years of implementation.

Neighboring Landowner Protection

Land acquired for preserves will be enhanced through management and habitat restoration. Populations of covered wildlife and plants are expected to increase within preserves as a result of these activities. Landowners with private land adjacent to new preserves may experience an increase in the abundance or number of state- or federally listed species colonizing or occupying their property as a result of this HCP/NCCP. This HCP/NCCP will not place any additional regulatory or financial burden on these neighboring landowners as a result of HCP/NCCP activities that result in increased occurrences of listed species above the existing baseline occurrences on their properties. See Chapters X and Y of the HCP/NCCP (Assurances, Implementation) and the Implementation Agreement for definitions, exceptions, and the procedures for establishing these protections on neighboring lands.

Note to reader: a similar provision is included in the San Joaquin County HCP; such a provision is proposed for this HCP/NCCP. The details of this provision will be developed in consultation with HCPA staff, representatives of landowner groups, and the regulatory agencies.

Field-Verified Conditions

Land-cover data, species distribution data, and species habitat models were developed for this HCP/NCCP at a regional scale and general level of resolution. These data and models were used in this HCP/NCCP to estimate impacts of covered activities and to develop a sound conservation strategy for the inventory area at a regional scale. These data and models are not intended for site-specific planning because of their low resolution and the lack of field verification. Project proponents must verify in the field all impacts on land cover types and suitable habitat for covered wildlife species as specified in the HCP/NCCP Conservation Measures. The Implementing Entity will conduct planning surveys for land cover type and covered species habitat on all lands considered for acquisition to determine whether the proposed acquisition site meets HCP/NCCP requirements (Figure 6-2). Planning surveys are described in more detail in the following conservation measures:

- Measure 1.2.5: Planning Surveys for Vegetation Communities, Rare Vegetation Types, and Rare Landscape Features
- Measure 1.2.6: Delineation of Waters of the United States
- Measure 1.2.1: Planning Surveys for Wildlife Species.
- Measure 1.2.2: Planning Surveys for Plants.

Acquisition Credit by Zone

To achieve the biological goals and objectives of the HCP/NCCP and to contribute 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 preserves can be assembled (by augmenting and connecting existing protected lands) to create the Preserve System. However, the Implementing Entity must retain flexibility in where land can be acquired because the plan depends on the availability of willing sellers. The HCP/NCCP balances these needs by focusing acquisition of certain land cover types within certain Zones and Subzones.

Credit will only be given if the acquisition occurs in the required Zone (Table 6-6) or if the acquisition meets another requirement within the Zone not specific to the land cover type. For example, acquisition of annual grassland will be focused in Zones 1, 2, 3, 4, and 5. A small amount of annual grassland occurs in Zone 6. If annual grassland is acquired in Zone 6, no credit will be given towards the overall requirements for preservation of annual grassland. However, if the annual grassland in Zone 6 serves as suitable habitat for Swainson's Hawk or Western Burrowing Owl, acquiring it may count toward the habitat requirements for those species in Zone 6.

Most natural land cover types will be acquired in Zones 1–5. Acquisition in Zone 6 will focus on cropland and pasture mainly as habitat for Swainson's Hawk and Western Burrowing Owl. Credit will also be given to acquisition of some aquatic land cover types such as freshwater marsh and sloughs and channels in Zone 6. These aquatic land cover types are generally compatible with agricultural operations and can be heavily used by resident and migratory waterfowl that frequent cultivated agricultural areas.

Land acquisition requirements for wetlands, ponds, streams, and riparian woodland/scrub are described separately from other land cover types.

Land Acquisition Requirements for Wetlands, Ponds, Streams, and Riparian Woodland/Scrub

Acquisition of wetlands, ponds, streams, and riparian woodland/scrub is not prioritized by Zone; this approach allows more flexibility in how the requirements are met. All wetlands, ponds, and streams will be delineated in the field prior to impacts and land acquisition according to Measure 1.2.6 (Wetland Delineations). To mitigate impacts on these aquatic land cover types, the Implementing Entity will acquire these land cover types in-kind within preserves according to the ratios in Table 6-7. Mitigation will also include creation,

restoration, or enhancement of aquatic land cover types as described in Measure 2.2.2 (Wetland Restoration Program). In order to contribute to the recovery of covered aquatic and riparian species, the Implementing Entity will also create or restore key aquatic land cover types within preserves above and beyond the mitigation requirements. These requirements are also described in Conservation Measures 2.2.1, 2.2.2, 2.2.3, 2.6.1, and 2.6.2.

Based on the mapping of the inventory area, there may not be a sufficient extent of seasonal wetland and open water within Zones to compensate for impacts (under Scenario 2) on these land cover types. Impacts on all aquatic land cover types will be limited to the amount of the same land cover type available for acquisition according to the preservation ratios in Table 6-7. Avoidance and minimization of impacts on aquatic land cover types (see Conservation Measure 2.2.4) at proposed project sites will reduce the amount of preservation area required. Once preservation sites with the appropriate aquatic land cover type are no longer available in the inventory area, impacts on that land cover type will no longer be covered under this HCP/NCCP. Alternative mitigation approaches will be evaluated by the Implementing Entity on a case-by-case basis. For example, in lieu of preservation, mitigation options could include restoring aquatic land cover types at a greater ratio than that required by the HCP/NCCP.

The HCP/NCCP land cover inventory identified 219 acres of riparian woodland/scrub in the inventory area, with 63 acres in existing public lands. According to the land cover mapping, 33 acres of riparian woodland/scrub is available for acquisition within the Zones, although this value may be an underestimate of the true amount of riparian woodland/scrub available. The remaining 123 acres occurs along streams in existing and proposed future urban areas. Credit for land acquisition of riparian woodland/scrub will be given first within the Zones (Table 6-7). If there are no opportunities for acquisition of riparian woodland/scrub within the Zones (i.e., due either to a lack of willing sellers or to no remaining riparian woodland/scrub), the Implementing Entity will receive credit for acquisition of riparian woodland/scrub elsewhere in the inventory area, as long as the land acquired contains the minimum buffers needed to maintain the function of the vegetation community as described in Conservation Measure 1.3.3. If these conditions cannot be met, then impacts on riparian woodland/scrub will be limited to the amount available for preservation at a 2:1 ratio within the Zones.

Preservation of streams will be accomplished according to stream type. Impacts on perennial streams will be mitigated at a preservation ratio of 2:1. Impacts on intermittent or ephemeral streams will be mitigated at a preservation ratio of 1:1. Perennial, intermittent, and ephemeral streams are defined in USACE regulations. Mitigation for impacts on streams will also include compensatory habitat restoration. Compensation for impacts on streams will include restoration of existing streams (e.g., creating meanders in channelized streams, removing concrete lining) and out-of-kind restoration of wetland and pond habitats. Restoration compensation for impacts on perennial streams may be accomplished through enhancement of riparian woodland/scrub. Restoration compensation for impacts on intermittent streams may be accomplished through enhancement of

perennial or intermittent streams. Restoration compensation for impacts on ephemeral streams (ephemeral streams were not mapped in the HCP/NCCP inventory) can be accomplished through wetland restoration. In addition to compensatory restoration, the Implementing Entity will conduct stream, wetland, and pond restoration to contribute to the recovery of California red-legged frog and foothill yellow-legged frog. See Conservation Measures 2.2.1 and 2.2.2 for more details.

Land Acquisition Requirements by Acquisition Zone

A key element of the Preserve System is acquiring land in large blocks. Large preserves provide greater viability as management units, maximize preserve capacity to support viable populations of covered species, maintain existing ecological functions, and preserve existing biodiversity. To achieve these beneficial outcomes, it is important to establish large, linked blocks of vegetation communities as well as a mosaic of these communities within the Preserve System. Land cover types will be used as the primary unit identified in the field and credited towards the acquisition requirements. If no specific requirement is given for a land cover type for a given zone, the acquisition requirement can be met in any Zone allowed in Table 6-6. In some cases, there are requirements for acquisition of habitat for a covered species, habitat that supports a population of a covered plant, or habitat configured in a specific way.

To ensure that acquisition occurs in locations that will maximize the benefits to covered vegetation communities and covered species, acquisition requirements are defined by Zone and, in some cases, by Subzone. The priorities for land acquisition within the Zones are shown in Figure 6-3.

The primary rationale for each requirement is described with each requirement (rather than at the end of the section as in other conservation measures). The specific benefits of this measure to each covered species are summarized in the section on species-specific conservation measures. The total acreage requirements for each terrestrial land cover type are listed in Table 6-8.

Actual Extent of Land Acquisition

Land acquisition will be constrained by many factors, including available funds, willing sellers, and parcel boundaries. The acreage requirements in Table 6-8 are the minimum required under the HCP/NCCP. Actual acquisition of some land cover types will likely be greater than the minimum requirements because parcel boundaries typically do not follow ecological boundaries and the boundaries of acquired parcels will include “non-target” land cover types. In addition, in order to meet land acquisition requirements for species habitat, species populations, or land configuration, land beyond that required (Table 6-8) will have to be acquired.

For example, to meet the requirements for Subzone 1c (i.e., 1,100 acres of annual grassland connecting Black Diamond Mines Regional Park and the Concord Naval Weapons Station), parcels that contain oak woodland will likely be purchased. Acquisition of oak woodland in Subzone 1c will contribute to the overall requirement of 440 acres of oak woodland. Because oak woodland is

widely distributed in the inventory area, it is expected that oak woodland will be acquired far in excess of the 440-acre requirement.

Based on the land acquisition requirements in these Conservation Measures, the minimum and maximum Preserve System size (Table 6-9) and extent of each land cover type to be acquired (Table 6-10) were determined.

Acquisition Requirements for Zone 1

The Implementing Entity will acquire at least 1,100 acres of annual grassland in Subzone 1c to create a connection from Black Diamond Mines Regional Park with the Concord Naval Weapons Station. The goal of this connection will be to create a movement route of annual grassland or oak savanna at least 0.5 mile wide to allow San Joaquin kit fox, California red-legged frog, and California tiger salamander to move between these core existing preserves. Creating a movement route of continuous annual grassland 0.5 mile wide, however, may not be possible, depending on the availability of willing sellers in Subzone 1c. To adjust for this uncertainty, if the land acquired includes oak woodland, it must be at least 0.75 mile wide. If land is acquired along the inventory area border in Subzone 1c, any annual grassland acquired incidentally within Subzone 1b (as a function of parcel boundaries that extend outside the inventory area) can be counted towards the annual grassland requirement for Subzone 1c.

The Implementing Entity will acquire at least 367 acres of annual grassland in Subzone 1a to protect ridgelines and watershed headwaters (e.g., Lawlor Ridge). Land within Subzone 1a may also provide a secondary connection for San Joaquin kit fox between Black Diamond Mines Regional Preserve and the Concord Naval Weapons Station once portions of the Keller Canyon landfill are closed and reclaimed. Preservation of this area will also protect known occurrences of California tiger salamander (Gan pers. comm.).

Lands within the Blast Zone of the Concord Naval Weapons Station in Subzones 1a, 1b, 1c, and 1e are of lower acquisition priority because these lands are presently more protected from development than lands within these Subzones outside the Blast Zone.

The Implementing Entity will acquire at least 25% of Subzone 1d. Acquisition in this Subzone will be focused in the northern half of the Subzone in order to secure annual grasslands that will serve as a buffer between urban development in Pittsburg and the Preserve System. Lands acquired in this Subzone will provide habitat for San Joaquin kit fox and other grassland-dependent covered species.

No land acquisition requirement is given for Subzone 1e. However, if land is acquired in this Subzone to meet other requirements (e.g., overall annual grassland requirement), it must be contiguous with lands acquired in Subzones 1a or 1c.

Acquisition Requirements for Zone 2

The Implementing Entity will acquire land in Subzone 2b, 2c, or both to connect Black Diamond Mines Regional Park and Clayton Ranch (EBRPD). The connection must be at least 0.5 mile wide. The Implementing Entity will also acquire at least 50% of Subzone 2a. Acquisitions in Subzone 2a will focus on the northwestern and southeastern corners of this Subzone to increase the size of habitat connections between Black Diamond Mines Regional Park and either the Concord Naval Weapons Station or Clayton Ranch, respectively. Acquisition of land in the northwestern and southeastern corners of Subzone 2a will protect the headwaters of two tributaries of Mount Diablo Creek. The additional requirements below apply to Zone 2.

- The Implementing Entity will acquire at least 7 of the 13 ponds in Subzone 2c to provide potential breeding habitat for California red-legged frog, California tiger salamander, and Tricolored Blackbird. This Subzone has a large number of unprotected ponds.
- The Implementing Entity will acquire 90% (124 acres) of the remaining chaparral in Subzones 2a, 2b, and 2c to protect patches of chaparral that serve as potential core habitat for Alameda whipsnake and provide important linkages for whipsnake populations in Mount Diablo State Park and Black Diamond Mines Regional Park. Preservation of these patches will also protect suitable habitat for Mount Diablo manzanita.
- The Implementing Entity will acquire land in Subzone 2a to protect the known population of Mount Diablo manzanita.
- Land acquired in Subzone 2f for the San Joaquin kit fox movement route must also include the two known occurrences of big tarplant in Deer Valley. Where possible, land acquired to meet kit fox and big tarplant requirements should also include reported sites supporting alkali soils in Deer Valley (Olson pers. comm.).
- Land acquired in Subzones 2h and 2g must include the four known occurrences of big tarplant outside the ULL.
- Land acquired in Subzone 2h must include the known occurrences of Mount Diablo manzanita and Brewer's dwarf flax (Mundie & Associates and City of Antioch 2002) and all modeled suitable habitat (86 acres) for silvery legless lizard.
- The Implementing Entity will acquire all 37 acres of modeled suitable habitat for silvery legless lizard identified in Subzone 2a.
- The Implementing Entity will acquire all modeled suitable habitat (43 acres) for silvery legless lizard in Subzone 2e. This requirement is expected to overlap with the requirements for San Joaquin kit fox habitat acquisition in this Subzone.
- The Implementing Entity will acquire land that supports suitable habitat for vernal pool invertebrates wherever practicable.

Additional land acquisition in Zones 2 and 4 is required to protect San Joaquin kit fox movement routes. See discussion of these requirements in *Land Acquisition Requirements in Zones 2 and 4 to Protect Kit Fox Movement Routes* below.

Acquisition Requirements for Zone 3

The Implementing Entity will acquire at least 90% (212 acres) of the suitable core habitat for Alameda whipsnake in Subzone 3a to protect the largest block of chaparral/scrub in the inventory area outside existing public lands. Protection of 90% of core habitat and the protection of movement habitat surrounding it will provide a key linkage between existing protected Alameda whipsnake habitat in Mount Diablo State Park and Black Diamond Mines Regional Park.

The Implementing Entity will acquire at least 25% of Subzone 3b (369 acres). Acquisition should be focused in the eastern half of Subzone 3b to increase the width of the linkage between the large chaparral patch (a portion of which is in Subzone 3a) and other chaparral patches in Mount Diablo State Park. All land acquired in this Subzone must contribute to this linkage and at least 50% of this land must be connected to Clayton Ranch through existing protected lands or HCP/NCCP preserves. Land acquired in this Subzone will contribute to the recovery of Alameda whipsnake by protecting important movement habitat between known populations.

Acquisition Requirements for Zone 4

Land acquisition in Zone 4 will be focused in two primary areas: the Briones Valley (Subzone 4d) and upper watershed lands adjacent to Mount Diablo State Park and Morgan Territory Regional Preserve (Subzones 4a and 4h). Acquisition in Subzone 4d will meet biological objectives to protect movement routes for San Joaquin kit fox and protect potential and known breeding habitat for California red-legged frog and California tiger salamander. Acquisition in Subzones 4a and 4h will create a more viable link between Morgan Territory Regional Preserve and Mount Diablo State Park. The current link (i.e., through existing public lands) is as narrow as 0.5 mile wide and is subject to a high level of edge effects along its southwestern border because of urban development in the hills above Danville (e.g., Blackhawk area). Acquisition in Subzones 4a and 4h will preserve the majority of the headwaters of Marsh Creek and its upper tributaries. Land acquisition in Zone 4 will be conducted in all Subzones to ensure that a diversity of species, elevation zones (i.e., an elevational gradient), vegetation associations (e.g., mixed evergreen forest vs. oak woodland), and habitat types are included in the Preserve System.

Land acquisition in Zone 4 will be focused along Marsh Creek, especially in the upper reaches where modeled suitable breeding habitat for foothill yellow-legged frog occurs. Acquisition of portions of Marsh Creek will protect modeled breeding and dispersal habitat for California red-legged frog, foothill yellow-legged frog, and California tiger salamander; and modeled movement habitat for Alameda whipsnake. Streambed and an adequate buffer zone will be acquired to the greatest extent possible. The stream and riparian buffer zone acquired will be consistent with the requirements in Conservation Measure 1.3.3.

The Implementing Entity will acquire land in Zone 4 according to the minimum acreage requirements listed in Table 6-11. These acreage requirements apply only to natural land cover types (i.e., ruderal or urban land cover types will not count toward these requirements). Other specific requirements for land acquisition within Zone 4 are listed below.

- The Implementing Entity will acquire at least 425 acres of chaparral/scrub within Zone 4 (out of 514 acres present) to protect suitable core habitat for Alameda whipsnake and to meet the overall HCP/NCCP requirements for acquisition of this land cover type.
- Acquisition in Subzone 4h must link the Morgan Territory Ranch (Seeno conservation easement) with Morgan Territory Regional Preserve and Mount Diablo State Park.
- Acquisition in Subzones 4a and 4h must include at least 90% (518 acres) of the modeled suitable core habitat for Alameda whipsnake.
- Protect the occurrence of Brewer's dwarf flax in Subzone 4f .
- Protect the known occurrence of Diablo helianthella and Brewer's dwarf flax in Subzone 4a
- Protect the known occurrence of Mount Diablo fairy lantern within Subzone 4b, if it is still extant.

If land acquisition occurs in Subzone 4a at the southern border of the inventory area, any natural land cover types incidentally acquired outside the inventory area (i.e., as a function of parcel boundaries occurring outside the inventory area) can be counted towards the acreage requirements for this Zone and Subzone.

Additional land acquisition in Zones 2 and 4 is required to protect San Joaquin kit fox movement routes. See discussion of these requirements in *Land Acquisition Requirements in Zones 2 and 4 to Protect Kit Fox Movement Routes* below.

Acquisition Requirements for Zone 5

In order to meet the overall HCP/NCCP requirements for annual grassland and alkali grassland acquisition, most of the land in Zone 5 must be acquired. The Implementing Entity will acquire at least 80% (7,120 acres) of the annual grassland in Subzones 5a and 5b, at least 70% (776 acres) of the alkali grassland, and 90% (23 acres) of the alkali wetlands in fee title or conservation easement to create a new core preserve. This core preserve must create a continuous habitat connection of at least 0.5 mile wide linking the conservation areas surrounding the Byron Airport with the Los Vaqueros Watershed lands. The preserve must also create a link of conservation land at least 0.5 mile wide between Vasco Caves Regional Preserve and the Contra Costa/Alameda County line. This connection would almost link the Brushy Peak Regional Preserve in Alameda County with Vasco Caves. All land preserved in Subzones 5a and 5b must be connected to other preserve lands within Zone 5 or to existing public lands such

as the Los Vaqueros Watershed, Vasco Caves Regional Preserve, or the Byron Airport conservation easements.

The new core preserve will protect a critical linkage for San Joaquin kit fox between its range outside Contra Costa County and its range in the East County. This preserve will also protect the majority of potentially suitable habitat for alkali soil-restricted covered plants: Brittle scale, San Joaquin sparscale, and recurved larkspur.

In addition to the landscape and species habitat requirements above, the Implementing Entity must also:

- protect the four known occurrences of brittle scale in Subzone 5a that occur outside existing protected lands;
- protect at least two occurrences of recurved larkspur in Subzone 5a or Subzone 6d;
- acquire the seasonal and alkali wetlands along the Contra Costa–Alameda County line south of the California Aqueduct to link with CDFG lands in Alameda County; and
- give priority to acquiring those sites with suitable habitat for vernal pool invertebrates, including rock outcrops and basins that provide suitable habitat for longhorn fairy shrimp.

Land acquisition in wind turbine areas can be achieved through conservation easements as long as existing wind turbine easements are compatible with the goals and objectives of this HCP/NCCP. Land cover types within incompatible wind turbine easements will not count toward the acquisition requirements within Zone 5. Land acquisition in areas with existing San Joaquin kit fox habitat conservation easements (e.g., surrounding the California Aqueduct) will not count towards the land acquisition requirements.

Acquisition Requirements for Zone 6

In Zone 6, the Implementing Entity will focus on acquiring conservation easements on cultivated agricultural lands that provide suitable habitat for covered wildlife species such as Swainson’s Hawk, Western Burrowing Owl, Golden Eagle, and San Joaquin kit fox. Focused acquisitions will protect most of the remaining alkali grassland, alkali wetlands, and alkali sink scrub in Zone 6.

The Implementing Entity will acquire conservation easements on at least 6,250 acres of cropland or pasture within Zone 6. Conservation easements will require that all enrolled agricultural lands be managed to support new foraging habitat or to improve existing foraging habitat for Swainson’s Hawk, Western Burrowing Owl, Golden Eagle, or Tricolored Blackbird. Adjustments to management that will be required under the easements will be compatible with an economically viable agricultural operation.

Conservation easements will be purchased within each Subzone according to the minimum requirements listed in Table 6-12. These geographical priorities were established to focus conservation in two primary areas: within the Agricultural Core of Contra Costa County and along the boundary between Zones 5 and 6. Conservation of cropland and pasture within the Agricultural Core (Subzone 6b) would simultaneously protect suitable habitat for Swainson's Hawk, Western Burrowing Owl, and Golden Eagle and help to achieve the goals of the Contra Costa County General Plan to conserve agricultural lands within the Agricultural Core. Preservation of cropland or pasture along the boundary between Zones 5 and 6 will establish an important buffer zone between existing and future urban areas and the annual grassland in Zone 5.

Conservation easements in Subzones 6c and 6d will also protect at least 938 acres of suitable low-use habitat for San Joaquin kit fox and provide a secondary movement route for kit fox between Alameda County and southeastern Contra Costa County. There have been five recorded sightings of kit foxes within Subzones 6c and 6d, so individuals likely use this area at least occasionally. Two agricultural land trusts are active or are becoming active in this area, the Agricultural Trust of Contra Costa County and the Brentwood Agricultural Trust. Acquiring conservation easements in Subzone 6c provides opportunities to link acquisitions of other groups to form a continuous buffer with Zone 5. Priority for land acquisition in Subzone 6e will be given to lands adjacent to the San Joaquin River and to lands acquired across the river in San Joaquin County, including lands acquired under the San Joaquin County HCP.

The Implementing Entity will acquire at least 80% (258 acres) of the alkali grassland in Zone 6 to preserve potential habitat for alkaline plants and to protect the rare vegetation association alkali sink scrub. The Implementing Entity will protect at least two occurrences of recurved larkspur in Subzone 5a or 6d.

Land Acquisition Requirements in Zones 2 and 4 to Protect Kit Fox Movement Routes

An important regional goal of this HCP/NCCP is to provide a viable connection for San Joaquin kit fox between the large block of public lands in and around the Los Vaqueros Watershed and Black Diamond Mines Regional Park. San Joaquin kit foxes occur in both places and are assumed to move between them regularly. This movement must continue in order to ensure a viable population in the area and to maintain kit foxes in Black Diamond Mines Park. There have been only two sightings of kit foxes between these areas; consequently, their movement patterns between these public lands are largely unknown.

Four potential movement routes are predicted for San Joaquin kit fox between Black Diamond Mines Regional Park and the Los Vaqueros Watershed (and adjacent public lands) (Figure 6-4). This prediction for movement routes is based on the land cover mapping and habitat modeling conducted for this HCP/NCCP, verified sightings of kit foxes, and the assumption that kit foxes need a corridor of suitable core habitat at least 0.5 mile wide (Jones & Stokes Associates 1996). All four routes are in Zones 2 and 4, and each is described below.

1. Through Round Valley. Annual grasslands that connect Round Valley to Black Diamond Mines Regional Park through Subzones 4e, 4c, 2c, and 2b (and possibly 2a) comprise the southernmost potential movement route for kit fox. These grasslands occur in a variety of landforms, including valleys and ridges. San Joaquin kit foxes have been sighted in Round Valley and within this movement route near Marsh Creek Road, suggesting that the route may be used. Suitable core habitat for kit fox is approximately 0.5 mile wide through most of this movement route, but it is continuous from end to end. At the northwestern end of the route, core modeled habitat for San Joaquin kit fox narrows to approximately 0.2 mile. To pass through this area, kit foxes would have to move through oak woodland or chaparral/scrub for less than a mile.

The long-term viability of this potential movement route is in question. Contra Costa Water District is currently planning to expand the Los Vaqueros Reservoir to as much as 500,000 acre-feet. The maximum size of the expanded reservoir would flood nearly all the modeled kit fox core habitat on the southeast side of the reservoir, eliminating that connection across the Kellogg Creek watershed. Kit foxes will still be able to cross the watershed along the northern shore of the new reservoir. However, the overall viability of this regional movement route will be reduced by the reservoir expansion.

2. Briones Valley. This potential movement routes runs through Briones Valley in Subzones 2c, 2d, and a portion of 2e. A secondary connection from Los Vaqueros may exist through the Cañada de los Poblanos in Subzone 4d. However, because Marsh Creek Road runs the length of this relatively narrow valley (0.2–0.25 mile wide), the viability of this valley for kit fox movement is uncertain. The hills between Briones Valley and Cañada de los Poblanos also contain annual grassland and are suitable for kit fox. A kit fox has been observed in Briones Valley near Deer Valley Road, suggesting that the Briones Valley movement route may be used. Suitable core habitat through most of Briones Valley is more than 0.5 mile wide but is discontinuous at one end. At the head of Briones Valley, suitable core habitat narrows to less than 0.1 mile. To traverse this area from Briones Valley, kit foxes would have to cross into Oil Canyon and Black Diamond Mines through patches of oak woodland, which is not considered suitable habitat for the species.

3. Deer Valley. The potential movement route through Deer Valley occurs in Subzones 2e and 2f. The movement route is already partially protected with the conservation easement from the Roddy Ranch Golf Course. Suitable core habitat through most of Deer Valley is more than 0.5 mile wide and is continuous from end to end. Suitable core habitat narrows to approximately 0.3 mile near Black Diamond Regional Park.

4. Horse Valley. The shortest distance around the north side of Roddy Ranch Golf Course between Black Diamond Mines and Cowell Ranch is through Horse Valley. This movement route traverses Subzones 2e, 2f, 2g, and 2h. Subzones 2h and 2g were delineated to provide a minimum 0.5-mile-wide patch of annual grassland around the north side of the golf course and into Black Diamond Mines

Regional Park. This movement route is the shortest distance through Horse Valley, assuming that kit foxes would not cross the golf course.

The Horse Valley potential movement route is part of a much larger area of modeled suitable core habitat for kit fox at the southern edge of Antioch. According to the land cover mapping, up to 4,815 acres of suitable core habitat is present in Subzones 2h, 2g, 2i, and 2e. This habitat forms the widest connection (approximately 1–2 miles) of suitable core habitat for kit fox between Black Diamond Mines Park and Cowell Ranch. Kit foxes have been sighted along the eastern edge of Black Diamond Mines Regional Park (adjacent to Subzone 2h); accordingly, they may use this area to move between the Los Vaqueros Watershed and Black Diamond Mines.

Development of up to 4,870 units has been proposed within the ULL in Subzones 2h and 2i (Mundie & Associates and City of Antioch 2002). It is likely that at least some of this development will be permitted and that the urban area of Antioch will expand to the south. As development in Antioch extends southward, the long-term viability for kit fox movement in the connection through Horse Valley will be reduced.

Two of the four potential kit fox movement routes are likely to remain viable in the long term. The route through Round Valley may lose its viability due to the expansion of the Los Vaqueros Reservoir, and the route through Horse Valley will lose some of its viability as development in Antioch extends farther south. The Deer Valley movement route must be maintained because it provides the widest band of suitable core habitat outside the ULL and well away from dense urban development. The Briones Valley movement route will also be preserved as a secondary link between Black Diamond Mines Regional Park and Cowell Ranch State Park.

Another secondary movement route can be created by preserving land within Subzone 2h. Protection of this movement route assumes that kit foxes can move across the Roddy Ranch Golf Course or across the hills (covered mostly in annual grassland) between Horse Valley and Deer Valley. With acquisition in these areas, there would be a minimum of two movement routes and possibly up to four routes for kit fox included in the Preserve System.

Land Acquisition Requirements in Zone 2 to Protect San Joaquin Kit Fox

- **Deer Valley.** The Implementing Entity will acquire land within Subzones 2e and 2f to create a continuous band of modeled suitable core or low use habitat for kit fox between Cowell Ranch State Park and Black Diamond Mines Regional Park. This band of habitat must be at least 0.5 mile wide. Where modeled suitable core habitat is not 0.5 mile wide, land acquired must be of the maximum width possible.
- **Briones Valley.** The Implementing Entity will acquire land within Subzones 2c and 2d to create a continuous band of modeled suitable core or low use habitat for kit fox between Cowell Ranch State Park and Black Diamond

Mines Regional Park. This band of habitat must be at least 0.5 mile wide. Where modeled suitable core habitat is not 0.5 mile wide, land acquired must be of the maximum width possible. If there are not enough willing sellers in the eastern half of Subzone 2d to meet this requirement, then acquisition can occur within Subzone 4d in the hills between Briones Valley and Marsh Creek Road to link Cowell Ranch with Black Diamond Mines Regional Park.

- **Sand Creek.** The Implementing Entity will acquire at least 75% (946 acres) of the land within Subzone 2h to enhance movement opportunities for San Joaquin kit fox through this area and to provide a wide buffer zone between future development in the Sand Creek area and the primary movement route in Briones Valley. Land acquisition will be concentrated in the western portion of this Subzone. Land acquisition in this area will also provide an important buffer between development and the known sightings of kit foxes at the eastern edge of Black Diamond Mines Regional Park.

Zone 2 contains 32% of the annual grassland within all the Zones. In order to meet the overall requirement for preservation of this land cover type, and to meet the preserve configuration requirements described above for this Zone, the Implementing Entity will acquire annual grassland within each Subzone to at least the minimum requirements listed in Table 6-13.

Measure 1.3.2. Establish Buffer Zones to Protect Preserved Uplands and Wetlands

Measure

The Implementing Entity will establish buffer zones between sensitive land cover types in the preserves and developed and agricultural lands. The purpose of these buffer zones is to eliminate or minimize the potential adverse affects of adjacent urban and agricultural uses on sensitive preserved, enhanced, restored, and created natural communities and covered species habitat. The buffer zone will be of sufficient width to achieve this purpose. In some cases, lands may not be available to serve as spatial buffers; in these instances, specific management actions may be undertaken to eliminate or minimize existing adverse effects that adjacent land uses could have on the preserves.

Guidelines for buffer widths for different land cover types are presented in Table 6-14. Site-specific buffer requirements will be considered and evaluated during assessments of land proposed for preserve acquisition. Based on the site assessment, the buffer width may be reduced from that identified in Table 6-14 if site-specific conditions (e.g., aspect, visibility) are such that the likelihood for adverse effects associated with activities on adjacent developed lands are greatly reduced or absent.

Land cover types (except ruderal) that are designated as buffer zones will be included within the Preserve System and may be credited towards terrestrial land cover or species habitat preservation requirements (see Conservation Measure 1.3.1). Aquatic land cover types and aquatic covered species breeding habitat

without sufficient buffer zones will not be credited toward meeting preservation requirements.

Rationale

- Buffers improve the likelihood that wildlife will use existing, enhanced, restored, and created habitat by reducing the adverse effects of development-related disturbances (e.g., harassment of wildlife associated with noise, visual disturbances, and night lighting).
- By increasing the physical space between protected resources and development, buffers protect vegetation, covered plant populations, and infrastructure used in habitat restoration (e.g., irrigation lines) from unintended damage or vandalism by trespassers.
- Buffers reduce the likelihood of contaminants in urban runoff from reaching preserved wetlands and ponds and occurrences of covered plants.
- Buffer widths of 500 and 100 feet from agricultural lands where pesticides are aerially and ground applied, respectively, should be sufficient to protect preserved and restored vegetation from pesticide drift (U.S. Fish and Wildlife Service 1992).

Measure 1.3.3. Establish Buffer Zones between Streams and Development

Measure

Preserve a buffer zone of at least 100 feet between new urban development and protected streams (those streams not removed by covered activities). The 100-foot buffer zone is measured from the top of the stream bank or outer edge of riparian vegetation, whichever is farthest from the stream channel. The total protected corridor would comprise the channel between its banks, the vegetated riparian zone (if present or restored), and 200 feet of upland buffer (100 feet on either side). The purpose of the stream buffer zone is to:

- improve water quality by filtering sediments and pollutants from urban runoff before they reach the stream;
- allow for protection of preserved and restored riparian woodland and scrub within and adjacent to the stream channel;
- allow channelized streams to reestablish some of their historic meanders within flood control levees or other limiting structures;
- maintain a buffer zone between urban development and existing and restored nesting habitat for Swainson's Hawk and other bird species;
- maintain and enhance the water quality of the stream to protect native fish populations, including populations of special-status species that occur in downstream reaches (e.g., fall-run Chinook salmon in Marsh Creek);

- provide upland aestivation and hibernation habitat for amphibians and reptiles;
- maintain a more viable wildlife corridor for some species (e.g., California red-legged frog and California tiger salamander) than would be present with a narrower buffer zone;
- maximize the natural flood protection value of the floodplain; and
- provide for recreational trails along the corridor that are compatible with wildlife use.

This buffer zone will also protect restored and enhanced riparian woodland/scrub (see Conservation Measures 2.6.1 and 2.6.2).

Where practicable, the stream setbacks should exceed the minimum requirements to provide a variable width stream corridor (Natural Heritage Institute 2002); such an enhanced corridor would increase habitat values, water quality protection, and opportunities for recreation.

Rationale

Streams in their lower reaches occur on flat floodplains that allow them to naturally meander and form sinuous channels. This channel pattern helps to create a diversity of aquatic and terrestrial habitat types to support high biological diversity. For example, the historic meander belt (i.e., the corridor in which a creek naturally meanders) of Marsh Creek in Brentwood was approximately 2,000 to 2,500 feet (Natural Heritage Institute 2002). Reestablishing this historic meander belt is no longer possible due to urban development, but benefits can still be realized by reestablishing a small portion of it within the urban matrix.

As urban development encroaches on streams, the need increases to channelize and straighten these streams to reduce their flood frequency. This has the undesirable effect of greatly reducing habitat diversity. If a buffer zone between urban development and stream banks is maintained (e.g., agriculture or natural communities), stream channels can maintain a natural or semi-natural channel while still reducing flood risk to nearby development.

A minimum stream setback of 100 feet has been recommended in Brentwood to achieve the goals outlined above (Natural Heritage Institute 2002). This minimum setback is based on an extensive review of existing conditions in Brentwood and published literature on stream setbacks (e.g., Young et al. 1980; Lynch et al. 1985; Magette et al. 1987; Herson-Jones et al. 1995; Spackman and Hughes 1995; Hagar 1999). This standard is assumed to be applicable to all streams within the ULL in the inventory area.

Opportunities exist within the ULL to protect stream buffer zones to at least the recommended width of 200 feet. In Brentwood, for example, the total undeveloped corridor width of Marsh Creek through the City varies from 130 feet to more than 1,000 feet, while existing protected corridors range from 0 to 120 feet (Natural Heritage Institute 2002). There are also opportunities in

Brentwood for buffer protection, restoration, and enhancement along Deer and Sand Creeks (Natural Heritage Institute 2002). Opportunities within other cities are unknown.

Preserve Management

Preserve management is designed to maintain and enhance vegetation communities, habitat for covered species, biological diversity, and ecosystem function. The location of preserves and condition of resources within these preserves will not be known until suitable sites are identified, surveyed, and purchased. Site-specific management objectives and techniques cannot be developed until preserve sites are known. Preserve management will be designed by the Implementing Entity through tiered management plans developed during HCP/NCCP implementation.

The Implementing Entity will prepare plans to manage preserve lands at system-wide and preserve-specific levels. System-wide management plans will be developed to identify an overall approach to control of exotic plants and recreational uses of preserve lands. Plans will also be developed for each preserve to identify, based on site-specific conditions and preserve objectives, the management/maintenance actions necessary to ensure that desired ecosystem characteristics and functions are maintained and protected. The conservation measures below describe the objectives, principles, and general requirements of these system-wide and preserve-specific plans.

Measure 1.4.1 Prepare and Implement an Exotic Plant Control Program for the Preserve System

Measure

An Exotic Plant Control Program will be developed and implemented for the Preserve System. When completed, applicable elements of the system-wide plan will be incorporated into the vegetation management element of management plans for each of the preserve areas (see Conservation Measure 1.4.3).

The goals of the Exotic Plant Control Program for the Preserve System will be to control the spread of noxious weeds (as defined by the California Department of Food and Agriculture) and exotic plants listed by the California Exotic Pest Plant Council (California Exotic Pest Plant Council 1999) into new areas and to control infestations of noxious and serious weeds, where practicable. Major elements of the Exotic Plant Control Program should include:

1. An assessment of the exotic plants within the Preserve System, including:
 - ❑ maps and descriptions of their distribution and abundance;
 - ❑ their known or potential effects on ecosystem function, native biological diversity, sensitive natural communities, and covered species;

- ❑ the means and risk of their spread to other areas within and outside the preserves; and
 - ❑ the cost, feasibility, and effectiveness of available control measures for each species.
2. Assessment of exotic plants not currently found in the preserves but that are found nearby or in similar habitats and that might invade the preserves in the future. The assessment should include a description of known or potential effects on ecosystem function, native biological diversity, sensitive natural communities, and covered species.
 3. Development and application of criteria for establishing exotic plant control priorities.
 4. Integration and coordination of exotic plant control efforts in the Preserve System with efforts of other ongoing exotic plant control efforts (e.g., participate in weed control activities in the Alameda–Contra Costa Weed Management Area and coordinate weed control efforts with the Contra Costa County Resource Conservation District, the Contra Costa County Department of Agriculture, Weights, and Measures, EBRPD, and CDPR.)
 5. A description of methods to control and prevent the establishment of exotic plants and criteria for evaluating the suitability of application of these methods based on site-specific conditions.
 6. Description of a process by which future exotic plants can be evaluated quickly to determine the best course of action for their effective removal or control.

Development of the Exotic Plant Control Program will be coordinated with the Contra Costa County Department of Agriculture, Weights, and Measures and other major resource management agencies in the inventory area including the CCWD, EBRPD, and CDPR.

Funds for implementing exotic plant control will be prioritized such that the exotic plants with the greatest impacts on covered species are addressed first.

The Exotic Plant Control Program will be prepared within 5 years of acquisition of the first parcel or when 25% of the Preserve System has been acquired, whichever comes first. The program will be evaluated and revised every 5 years until all preserve acquisition has been completed. Once the entire preserve system has been acquired, the program will be reviewed for effectiveness at least every 10 years.

Rationale

- Exotic plants pose a serious threat to ecosystem function, native biological diversity, and many covered plant species.
- The number of exotic plants in the inventory area is unknown, as is the number of highly invasive noxious weeds. Within the Los Vaqueros Watershed alone, biologists identified 13 noxious weeds during surveys

between 1987 and 1995 (Jones & Stokes Associates 1989; Brady & Associates 1996). Since these surveys were conducted, new noxious weeds may have invaded the area.

- The spread of exotic plants could be exacerbated by covered activities, as well as by increased human and pet population and activities that result from covered activities in the inventory area.
- An aggressive Exotic Plant Control Program is needed to minimize the adverse impacts of exotic plants and to enhance covered natural communities.
- Many exotic plants cannot be effectively controlled due to their great abundance, high reproduction rate, and proficient dispersal ability; the high cost of control measures; or unacceptable environmental impacts of control measures.
- A system-wide Exotic Species Control Program will allow the Implementing Entity to evaluate the threat of exotic plants across the Preserve System and then determine the sites in greatest need of control measures and the sites where control measures will be most effective and efficient.
- The principles of this program are consistent with exotic plant management activities in the Los Vaqueros Watershed lands (Brady/LSA 1999).

Measure 1.4.2. Prepare and Implement a Recreation Plan

Measure

A Recreation Plan will be developed and implemented for those lands that are acquired for the HCP/NCCP (i.e., the HCP/NCCP Preserve System) to facilitate passive recreational uses in suitable areas of preserves. Suitable areas are those in which passive recreational uses are compatible with the preservation of covered vegetation communities, covered species, and biological diversity. When completed, applicable elements of the system-wide plan will be incorporated into each individual preserve management plan.

Recreational uses will be designed to minimize impacts on biological resources and must adhere to the guidelines listed below.

- In all preserves, recreation is of secondary importance to the biological goals and objectives of this HCP/NCCP.
- Recreation will only be allowed where it is compatible with the biological goals of the HCP/NCCP and has less-than-significant impacts on biological resources after implementation of necessary mitigation measures, as described in the EIR/EIS.
- Recreational use and impacts will be monitored to ensure that uses do not adversely affect biological resources. If uses are found to be adversely affecting biological resources, the use will be discontinued until adjustments in the use can be made to reduce or eliminate impacts.

- Recreational uses allowed in preserves including hiking, bicycle riding, walking, horseback riding, wildlife observation and photography, and environmental education and interpretation on designated trails at appropriate sites. Camping, picnicking, off-trail activities, and other active recreation (e.g., outdoor sports) will be prohibited.
- No motorized vehicles or boats will be allowed in preserves, except for use by the preserve manager or with the prior approval of the preserve manager (e.g., contractors implementing HCP/NCCP conservation measures such as habitat restoration and monitoring, grazing tenants, and maintenance contractors). For preserves under conservation easements, vehicle use will be allowed as part of the regular use of the land (e.g., agricultural operations, permanent residents, utilities, other easement holders), as specified in the easement.
- Dogs will be allowed in designated preserves and only on leash. Leash laws will be strictly enforced because of the potential impact of dogs on biological resources, including covered species such as California red-legged frog, San Joaquin kit fox, Western Burrowing Owl, and Alameda whipsnake.
- Recreational hunting or fishing within preserves will be prohibited. However, hunting for management purposes (e.g., feral pig control) is allowed where it will contribute to achieving the goals and objectives of the HCP/NCCP. The Implementing Entity will coordinate with CDFG to develop hunting protocols.
- Introduction or possession of domestic or feral animals, including dogs, cats, ducks, fish, reptiles, and any exotic, non-naturalized species, is prohibited within the preserves to prevent interference with and mortality of native species, except by the preserve manager for management purposes.
- Trails will be established on existing roads or trails wherever possible to minimize the need for new land-disturbing activities.
- Trails will be sited to minimize disturbance to adjacent landowners and land uses.
- Recreational uses will be controlled using a variety of techniques including fences, gates, clearly signed trails, educational kiosks, trail maps and brochures.
- Recreation staging areas will be developed only in areas within the preserve that are already disturbed and not suitable for habitat restoration. Sites at the edge of the preserve will be chosen over sites on the interior of the preserve.
- Construction of recreational facilities within preserves will be limited to those structures necessary to directly support the authorized recreational use of the preserve. Existing facilities will be used where possible. Facilities that support recreation and that may be compatible with the preserve include parking lots (e.g., small gravel lots), trails, educational and informational kiosks, and portable restrooms.
- Signs and informational kiosks will be installed to inform recreational users of the sensitivity of the resources in the preserve, the need to stay on

designated trails, and the danger to biological resources of introducing wildlife or plants into the preserve.

- Bicycles will be prohibited within 500 feet of core habitat for Alameda whipsnake to minimize impacts on this species.
- Trails will be closed between January 15 and August 1 within 0.5 mile of active Golden Eagle nests to prevent disturbance or harassment.
- Prohibit trails within 100 feet of wetlands that provide habitat for covered amphibians.
- Preserves will be closed to all recreational uses until a Recreation Plan for the preserve is developed and approved by the Implementing Entity.

Exceptions to the guidelines listed above will be considered by the Implementing Entity on a case-by-case basis. Exceptions to these guidelines may only be authorized by the Implementing Entity.

At a minimum, the Recreational Plan will contain the following elements:

- identification of sites within preserves where recreational use is compatible with the goals and objectives of the HCP/NCCP;
- maps of existing and proposed recreational trails, staging areas, and facilities;
- site-specific methods of recreational use controls;
- trail and use monitoring methods, schedules, and responsibilities;
- a framework for enforcement of recreational restrictions;
- an evaluation of whether the impact of planned recreational use is below the limits set in the EIR/EIS, and whether planned recreation is compatible with the goals and objectives of the HCP/NCCP; and
- clear triggers for use restrictions or closure based on sensitive biological indicators.

The Recreation Plan will be prepared within 5 years after acquisition of the first parcel or when 25% of the preserve system has been acquired, whichever comes first. The Plan will be evaluated and revised every 5 years until all preserve acquisition has been completed. Once the entire preserve system has been acquired, the Plan will be reviewed for effectiveness (i.e., compatibility with the preservation of covered vegetation communities, covered species, and biological diversity) at least every 10 years.

Rationale

- Recreation in open space is an option demanded by residents in and near the inventory area. Allowing limited recreational use within preserves will broaden the appeal of this HCP/NCCP. Moreover, because recreation already occurs in many of the potential preserves, current users will expect to continue their use of these sites.

- Recreational users who understand the sensitivity of the resources in the preserves will help patrol the preserve and provide valuable assistance to preserve managers in ensuring that users follow the rules. Responsible users can also become volunteers to assist the preserve manager in maintaining the preserve (e.g., trail maintenance) and in complying with the terms of the HCP/NCCP (e.g., covered species monitoring and habitat stewardship). This involvement will reduce the overall cost of HCP/NCCP implementation.
- Recreational uses may have impacts on biological resources, including covered vegetation communities and covered species. However, the societal benefit of recreational uses within limited areas of the preserves justifies accepting some minimal level of impact on these resources.
- Providing limited public access to preserve lands is an important tool in educating the public about the value of protecting and properly managing biological resources. An educated public can be an advocate for securing additional funds for HCP/NCCP implementation.
- Providing additional recreational opportunities is an important goal of the Contra Costa County General Plan.

Measure 1.4.3. Prepare Preserve Management Plans for Non-Agricultural Lands

Measure

Preserve management plans will be prepared for each preserve in non-agricultural lands (Zones 1–5). Management plans will be prepared within 2 years of acquisition of the first parcel in a preserve area and will be developed in cooperation with adjacent land management agencies, resource agencies, and current grazing lessees, if any. As additional lands are added to the preserve, the management plan will be revised to reflect new management methods that may become necessary.

Management plans should be reviewed by the Implementing Entity at regular intervals (e.g., every 5 years) and updated to improve the efficacy of preserve management. This review should be based on an evaluation of the success of management methods (i.e., knowledge gained through the Adaptive Management Program) that have been implemented over the previous management period (e.g., 5 years) in achieving objectives of the preserve, as well as on other outside research. Management Plans will be working documents; accordingly, they should not preclude the modification of management measures prior to plan updates where adaptive management or new research identify more effective techniques. As applicable to each preserve, preserve management plans should include the following types of information.

Objectives of the Conservation Area. Each management plan will clearly identify the biological objectives (e.g., extent of each preserved, enhanced, and restored community) for the preserve. Biological objectives for each preserve will be tiered from the biological goals and objectives of the HCP/NCCP. The

management plan will also identify the landscape-, community-, and species-level conservation measures applicable to the preserve.

Vegetation Management. Each management plan will describe preserve-specific objectives for:

- reducing the abundance and distribution of exotic plants;
- increasing the abundance and distribution of covered plants, native plants in general, and rare vegetation alliances;
- reducing the fuel load of the preserve so that the risk to biological resources of catastrophic wildfire is at an acceptable level and the risk to adjacent urban areas is minimized (meeting all state and local requirements). The methods and intensity of fuel management will vary depending on the location of the preserve relative to human populations and structures, emergency vehicle access, and the sensitivity of resources in the preserve to fuel load reduction techniques (e.g., fuel breaks, prescribed fire, mowing); and
- minimizing 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 HCP/NCCP; see Chapter 4).

The Preserve Management Plan will also identify the types of management actions and the implementation schedule required to achieve the vegetation management objectives. Anticipated methods for managing vegetation include:

- livestock grazing;
- prescribed burning;
- mechanical mowing (e.g., mowing fire breaks at the end of the growing season around the margins of preserves or near recreational trails);
- hand removal of vegetation (e.g., to remove infestations of exotic plants); and
- application of herbicides (e.g., spot spraying with backpack units to remove infestations of exotic plants).

Principles that will be used to guide the use of livestock and prescribed burns to manage vegetation on preserves are described in Appendix A.

Management plans will also describe the ongoing vegetation management actions that must be undertaken to implement community-level measures required on each of the preserves.

Fire Management. Each management plan will include a fire management plan with the following elements:

- a map of fire access roads and gates,
- identification of fuel load management methods and criteria for their application,
- a description of fire suppression resources and responsibilities, and
- a discussion of restoration/rehabilitation of vegetation following a fire.

Fire management plans, to the extent practicable, must be consistent with achieving the biological objectives of the preserve. Preparation of fire management plans for preserves will be coordinated with the California Department of Forestry and Fire Protection and local fire districts.

Maintenance of Infrastructure. Each management plan will include a map showing the location of infrastructure, including roads, firebreaks, fences, gates, pumps, wells, water control structures, ditches, canals, drains, power lines, and buildings. The management plan will include a schedule for inspecting infrastructure to determine the need for maintenance. Work needed to maintain infrastructure that is necessary for maintaining preserves (e.g., firebreaks, fences) will be conducted as soon as practicable after the need for maintenance has been identified. The management plan should also identify periods during which maintenance activities should be conducted to avoid or minimize adverse affects on covered communities and species.

Recreation. Preserve management plans will identify recreational uses and use levels that are suitable for the site and compatible with biological goals and objectives. The recreational element of each preserve management plan will be tiered from the Recreation Plan (see Conservation Measure 1.4.2).

Monitoring Requirements. Each management plan will describe compliance, effects, and effectiveness monitoring requirements, including monitoring schedules and reporting requirements, applicable to the preserve area. The monitoring element of preserve management plans will tier from and supplement the overall monitoring plan for the HCP/NCCP. [*Note to reader: the monitoring plan has not yet been developed. This section may be expanded to include additional information on completion of the draft monitoring plan.*]

Adaptive Management Plan. Preserve area management plans will include an adaptive management element. The adaptive management approach in preserve management plans will tier from and supplement the overall adaptive management plan for the HCP/NCCP. [*Note to reader: the adaptive management plan has not yet been developed. This section may be expanded to include additional information on completion of the draft monitoring plan.*]

Rationale

Preserve management plans are necessary to provide in a single document sufficient information and guidance to ensure that each preserve will be managed

in a manner that will achieve its biological objectives and meet terms and conditions of permits (e.g., monitoring requirements).

Measure 1.4.4. Prepare Preserve Management Plans for Agricultural Lands

Measure

Agricultural management plans will be prepared for preserved croplands and pasturelands. Agricultural lands owned in fee title by the Implementing Entity or a participating partner will continue in agriculture use under lease to farmers. It is anticipated that most agricultural lands will be preserved under conservation easements. The Implementing Entity will prepare the management plans in cooperation with the landowner, if applicable.

Agricultural lease and conservation agreements will include an agricultural management plan that describes the agricultural practices that will be undertaken to ensure the suitability of leased lands as Swainson's Hawk foraging habitat and Western Burrowing Owl foraging and breeding habitat, if applicable, as well as limitations on permitted practices to reduce adverse effects of some types of practices on covered species and other wildlife (see Conservation Measure 2.7.1). In areas suitable for giant garter snake, agricultural lands will maintain and enhance habitat for this species. Lease agreements will not be entered into for periods of less than 2 years. Conservation easements on agricultural lands that are managed to maintain and enhance Swainson's Hawk foraging habitat, Western Burrowing Owl foraging and breeding habitat and, where appropriate, suitable giant garter snake habitat will be in effect for a minimum duration of 20 years. Habitat maintenance and enhancement measures will be designed to meet the habitat needs of covered species as described in the species profiles. Habitat maintenance and enhancement measures required in conservation easements will be compatible with maintaining the ongoing economical viability of agricultural use.

Site-specific conservation measures designed to maintain and enhance habitat for Swainson's Hawk, Western Burrowing Owl, and giant garter snake will be documented in an Agricultural Management Plan. Agricultural Management Plans for agricultural lands preserved through conservation easements must be filed with the Implementing Entity for periods of not less than 2 years. Agricultural Management Plans will include the following information:

- a schedule of major farming activities (e.g., tilling, planting, harvesting);
- a description of crop type, area, and location farmed;
- crop rotation patterns;
- an application schedule for and types of herbicides and pesticides to be applied;
- a description of provisions for compliance inspections; and

- specific measures to maintain and enhance habitat for covered species through avoidance, minimization, and enhancement.

The Implementing Entity, with concurrence of the landowner or lessee, may also consider managing lands preserved to provide Swainson's Hawk foraging habitat in a manner that provides desirable benefits for other wildlife. For example, lands managed in corn or grains could be managed in a manner that would also provide suitable foraging habitat for wintering waterfowl and shorebirds during the late fall and winter when Swainson's Hawks are not present. Types of management actions that could improve foraging conditions for these species include:

- deferring the tilling of corn and grain fields to later in the fall to increase the amount and availability of forage for waterfowl;
- leaving a portion of corn or grain fields unharvested to increase the quantity of forage available for waterfowl (the forage would gradually become available to these species as senescent plant stalks fall over as a result of weathering); and
- shallow-flooding corn, grain, and irrigated pastures during the fall and winter to improve foraging conditions for waterfowl and shorebirds.

Rationale

Agricultural Management Plans 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 stated biological objectives and meet terms and conditions of permits (e.g., monitoring requirements).

Vegetation Community–Level Conservation Measures

Measures for Multiple Vegetation Communities

Measure 2.1.1. Enhance, Restore, and Create Land Cover Types and Species Habitat to Compensate for Impacts and Contribute to Recovery

Measure

Enhancement, restoration, or creation is required for impacts on some land cover types to ensure no net loss of these land cover types, to replace the functions of vegetation communities and species habitat lost to covered activities, and to contribute to the recovery of covered species. These requirements are in addition to the preservation requirements described in measure 1.3.1. Table 6-15 lists the type of replacement that is required for each land cover type. Enhancement is

required for all land cover types and will be accomplished through the conservation measures listed in Table 6-15.

Land cover restoration or creation will be conducted for a subset of land cover types. The Implementing Entity will restore land cover types for which restoration is feasible and success has been demonstrated elsewhere. Where restoration is infeasible, in-kind or out-of-kind/like-function creation of land cover types is required.

Restoration and creation will be accomplished in two ways. The Implementing Entity will be required to compensate for impacts of covered activities on specific land cover types through either restoration or creation at the ratios listed in Table 6-16. The actual acreage of compensation will be determined through planning surveys conducted at project sites to determine the actual extent of impacts (see Conservation Measures 1.2.5 and 1.2.6). The Implementing Entity will also restore or create land cover types to contribute to the recovery of covered species. Table 6-16 lists the acreage requirements for recovery contributions that are required in addition to compensatory habitat restoration and creation.

Restoration and creation will be coordinated with preserve design efforts. Preserve land acquisition will be conducted to incorporate areas suitable for restoration or creation of land cover types necessary to meet HCP/NCCP requirements. Restoration and creation will be designed within preserves to meet the goals and objectives for each relevant habitat and covered species. Land cover restoration and creation will increase habitat for specific life-history requirements of covered species. Sites selected for restoration will support soils and topography suitable for restoring the target land cover type that was historically present at the site. Restoration and creation will be designed and constructed to avoid or minimize direct or indirect impacts on existing functioning habitat for covered species.

Habitat enhancement activities will always be conducted within HCP/NCCP preserves. Restoration and creation of habitat will be conducted in HCP/NCCP preserves where practicable. If no suitable sites are present or actions are not practicable in HCP/NCCP preserves (e.g., because they may substantially and adversely affect habitat for a covered species), then restoration and creation will be conducted on lands in the inventory area owned by EBRPD, the California Department of Parks and Recreation, or the Contra Costa Water District. Such habitat restoration and creation sites should be located in areas of existing protected lands that are managed consistently with HCP/NCCP Preserve System principles. Habitat restoration and creation conducted on existing public lands will be funded and conducted by the Implementing Entity. Responsibilities for ongoing management and monitoring of these sites will be determined on a case-by-case basis but will always be funded by the Implementing Entity. Every effort will be made to find suitable restoration or creation sites in HCP/NCCP preserves.

Restoration or creation conducted as mitigation for impacts must be initiated prior to conducting the covered activities that result in those impacts. Restoration or creation that contributes to recovery effects can be implemented at any time, but must be implemented to precede the timing of impacts of covered activities. For every 100 acres of impacts on the land cover types in Table 6-16, the Implementing Entity must implement at least 20% of the overall requirement for restoration and creation that contributes to recovery, and roughly in proportion to the types of land cover impacted by covered activities until that point in time.

Restoration procedures and guidelines for specific vegetation communities are found in the Conservation Measures listed in Table 6-14. Restoration actions are covered activities because some of the restoration techniques are expected to have temporary adverse impacts on covered species and may result in take of these species. Mitigation for these impacts is included in the conservation strategy.

Wetlands, Ponds, and Streams

Measure 2.2.1. Wetland and Pond Enhancement and Management Program

Measure

Wetlands and ponds within HCP/NCCP preserves will be managed to increase their functions and values and to enhance their ability to support existing and new populations of covered species. Measures in the wetland enhancement program will be applied to all wetlands within the preserves. Measures to be applied will depend on the type, location, extent, and condition of the wetlands as determined by the wetland delineation conducted according to Conservation Measure 1.2.6. Wetlands within preserves will also be surveyed to determine whether they support aquatic or amphibian covered species or have the potential to support these species. In addition, stockponds will be assessed to determine if they maintain water in typical rainfall years for periods sufficient to support aquatic life stages of California tiger salamander and California red-legged frog.

Techniques to be employed in the wetland enhancement and management program include but are not limited to:

- reducing grazing pressure to reduce trampling of vegetation and alteration of microtopography;
- introducing grazing to some areas to reduce cover of exotic plants when such a technique is consistent with maintaining values for covered species;
- fencing around sensitive wetlands and upland buffers to permanently or temporarily exclude livestock;

- periodically draining stockponds and other permanent wetlands to eliminate exotic fish and bullfrogs (and increase the features' suitability for covered aquatic species and amphibians);
- removing invasive exotic plants;
- installing check dams to arrest erosion of channels within seasonal wetlands (including alkali wetlands) or permanent marshes;
- removing artificial fill material, structures, or debris to restore historic microtopography and enhance surface hydrology;
- repairing leaky stockponds or otherwise increasing the storage capacity of stockponds (e.g., raising spillway elevations) that could support salamander and frog production if the ponds retained water for longer periods; and
- in conjunction with controlling exotic plants in permanent marshes and ponds, installing native emergent vegetation to improve habitat values for covered species (e.g., provide substrate for amphibian egg attachment, cover for amphibian larvae, roost and nest sites for Tricolored Blackbirds where treated wetlands are located near foraging habitat).

These techniques are described in detail in Appendix X [*Note to reader: this appendix will be added later and will be based on the wetland enhancement program developed for the Los Vaqueros Watershed (Jones & Stokes 1993b)*]. The wetland enhancement program will be developed and implemented in coordination with the Contra Costa Mosquito Abatement District (CCMAD) to ensure that enhanced wetlands do not increase mosquito populations in the preserves and threaten human health. CCMAD staff will have access to all wetland sites to monitor mosquito populations. Once wetlands restored or created under Conservation Measure 2.2.2 reach their success criteria, they will be brought under the wetland enhancement and management program. Wetland enhancement activities may have temporary adverse effects on covered vegetation communities or covered species. These effects are included in the estimates of vegetation community impact and take of covered species described in Chapter 5.

Rationale

- Wetland delineations will be required in all impact areas in order to quantify the impacts on jurisdictional wetlands. Similarly, wetland delineations are required within all preserves in order to demonstrate that the compensation requirements of the HCP/NCCP, as well as those of the Regional General Permit that will be developed from it, are being met.
- Wetland enhancement measures must be designed for specific wetland types and, in some cases, specific sites. As described below, the success of various techniques depends on the wetland type and the site conditions under which they are applied. Wetlands that are highly degraded may require more intensive management. Wetlands already in good condition (e.g., that support populations of covered species) may require little or no enhancement measures.

- Fencing wetlands within the Los Vaqueros Watershed has been shown to be a rapid and effective method of enhancing some wetlands. After fencing, vegetation cover and wetland species diversity can increase substantially in stockponds and other permanent or near-permanent freshwater wetlands that have been degraded by cattle grazing (Contra Costa Water District 2002).
- In studies at Los Vaqueros, livestock exclosures were found to benefit seasonal alkali wetlands in the short term. After 1 year, the relative cover, species richness, and species diversity of native target plants was greater in exclosures than immediately outside the exclosures (Jones & Stokes 1992b). The positive trend, however, was not statistically significant, suggesting that improvements in this vegetation community will be gradual and that further research is necessary.
- Other factors that may have contributed to the decline of seasonal wetlands in the Kellogg Creek watershed include a reduction in surface water flows due to stream channel downcutting and a drop in the local water table (Jones & Stokes 1992b).
- Small checkdams have been shown to be effective at arresting stream channel erosion in seasonal alkali wetlands in the Los Vaqueros Watershed within 6 months of dam installation (Jones & Stokes 1992b). Over time, such small dams may also increase the recharge of the local aquifer, raising the water table and increasing soil moisture levels near the surface. This effect could, in turn, increase the cover and extent of seasonal wetland vegetation along stream channels.

Measure 2.2.2. Wetland Restoration and Pond Creation Program

Measure and Rationale

The Implementing Entity will restore wetlands and create ponds in HCP/NCCP preserves according to the requirements listed in Table 6-16. Compensation for impacts to wetlands or ponds will be accomplished through restoration of wetland land cover types at ratios of either 1:1 or 2:1, as well as creation of ponds at a ratio of 1:1 (Table 6-16). The Implementing Entity will also restore or create wetland and pond land cover types to contribute to the recovery of California red-legged frog, California tiger salamander, Tricolored Blackbird, and covered vernal pool invertebrates (Table 6-16). The overall goals of the wetland restoration and pond creation program are listed below.

- Provide a net increase of wetland and pond area, functions, and values in the inventory area.
- Compensate for the temporal loss of wetland and pond functions with preservation of in-kind wetlands (Conservation Measure 1.3.1) while wetland restoration or creation projects are implemented and restored wetlands are developing their full functions.

- Ensure no net loss of stream channel habitats that are likely considered jurisdictional waters by USACE, RWQCB, and CDFG and regulated under Sections 404 and 401 of the CWA and Section 1601 of the California Fish and Game Code.
- Implement in-kind restoration of wetlands and ponds in preserves where technically and financially feasible and where restoration would avoid significant effects on existing biological resources.
- Where in-kind restoration is not technically or financially feasible, wetland restoration will be achieved out-of-kind using a system of wetland functional units to ensure that functions of restored wetlands are greater than the functions of wetlands lost (Jones & Stokes 1993b, 1994).
- Restoration sites will be selected that maximize the chances of meeting success criteria and minimize the need for long-term management of wetland sites.
- If feasible, all wetlands and ponds restored or created will be designed to support covered aquatic or amphibian species.
- Wetlands and ponds restored or created will support wildlife habitat of equal or greater function than the habitat lost to covered activities.

Restoration/creation principles and rationales for each aquatic land cover type are described below.

- **Alkali wetlands.** The Implementing Entity will restore approximately 12 acres of alkali wetlands (approximately 6 acres of compensation and 6 acres of mandatory restoration to contribute to species recovery), including alkali meadows and alkali marshes (Jones & Stokes Associates 1989). Restoration will occur on suitable alkaline soils that have been degraded by disturbances such as intensive grazing or cultivation and that previously supported wetlands. Historic photos and other historic records will be used to determine the former extent and type of alkali wetlands present on potential sites. Restoration programs have been designed for a large alkaline wetland complex in Alameda County and the City of Livermore (H. T. Harvey & Associates 2000; Jones & Stokes 2001) that is similar to those found in the inventory area; these programs may be used as models.
- **Seasonal wetlands.** The Implementing Entity will restore up to 120 acres of seasonal wetlands in preserves (up to 88 acres of compensation and 32 acres of mandatory restoration to contribute to species recovery) (Table 6-16). If suitable sites are available, at least 10% of the mandatory restoration (up to 3.2 acres) will be northern claypan vernal pools that will support covered vernal pool invertebrates. Northern claypan vernal pools occur in unique hydrologic, soil, and geologic conditions that cannot be recreated. Restoration of vernal pools must occur within suitable areas that have been severely degraded. Restored vernal pools will be evaluated to determine if covered vernal pool invertebrates are present at frequencies similar to natural vernal pool complexes. If not, the Implementing Entity will assess the

feasibility of transplanting species from occupied pools to restored pools to establish new populations.

- **Ponds.** The Implementing Entity will create approximately 35 acres of ponds in preserves (approximately 15 acres of compensation and 20 acres of mandatory creation to contribute to species recovery). All ponds will be created to support breeding habitat for California red-legged frog and California tiger salamander and will be sited away from paved roads to reduce the likelihood of mortality during periods when frogs and salamanders move between ponds and uplands. Created ponds will be spaced at least 0.25 miles from other ponds to mimic the spatial pattern of ponds found in the Los Vaqueros Watershed (where red-legged frog populations are unusually high). Pond depth shall be sufficient to hold water until mid-September to provide suitable breeding habitat for red-legged frogs and to preclude dense growth of emergent aquatic vegetation. Pond size will vary depending on the availability of water and site and watershed conditions but must be less than 1 acre.

At least 50% of the pond acreage must also support breeding habitat for Tricolored Blackbird. Ponds designed to provide Tricolored Blackbird habitat will be located within flight range of foraging habitat. In most cases, ponds will be created by installing small check dams along streams. Ponds will be designed so that they can either be artificially drained or so they do not maintain surface water long enough to promote establishment of bullfrog, nonnative fish, or other predators of California red-legged frog and California tiger salamander, but are ponded for sufficient duration to support successful breeding of California red-legged frog and/or California tiger salamander (see Conservation Measure 2.2.1). Native emergent and aquatic vegetation will be planted in ponds to provide suitable breeding habitat for these covered species.

- **Perennial wetlands.** The Implementing Entity will restore up to 56 acres of perennial wetlands in preserves (up to 36 acres of compensation and 20 acres of mandatory restoration to contribute to species recovery). Restoration will occur on suitable soils and in areas where perennial wetlands historically occurred and have since been drained or severely degraded. Restoration may include recreating the historic topography of the site and planting native freshwater emergent and aquatic plants. All perennial wetlands created will support breeding habitat for Tricolored Blackbird and will be sited within flight distance of foraging habitat. Credit will be given toward perennial wetland restoration for perennial wetlands established as a result of the creation of ponds described above (i.e., creation of ponds with emergent wetland vegetation).
- **Sloughs/Channels.** Impacts on sloughs and channels in Zone 6 will be compensated by restoration of riparian woodland/scrub in Zone 6 at a ratio of 1:1. The Implementing Entity will restore 88 acres of riparian woodland/scrub in existing streams and channels that historically supported riparian woodland/scrub vegetation. Lost sloughs or channels cannot be recreated because of the constraints of existing agricultural operations in

Zone 6 and the difficulty of creating the topographic and hydrologic conditions to support them. By replacing lost sloughs and channels with riparian woodland/scrub, there will be a net increase in high-quality habitat for covered species and biological diversity. Any sloughs or channels supporting giant garter snake will be addressed according to Conservation Measure 3.9.2.

- **Open Water.** Impacts on open water land cover will be compensated by the creation of additional ponds to support breeding habitat for California red-legged frog, California tiger salamander, and Tricolored Blackbird. Restoration or creation of large bodies of open water is not required because this land cover type provides limited values to wildlife. The Implementing Entity will create 40 acres of additional ponds to compensate for the 40 acres of open water impacts that are expected.

Wetland restoration or pond creation will be accomplished using the techniques outlined in the conceptual wetland restoration program (Appendix X) [*Note to reader: This appendix will be added at a later date*]. This program is based on the successful wetland mitigation program development and being implemented for the Los Vaqueros Reservoir Project (Jones & Stokes 1993b, 1994; Contra Costa Water District 2001a, 2001b). All wetland types found in the inventory area are also found in the Los Vaqueros Watershed and are included in that mitigation program.

Measure 2.2.3. Wetland, Pond, and Stream Avoidance and Minimization Measures

Measure

All project proponents will implement as many of the following measures as are practicable to avoid and minimize impacts of covered activities on wetlands, ponds, streams, and riparian woodland/scrub.

- All wetlands, ponds, and streams will be avoided to the maximum extent practicable on site.
- All wetlands, ponds, streams, and riparian woodland/scrub to be avoided by covered activities will be staked in the field by a qualified biologist. Temporary fencing will be erected around these resources and a suitable buffer zone of at least 20 feet. Buffer zones will vary depending on the resource extent, quality, site conditions, and planned activity. For example, construction activities using heavy equipment will require a wider buffer zone (e.g., 50–100 feet) than an ongoing activity such as clearing vegetation for a fuel brake (e.g., 20 feet).
- Personnel conducting land-disturbing activities within 100 feet of wetlands, ponds, streams, or riparian woodland/scrub will be trained by a qualified biologist in these avoidance and minimization measures and the legal obligations of project proponents working under this HCP/NCCP.

- Vehicles and equipment will be parked on pavement, existing roads, and previously disturbed areas.
- Trash generated by covered activities will be promptly and properly removed from the site.
- No vehicles will be refueled within 100 feet of wetlands, ponds, streams, or riparian woodland/scrub unless a bermed and lined refueling area is constructed.
- Appropriate erosion control measures (e.g., hay bales, filter fences, vegetative buffer strips) will be used on site to reduce siltation and runoff of contaminants into wetlands, ponds, streams, or riparian woodland/scrub.
- Hay bales used for erosion control will be certifiably weed free.
- Seed mixtures applied for erosion control will not intentionally contain invasive nonnative species, and to the extent feasible will be composed of native species.
- Stream crossings will be located in stream segments without riparian vegetation, and bridge footings will be built outside the ordinary high water mark of these streams.
- Herbicide will not be applied within 100 feet of wetlands, ponds, streams, or riparian woodland/scrub.

Rationale

- Avoidance and minimization measures are required to meet the biological objectives of the HCP/NCCP to avoid and minimize effects on wetlands, ponds, streams, and riparian woodland/scrub.
- Because of the sensitivity of these aquatic land cover types, special avoidance and minimization measures are necessary.

Grassland

Measure 2.3.1. Enhance Native Grassland Alliances

Measure

Native grassland alliances will be enhanced in the preserves by using techniques tailored to the alliance and the site. All stands of grasslands with at least 25% relative cover of native species (grasses or forbs) will be mapped within the preserves to identify areas suitable for special management practices to maintain and enhance the proportion of native grass cover. Each grassland stand will be classified to the alliance level according to the CNDDDB vegetation classification scheme (California Department of Fish and Game 2002). A pilot program will be initiated to determine the feasibility of enhancement activities on a larger scale. The pilot program will utilize a research design that addresses management actions including grazing and burning regimes to promote native grassland species. The pilot program will be conducted as part of the Adaptive

Management Program (see Chapter X). The following guidance is provided for the development of experimental management treatments.

- Warm-season (late spring and fall) prescribed burning has been effective in some areas at increasing the cover of native species in grasslands and reducing the cover of exotic species (Menke 1992; Meyer and Schiffman 1999). Late fall (September–October) burning is recommended for native grassland enhancement plots in the Los Vaqueros Watershed lands (Brady/LSA 1996, 1999).
- Repeated burning, or a combination of burning and mulching or grazing over several years, may be necessary to maintain the dominance of native species over exotic species reestablished by the first few treatments (Parsons and Stohlgren 1989). Short-term winter grazing following burning may help to control exotic grasses as they germinate after winter rains (Brady/LSA 1999). Alternatively, mid-summer grazing may be effective because by then most native perennial grasses would be dormant and not damaged substantially by grazing. In areas where fuel loads are relatively high due to a lack of grazing or high productivity, a combination of grazing followed by burning may be effective at reducing the density of native grasses while minimizing the mortality to native grasses from fire.
- Experimental treatments could include supplementing the seed rain of native grasses to increase their opportunities to establish and out-compete the exotic grasses (Seabloom et al. 2002). Any seed supplements in native grasslands must use locally derived genetic stock. To maximize the success of seed addition, pretreatment, such as burning one year prior to seeding to reduce weed seeds on the surface and litter, may be required (Brady/LSA 1996).
- Managers must consider the impacts of management treatments on other covered species. For example, if burns occur within Alameda whipsnake habitat, burning in September or October is compatible with whipsnake protection goals (Jones & Stokes Associates 1992a).

If monitoring demonstrates that the treatments are effective at increasing the proportional cover of native grasses and forbs, the preserve manager should evaluate whether these treatments can be applied to the entire stand of the native grassland alliance to achieve enhancement objectives of native grassland on a larger scale. In some cases, the livestock grazing regime could be shifted in time, location, or intensity to achieve these goals (or at least to partially achieve them). In other cases, large-scale application of the techniques may not be feasible due to their environmental impacts or hazard risk. This evaluation must be done on a case-by-case basis in which the expected benefits of the management to native grassland are weighed against the environmental impact, risk, and increased cost of applying the technique on a larger scale.

Rationale

- Native grassland alliances are expected to be protected within the preserves, but these grasslands are expected to be degraded (i.e., low relative cover of

native species) due to past or current land uses practices and the spread of nonnative plants.

- Site conditions (both physical and biological) will be important in developing appropriate management techniques to attempt to enhance native grassland alliances. For example, in the Los Vaqueros Watershed, native grasslands primarily occur on steep north or east-facing slopes where soil moisture tends to be higher (Jones & Stokes Associates 1989). Management strategy at these sites will differ from sites on more level topography and drier, south-facing slopes. Huntsinger et al. (1996) have shown that different populations of purple needlegrass may respond differently to the same treatments of grazing or burning.
- Recent research conducted in Santa Barbara suggests that seedlings of California native grasses can be excellent competitors when enough seeds are present to overcome the dominance in the seed pool of the exotic grasses (Seabloom et al. 2002). Experimental treatments could include testing this seed supplementing approach within the preserves.
- Enhancement of native grassland alliances must be implemented using an experimental approach because site-specific conditions of species composition, topography, and soils will determine which techniques will work best.

Measure 2.3.2. Enhance Prey Base and Natural Burrow Availability in Grasslands

To improve the prey base for several covered species (e.g., San Joaquin kit fox, Western Burrowing Owl, Golden Eagle, Swainson's Hawk) and other native predators (e.g., Red-tailed Hawk, Northern Harrier, American Kestrel), preserved grasslands will be managed to enhance ground squirrel and other small mammal populations (e.g., voles, mice, rabbits). In addition to a prey base, ground squirrels provide burrows that benefit San Joaquin kit fox as den sites; Western Burrowing Owl as nesting habitat; and California red-legged frog and California tiger salamander as aestivation habitat. The Implementing Entity will eliminate existing rodent control measures (e.g., poisoning, hunting, and trapping) in preserves. Removing existing ground squirrel control measures is expected to be sufficient to increase squirrel populations.

On acquisition of preserve lands where rodent control measures are being implemented, the Implementing Entity will conduct a baseline survey to estimate the distribution and abundance of ground squirrels within 1 year of the acquisition. Follow-up monitoring will be conducted to determine the effect of removing control measures on ground squirrel abundance and distribution. If squirrel populations do not increase, then active measures, such as creating soil or debris piles, will be taken to encourage rodent use in the area. Where lands neighboring preserves require ground squirrel management to protect agricultural uses or public health, the Implementing Entity will establish a buffer zone in the preserve within which ground squirrel colonies will not be encouraged. The

width of this buffer will be determined by the preserve manager in consultation with neighboring landowners and will depend on site conditions, the size and density of the local ground squirrel population, and the intensity of control methods used adjacent to the preserve. The use of rodenticides or other rodent control measures will be prohibited in preserves except as necessary to address adverse impacts on adjacent landowners' levees, road-beds, or railroad-beds. Pilot studies of management methods that enhance the rodent prey base, and particularly the populations of ground squirrels, will be conducted through the Adaptive Management Program (see Chapter X), and effective management measures will be incorporated into grassland management actions (See Conservation Measure 1.4.3 and 2.3.1).

Rationale

- Historically, measures such as hunting and rodenticides have been used extensively in the inventory area to control rodents and reduce conflicts with livestock. This has greatly decreased the populations of these species, reducing prey availability for their predators. In 1975, California ground squirrel, which is the main prey item for San Joaquin kit fox in Contra Costa County, was thought to have been eradicated countywide after extensive rodent eradication efforts (Bell et al. 1994; U.S. Fish and Wildlife Service 1998). California ground squirrel populations have been increasing in Contra Costa County since then; however, their abundance may still limit San Joaquin kit fox presence and abundance in the eastern portion of the County (Orloff pers. comm.).
- Enhanced rodent populations will increase the prey base for San Joaquin kit fox and covered raptor species and will increase the availability of potential den sites for San Joaquin kit fox, nest sites for Western Burrowing Owl, and aestivation sites for California tiger salamander and California red-legged frog.
- This measure is intended to supplement other conservation measures to increase the population size of several covered wildlife species. Other ecological factors may limit the populations of covered species in the inventory area in addition to the size and density of rodent populations. For example, the population of San Joaquin kit fox in the inventory area may be limited by mortality from road kill, poisoning (typically by coyote bait), coyote predation, or competition from nonnative red foxes (U.S. Fish and Wildlife Service 1998 and references therein). However, there is evidence in other parts of the kit fox range that the abundance of prey affects reproductive success (Egoscue 1975; White and Ralls 1993). The effects of disease and parasites are thought to play a minor role in kit fox demography (U.S. Fish and Wildlife Service 1998). Although research to date suggests that prey abundance is important, a lack of studies in the northern part of the kit fox range contributes to uncertainty about the efficacy of this conservation measure in the preserves. Because of this uncertainty, adaptive management and research studies are required to understand factors controlling kit fox population and to improve management techniques.

Oak Woodland and Oak Savanna

Measure 2.4.1. Minimize Effects on Oak Woodland

Measure

The measures listed below will be followed within construction zones to minimize impacts on oak trees that cannot be avoided.

- All oak trees to be retained will be flagged before construction or grading. Construction fencing will be installed at least 5 feet beyond the dripline of all oak trees to prevent damage to trees or roots and to prevent soil compaction during construction.
- Paving and soil compaction within the oak tree dripline resulting from such activities as storing construction materials, parking vehicles, or access routes will be minimized. If paving is required, porous or other material that minimally compacts the soil will be used. Where soil compaction occurs, soil permeability and root aeration will be restored as directed by a qualified arborist.
- Soil surface removal and cut or fill activities within tree driplines will be minimized. If cuts or fills are necessary within a tree dripline, supplemental drainage or irrigation and root aeration will be provided as necessary to prevent tree death.
- Trenching within tree driplines will be minimized.
- Unnatural waters sources (e.g., construction site runoff) will be prevented from entering oak woodlands during the dry season (May–October).
- Landscaping within oak tree driplines will be limited to plant species that do not require irrigation or to permeable, inert material such as wood chips or gravel.

Rationale

- Oak trees that will be retained on construction sites should be preserved whenever possible to retain the wildlife value of individual trees.
- Avoidance and minimization measures implemented during construction can be effective at preserving oak trees on site, thus enhancing property values.

Measure 2.4.2. Maintain and Enhance Oak Woodland and Oak Savanna Vegetation

Measure

Up to approximately 10,500 acres of existing oak woodland and savanna could be acquired in the Preserve System (Table 6-9). The Implementing Entity will maintain or enhance oak savanna and oak woodlands within preserves through a process of assessment, factor analysis, active management, and long-term monitoring. The goal of this measure is to maintain the current canopy coverage

of oaks and other overstory trees within oak woodland and oak savanna land cover types. Stands will be assessed in each preserve within 2 years of acquisition to identify factors that may be limiting ecological functions.

The Implementing Entity will analyze recent aerial photographs of the preserves to document the percent canopy coverage within these land cover types and to determine site-specific goals for maintaining this canopy coverage. If available, historical aerial photographs will be used to determine if the oak canopy is increasing, decreasing, or stable. Oak stands in preserves will be evaluated in accordance with the decision-making tree adopted by the California Department of Forestry (Jones & Stokes Associates 1988) (Figure 6-5) and used for management of oak stands in the Los Vaqueros Watershed (Brady and Associates 1997). If canopy coverage is declining, stands will be surveyed to determine if recruitment is adequate to replace lost trees and meet canopy coverage goals. If surveys indicate that recruitment is insufficient, management actions will be implemented to improve recruitment. Appropriate management techniques will be determined on a site-specific basis and may include:

- modifying livestock stocking rates, timing of grazing, or livestock access to certain areas (see Conservation Measures 1.4.3 and 3.17.3);
- planting acorns or seedlings of locally collected stock of the species in decline within existing oak stands;
- fencing seed trees or stands of juvenile oaks to exclude native herbivores such as gophers, ground squirrels, or black-tailed deer until trees grow above the browse line;
- reducing the biomass of understory herbaceous vegetation around seed trees or seedlings to reduce competition for water and nutrients (see Conservation Measure 2.3.1); and
- population control of exotic herbivores such as wild pigs.

At sites where the understory of oak savanna and oak woodland in preserves is dominated by annual grassland, the understory will be managed according to the principles and guidelines outlined in Conservation Measure 2.3.1, except that the health and recruitment of overstory trees will also be considered. At least every 10 years, oak savannas and woodlands within preserves will be reevaluated using aerial photographs and the oak decision-making tree (Figure 6-5). More intensive management actions will be conducted if a sudden decline in oak woodland or oak savanna stands is observed.

Rationale

- Many factors may influence the population dynamics of oaks (Pavlik et al. 1991). Accordingly, a site-specific assessment is required to determine the factors most important in stands within preserves.
- Based on the assessment of oaks in the Kellogg Creek watershed (Jones & Stokes Associates 1995), the factor that may most likely be limiting stands in the inventory area is a lack of oak regeneration due to a high density of

invasive weeds and nonnative plants in the understory. Other studies have found browsing by deer or livestock to be an important factor influencing recruitment (Bartolome et al. 2002), while others have found that grazing by small mammals (Tyler et al. 2002) or large mammals (Borchert et al. 1989) is very important. Fire may have negative or no effects on oak recruitment, depending on the timing, frequency, and intensity of the fire (Griffin 1977; Bartolome et al. 2002).

- Wild pigs may be a serious threat to oak regeneration in the inventory area. A recent study of the effects of wild pigs in California showed that they can disturb up to 35–65% of the ground annually where they occur in high densities, and that they significantly reduce acorn survival (Sweitzer and Van Vuren 2002).
- Sudden oak death (SOD), caused by the pathogen *Phytophthora ramorum*, is a serious threat to the oak woodland and mixed evergreen forest of northern California. Several dominant and important trees in the inventory area have been identified as hosts to this pathogen: coast live oak (*Quercus agrifolia*), California black oak (*Quercus kelloggii*), California bay laurel (*Umbellularia californica*), madrone (*Arbutus menzesii*), California buckeye (*Aesculus californica*), and big-leaf maple (*Acer macrophyllum*) (Garbelotto et al. 2002). The pathogen can kill adults of the oaks and madrone; bay laurel, buckeye, and maple host the pathogen without being killed by it. With the exception of coast live oak, these species are restricted to the mixed evergreen forest at higher elevations of the inventory area. Dominant oaks in the oak woodland and oak savanna, blue oak (*Quercus douglasii*) and valley oak (*Quercus lobata*), have not shown symptoms of the pathogen. As of December 2, 2002, there have been no confirmed cases of SOD in the inventory area (see <http://kellylab.berkeley.edu/SODmonitoring/> for the latest data). It is unknown if climatic or other factors will limit the spread of SOD into the inventory area. Because of the seriousness of this potential threat, oaks and other trees susceptible to the pathogen will be monitored regularly. Management under this measure may need to be adjusted to account for the effects of the pathogen if it spreads into the inventory area. See the adaptive management plan and changed circumstances chapters for more details.

Measure 2.4.3. Restore Oak Savanna

Measure

To compensate for impacts on oak savanna, a total of 202 acres of oak savanna will be restored within preserves on annual grassland or ruderal land cover types with suitable site conditions for oak savanna establishment (Table 6-16). Mitigation of impacts on oak savanna alliances will be accomplished in-kind. For example, impacts on blue oak savanna will be mitigated by restoration of blue oak savanna, and impacts on valley oak savanna will be mitigated by restoration of valley oak savanna. Restoration of oak savanna under this measure is in addition to oak savanna preservation (see Conservation Measure 1.3.1). The overall restoration objective is to establish within 50 years of initiating

restoration a sufficient number of oak trees to provide a percent tree canopy cover equal to or up to 10% greater than the percent canopy cover in oak savanna stands removed by covered activities.

Potential restoration sites will be evaluated on the basis of criteria including but not be limited to:

- topographic, soil, groundwater, and surface water conditions suitable for the target oak savanna alliance (e.g., blue oak savanna, valley oak savanna);
- existing ecological functions and values that could be adversely affected by restoration;
- proximity to existing oak savanna stands;
- areas with evidence of historic occurrences of oak savanna (e.g., based on historic photographic analysis or other records);
- distance to the impact area;
- parcel size (among parcels with similar restoration potential, preference will be afforded to larger parcels) and the ability to continue long-term management, maintenance, and monitoring;
- proximity to other enhancement or restoration sites within preserves;
- proximity to existing, approved, and proposed developments or other adjacent land uses that may degrade the intended values of mitigation stands; and
- the amount and cost of site preparation needed, all else being equal (restoration costs should be weighed against the conservation benefits of restoring the subject site as opposed to other sites).

Local site selection and restoration design will follow the procedures used in the mitigation program for the Los Vaqueros Reservoir project (Jones & Stokes 1991, 1993a), as modified by recommendations in recent monitoring reports (Contra Costa Water District 2001c).

Once restoration sites are selected, the Implementing Entity will prepare a site restoration plan that describes:

- percent canopy cover objective to be reached in 50 years;
- restoration techniques (e.g., type, quantity, and density of planting material; weed and herbivory control methods and schedule; irrigation methods and schedule) required to achieve the objective;
- monitoring program and performance objectives; and
- potential remedial measures that could be undertaken if performance objectives are not achieved.

Based on the restoration plans for each restoration site, construction specifications and drawings will be prepared to guide contractors who will implement restoration (e.g., Jones & Stokes 1995, 1998). To the extent practicable, restoration designs and specifications will adhere to the following principles and techniques.

- Restoration designs will include inputs of water only as necessary to ensure successful establishments of oak seedlings.
- Source material for plantings will be collected from adjacent or nearby stands of oaks in different years and from as many different individual trees as is practical to ensure a wide representation of the local gene pool.
- Soil supporting conspecific trees and a high density of mycorrhizal fungi will be collected to inoculate planting sites with the fungi.
- Mitigation plantings will be protected from herbivory including native and exotic herbivores such as black-tailed deer, cattle, feral pigs, and rodents.
- Mitigation plantings will be irregularly spaced to avoid an orchard-like grove of oaks and to increase the structural diversity of the mitigation sites.

Rationale

Compensation for loss of oak savanna is required to mitigate impacts on wildlife supported by this diverse natural community. Compensation will be achieved through preservation of oak savanna (see Conservation Measure 1.3.1) and restoration at a 1:1 ratio to ensure no net loss of oak savanna.

The approach to oak savanna restoration described above is based largely on the approach to restoration used for the Los Vaqueros Reservoir project. The Los Vaqueros Reservoir project has been successful at establishing valley oaks in the Kellogg Creek watershed. Of 858 seedlings planted in 1995 in the Los Vaqueros Watershed, 695 (81%) survived to 2001 with an average height of 5.3 feet, average canopy diameter of 1.7 feet, and good vigor. Of 1,739 seedlings planted in 1998, 1,516 (87%) survived to 2001 with an average height of 3.6 feet, average canopy diameter of 2.0 feet, and good vigor. (Contra Costa Water District 2001c.) Restoration of oak savanna will provide habitat values for many species of wildlife that use preserve lands. Restored oak trees will provide food (e.g., acorns, catkins, leaves, buds, insects) used by many species of wildlife such as woodpeckers, Plain Titmouse, wrens, Western Bluebird, towhees, White-breasted Nuthatch, and black-tailed deer. Oak trees also provide perches for resting and foraging birds (e.g., hawks, owls) and nest sites for many species of songbirds and raptors, including cavity-nesting species (e.g., titmice and wrens).

Chaparral/Scrub

Measure 2.5.1. Maintain or Improve Quality of Chaparral/Scrub Habitat through Adaptive Management

Measure

The historic extent, conditions, and fire frequency of chaparral and coastal sage scrub stands within preserves will be assessed through interpretation of aerial photographs and analysis of historic records of fire in the area. The results of this study will be used to determine whether active management is required to maintain these stands in their current extent and condition.

Prescribed burns will be used sparingly and strategically in this vegetation community, and only when necessary to reduce extreme fire hazards in areas of likely fire risk or to enhance unoccupied habitat for Alameda whipsnake. Chaparral and coastal sage scrub stands within preserves will be monitored through vegetation sampling and periodic interpretation of aerial photographs to ensure that the overall extent of these stands is not declining; this procedure is described in the monitoring chapter. Monitoring will be used to determine the status of habitat function for Alameda whipsnake and the need for active management measures in chaparral and scrub vegetation. Prescribed fires, if determined to be necessary, will be carefully planned and implemented with the cooperation of the California Department of Forestry and Fire Protection and local fire agencies. A burn plan will be prepared for each prescribed fire event.

Rationale

Management of chaparral and coastal sage scrub in the last decade, including within the inventory area, has focused on the use of prescribed burning to enhance this community, restore the historic fire frequency, and reduce the unnatural buildup of fuel. Mount Diablo State Park has been implementing a prescribed burn program in chaparral and other fire-dependent vegetation types since 1986 (Nielson 2001). This management technique is based on three key assumptions: (1) the current fire-return time in chaparral is longer than historic levels due to modern fire suppression, (2) vegetation density has increased as a result, and (3) this increase in vegetation density has increased the risk of fire.

Many land management plans recommend rotational burning of chaparral and other shrublands to maintain a mosaic of stand ages, providing the maximum benefit to this community and to minimize the chances of catastrophic wildfire. However, recent research suggests that the assumptions on which these policies are based are wrong for chaparral communities in southern California and may also be wrong for chaparral communities in central and northern California (Keeley 2002). The frequency of fire in southern California shrublands is as frequent or more frequent in the twentieth century than it was in the nineteenth century (prior to fire suppression activities) partly because fire suppression activities have been ineffective at reducing fire frequency in shrublands (Keeley et al. 1999; Keeley and Fotheringham 2001). Fire hazard in chaparral habitat appears to be either independent of or only weakly dependent on stand age

(Moritz 1999) for the first 20 years after fire (Schoenberg et al. 2003). The frequency of severe weather conditions (e.g., low humidity, high winds, and drought) and the number of people with access to stands (providing an ignition source) appear to play much more important roles than do vegetation conditions in determining fire risk.

Prescribed burning in chaparral will likely reduce wildfire risk, but it may also adversely affect the community. Fires that occur too frequently in chaparral (either wildfires or prescribed burning) may reduce chaparral biological diversity by eliminating species not adapted to frequent burning (Zedler et al. 1983). It has also been assumed that prescribed fires are effective at reducing or controlling exotic plants. However, prescribed fires in chaparral must be conducted in late fall or winter when weather conditions maximize the ability of fire crews to control the fire, when there is little effect on the seed banks or reproductive capability of exotic plants. Chaparral that experiences frequent fires will be exposed to high rates of erosion and potential watershed damage. Research suggests that prescribed burns may have no effect on chaparral and may be detrimental. With little evidence that this expensive technique is effective at enhancing chaparral communities, it should be used only to reduce fire risk unless future research shows otherwise.

Most of the studies on the effects of burning and prescribed fires have occurred in chaparral and coastal sage scrub in southern California where these vegetation communities often dominate the landscape. It is therefore unclear if results from southern California apply to the chaparral and coastal sage scrub in the inventory area, where chaparral and coastal sage scrub form discrete patches within annual grassland, oak woodland, or mixed evergreen forest. Management of chaparral and coastal sage scrub within the inventory will be conducted using a cautious and adaptive approach. Prescribed burning will be used sparingly and only when necessary to reduce extreme fire hazards or obvious signs of stand decadence from fire suppression activities. If future research demonstrates the benefits of prescribed burning (or another active management technique), then management in preserves can be adjusted.

The effects of prescribed fire on Alameda whipsnake are largely unknown. However, USFWS considers fire suppression one factor in the decline of Alameda whipsnakes because it may reduce the extent of early to mid-successional stages of this vegetation community, which whipsnakes prefer, and because it may increase the risk of catastrophic wildfire (U.S. Fish and Wildlife Service 1997, 2000). As discussed above, recent research suggests that fire suppression may not be linked to these factors. Because of the uncertainty in the effects of prescribed fire on this species, its use will be limited to unoccupied habitat for whipsnake where practicable. If prescribed fire is necessary in preserves in occupied whipsnake habitat (e.g., to reduce extreme wildfire risk), then an impact minimization measure will be implemented (see Conservation Measure 3.8.2).

Riparian Woodland/Scrub

Measure 2.6.1. Stream and Riparian Woodland/Scrub Enhancement Program

Measure

All degraded streams and riparian woodland/scrub within the preserves will be improved to increase overall ecological functions and values (i.e., species richness and diversity, vegetative cover, wildlife habitat function) and to enhance the ability of these habitats to support existing and new populations of covered species.

The Implementing Entity will map riparian corridors within the preserves to identify stream segments suitable for enhancement measures. Potential enhancement sites will be evaluated and measures identified in coordination with the other local agencies or organizations active in riparian restoration in the inventory area (e.g., Contra Costa County Resource Conservation District, Contra Costa County Watershed Forum, Delta Science Center). Detailed measures 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 wetland habitat). These measures will include descriptions of plant material requirements (e.g., collected and propagated from local sources), planting and construction methods, and adaptive management and monitoring requirements including indicators and success criteria.

Techniques that could be used to enhance streams and riparian woodland/scrub include but are not limited to:

installing livestock exclusion fencing along designated stream segments and providing alternative water supplies for livestock;

- hand or mechanical removal of invasive nonnative plant species (e.g., *Arundo donax*);
- installing biotechnical bank stabilization structures to arrest bank erosion and provide opportunities for planting native riparian woodland/scrub vegetation;
- planting appropriate native riparian woodland/scrub vegetation in gaps in existing riparian corridors using locally collected material (planting in gaps larger than one tree canopy length is considered riparian restoration; see Conservation Measure 2.6.2);
- planting riparian woodland/scrub vegetation along stream banks to expand existing riparian vegetation;
- installing willow cuttings along the edge of the low-flow channel to increase overhead cover;

- planting riparian woodland/scrub understory species in existing riparian corridors in areas where the understory has been denuded;
- removing debris such as trash, garbage, and/or dumped fill material (e.g., concrete, asphalt) from the stream channel to facilitate stream flow;
- removing and/or modifying barriers (e.g., culverts, low-flow crossings, diversion structures) to up- and downstream fish migration; and
- installing instream woody material, boulders, and/or rock structures (e.g., cross or V weirs) to create pools and/or narrow the low-flow channel.

Riparian enhancement measures will be integrated into the preserve management plans (see Conservation Measure 1.4.3).

Rationale

- Covered species that will benefit from the riparian enhancement program include California red-legged frog, California tiger salamander, foothill yellow-legged frog, and Swainson's Hawk. The program will also benefit other wildlife, including raptors, migratory and resident songbirds, and native insects.
- Uncontrolled livestock access to riparian areas can adversely affect existing habitats through the trampling of native vegetation, inducing bank erosion, introducing nonnative vegetation, and reducing the natural recruitment and establishment of native riparian vegetation through grazing.
- Invasive, nonnative plant species compete successfully with native plant species for limited water, nutrients, light, and space. This competition results in a decrease in the overall species diversity and, consequently, in the quality of habitat provided by riparian areas.
- Installing bank stabilization structures in areas of actively eroding stream banks reduces sediment input and downstream sediment transport/deposition, and reduces adverse effects on instream habitat and water quality.
- Planting riparian woodland and scrub vegetation within existing riparian corridors will increase the width, length, connectivity, and overall species diversity of existing habitat patches.
- Planting riparian woodland and scrub vegetation along stream banks and installing cuttings along the low-flow channel will increase overhead cover and shaded bank/stream surface, reducing water temperatures to improve aquatic habitat for covered amphibians.
- Removing debris from the stream channel will facilitate stream flow, improve water quality, and enhance existing aquatic habitat.
- Installing instream structures will create pools and overhead cover, increase inputs of organic material, and enhance aquatic habitat for covered species.
- Removing barriers and/or constructing passage structures will facilitate up- and downstream migration of fish and enhance habitat for covered aquatic species.

Measure 2.6.2. Stream and Riparian Woodland/Scrub Restoration Program

Measure

The Implementing Entity will restore stream and riparian woodland and scrub habitats within preserves according to the requirements listed in Table 6-16. Impacts to streams or riparian woodland/scrub will be compensated through the restoration of stream and riparian woodland/scrub habitat types at a ratio of 1:1. The Implementing Entity will also restore ___ acres of riparian woodland/scrub to enhance overall native biological diversity and to contribute to the recovery of covered species (Table 6-16). [*Note to reader: the acreage requirements for riparian woodland/scrub restoration to contribute to species recovery have not yet been determined.*]

Potential impacts on streams will be avoided and/or minimized through implementation of activities described under Conservation Measure 2.2.4. Where impacts on streams are unavoidable, mitigation will focus on enhancement and restoration of streams within preserves. Where mitigation within preserves is infeasible, stream restoration within existing protected areas is allowed. Impacts on streams without riparian woodland/scrub cover can be compensated through either restoration of riparian woodland/scrub vegetation on existing streams or restoration of seasonal or permanent wetlands on an acre-for-acre basis to replace some stream functions (see Conservation Measure 2.2.2). Restoration of streams without vegetation will not be encouraged because all but the smallest streams in the inventory area are vegetated. Impacts on streams with riparian woodland/scrub vegetation will be compensated through a combination of stream restoration and restoration of riparian woodland/scrub vegetation. Stream restoration will be accomplished in-kind where possible. Restoration principles and rationales for the stream types that occur in the inventory area are described below.

Perennial Streams. The Implementing Entity will restore approximately ___ acres of perennial streams (approximately ___ acres of compensation and ___ acres of mandatory restoration to contribute to the recovery of covered species) located within the inventory area. Restoration will occur along perennial streams that have been degraded by past land use activities and that historically supported riparian woodland/scrub vegetation. Restoration of perennial streams will likely focus on the implementation of intensive measures such as excavating stream banks and floodplain surfaces because of the ecological benefits to covered species associated with permanent water. Combined with restoration of riparian woodland/scrub, implementation of these activities will provide shade and cover, reduce water temperatures, increase channel complexity, and enhance instream aquatic habitat for fish and other aquatic organisms.

Intermittent Streams. Compensation for the loss of intermittent streams can be accomplished through restoration of intermittent or perennial streams. The Implementing Entity will restore approximately ___ acres of riparian woodland/scrub habitat (approximately ___ acres of compensation and ___ acres

of mandatory restoration to contribute to the recovery of covered species) along intermittent streams located within the inventory area. Restoration will occur along intermittent streams that have been degraded by past land use activities and that historically supported riparian woodland/scrub vegetation. Restoration of intermittent streams will likely involve measures similar to those implemented for perennial streams (e.g., stream bank and floodplain excavation, planting), but because of the lack of perennial flow will likely not include instream aquatic features.

Ephemeral Streams. The Implementing Entity will restore approximately ___ acres of riparian woodland/scrub habitat (approximately ___ acres of compensation and ___ acres of mandatory restoration to contribute to the recovery of covered species) along ephemeral streams located within Preserves. Restoration along ephemeral streams will primarily focus on planting upper terrace riparian species (e.g., oaks, California bay, California buckeye) that can tolerate drier site conditions. If the restoration of ephemeral streams is not feasible because of site conditions or other considerations, the Implementing Entity will be required to restore riparian woodland/scrub or seasonal or permanent wetland habitats on an acre-for-acre basis to replace lost stream functions.

Potential restoration sites in the inventory area (e.g., Robins and Cain 2002; Walking et al. 2002) will be evaluated and measures identified in coordination with the other local agencies or organizations active in riparian restoration in the inventory area (e.g., Contra Costa County Resource Conservation District, Contra Costa County Watershed Forum, Delta Science Center). Restoration sites will be selected based on factors including, but not limited to:

- the potential success of restoration activities, based on site-specific conditions (e.g., hydrology, soils);
- the ability of the site to support covered species after restoration;
- the proximity of the site to the area in which streams or riparian woodland/scrub were lost to covered activities;
- the proximity of the site to other intact riparian corridors that support, or are likely to support, covered species; and
- the ability of the restored stream and/or riparian woodland/scrub to contribute to regional conservation goals of habitat connectivity.

Detailed restoration plans, including 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 or wetlands). Restoration plans will include the following key components:

- defining restoration goals and objectives, performance indicators, and success criteria;

- collecting and analyzing baseline data (e.g., soil type and suitability for riparian planting, low-flow conditions, past land use history/alterations);
- identifying suitable/feasible restoration measures;
- developing conceptual restoration designs;
- developing 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
- preparing an adaptive management and monitoring plan that includes descriptions of responsible parties, monitoring methods and schedule, indicators (e.g., vegetative cover), success criteria (e.g., 20% cover by year 5), and adaptive management measures (e.g., replanting with different species).

Measures that could be implemented to restore streams and riparian woodland/scrub include but are not limited to (U.S. Department of Agriculture 1999):

- replacing existing hardscape bank protection structures (e.g., riprap, concrete, sakrete) with biotechnical bank stabilization structures, consistent with flood protection purposes;
- excavating and grading existing stream banks and/or floodplain surfaces to create suitable planting sites for riparian woodland/scrub vegetation, provide opportunities for the deposition of fine grain materials and native seed stock, and enhance existing flood capacity (if needed to offset the loss of flood capacity from plantings);
- planting riparian woodland and scrub vegetation on newly excavated channel banks and floodplain surfaces to increase overhead cover and shaded bank/stream surface, thereby reducing water temperatures to improve aquatic habitat for covered amphibians;
- planting appropriate native riparian woodland/scrub vegetation within large gaps in riparian corridors (planting in gaps smaller than one tree canopy length is considered riparian enhancement; see Conservation Measure 2.6.1) to increase the width, length, connectivity, and overall species diversity of existing habitat patches;
- shifting or realigning straightened stream channels to restore meanders (e.g., usually on agricultural lands) and increase instream habitat complexity and quality for covered aquatic species; and
- installing woody material, boulders, and/or instream structures to create pools, reduce the width of the low-flow channel, increase inputs of organic material, and improve habitat for covered aquatic species.

Agriculture

Measure 2.7.1. Enhance Agricultural Lands to Benefit Covered Species

Measure

The Implementing Entity will acquire conservation easements on at least 6,250 acres of agricultural land in Zone 6 from willing sellers (see Conservation Measure 1.3.1). Conservation easements will require landowners to modify existing agricultural-related practices to enhance the value of agricultural lands for covered species (see Conservation Measure 1.1.4)

Management measures that could be implemented on agricultural lands to benefit covered species are presented in Table 6-17. Specific management practices that may be required for a particular parcel will depend on its location within the Preserve System relative to the distribution and needs of covered species, as well as the types of management actions that can be reasonably undertaken while maintaining ongoing and profitable farming operations. The Implementing Entity will develop agricultural management plans for each conservation easement that describe the management measures to be implemented by the landowner. Requirements and terms of agricultural management plans are described in Conservation Measure 1.4.4.

Rationale

Agricultural lands are the dominant land cover type in Zone 6. Consequently, the primary opportunity to enhance habitat for covered species in the Zone require enhancing habitat on agricultural lands.

Species-Level Conservation Measures

Note to reader: Species-specific conservation measures are numbered sequentially for every species, regardless of whether measures are needed at this time or not. Additional species-specific conservation measures may be added later, so these numbers serve as placeholder in that event.

Townsend's Big-Eared Bat

Many of the landscape-level and community-level conservation measures will directly benefit Townsend's western big-eared bat. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized. The conservation strategy will preserve at least 25,000 acres of terrestrial vegetation communities, including alkali grassland, annual grassland, chaparral, oak savanna, and oak woodland, that are expected to include suitable microhabitats for roosting bats, such as caves, mines, or other structures. However, the distribution of Townsend's western big-eared bat and its suitable

habitat in the inventory area are not well known; accordingly, the additional species-specific measure described below will be implemented if occupied sites are located.

Management of preserves will benefit Townsend's western big-eared bat. For example, several measures will enhance foraging habitat by restoring streams, wetlands, and associated riparian habitat in habitat preserves, and controlling the use of insecticides in preserves (see Conservation Measures 1.3.2, 2.2.1, 2.2.2, 2.2.3, 2.2.4, and 2.6.1.)

Measure 3.1.1. Conduct Preconstruction Survey and Minimize Impacts on Townsend's Big-Eared Bat during Sensitive Periods

Measure

If impacts on hibernation or nursery sites cannot be avoided, seal hibernation sites before the hibernation season (November–March); seal nursery sites before the nursery season (April–August). If the site is being used as a winter roost, then the action should occur either prior to or after the hibernation season (November–March). If the site is being used as a nursery colony (April–August), the action should not occur until after August 15, when the pups are weaned and are able to fly.

Rationale

The locations of all suitable or occupied microhabitat within the inventory area are not known due to survey and mapping limitations. Hibernation or nursery sites may be located during planning or preconstruction surveys. Avoiding impacts on these sites during sensitive periods would minimize disturbance or direct mortality as a result of covered activities and would provide an opportunity for bats to reestablish elsewhere.

San Joaquin Kit Fox

Many of the landscape-level and community-level conservation measures are designed specifically to benefit and contribute to the recovery of San Joaquin kit fox. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (Conservation Measures 1.1.1 and 1.1.2). The conservation strategy will protect at least 18,007 acres of suitable core habitat and 4,523 acres of suitable low-use habitat for San Joaquin kit fox in the inventory area (Table 6-17). A network of core preserves will protect a critical linkage for San Joaquin kit fox between its range outside Contra Costa County and most known locations in Contra Costa County. For example, habitat linkages at least 0.5 mile wide will be acquired and protected to ensure that kit foxes can continue to move between the Contra Costa/Alameda County line and the Concord Naval Weapons Station at the northwestern corner of the species' range. This important regional connection will be made by connecting the

following existing large protected areas known or suspected to support San Joaquin kit fox:

- Brushy Peak Regional Preserve (Alameda County) and Vasco Caves Regional Preserve;
- Byron Airport conservation easements and the Los Vaqueros watershed;
- Cowell Ranch/Los Vaqueros watershed and Black Diamond Mines Regional Preserve; and
- Black Diamond Regional Preserve and the Concord Naval Weapons Station.

There are four possible movement routes through annual grassland between Black Diamond Regional Preserve and Cowell Ranch/Los Vaqueros. The southernmost linkage is the narrowest (approximately 0.2 miles at its narrowest point), and its viability may be compromised by the planned expansion of the Los Vaqueros Reservoir. Two linkages of annual grassland between Black Diamond Regional Preserve and Cowell Ranch/Los Vaqueros will be created out of the other three possible routes to ensure that movement between these core protected areas can continue. Annual grassland within preserves will be managed to enhance small mammal populations (a prey base for kit fox) (Conservation Measure 2.3.2) and to enhance the native plant component of this vegetation community (Conservation Measure 2.3.1).

Measure 3.2.1. Implement Preconstruction Survey and Impact Minimization Program for San Joaquin Kit Fox

To avoid or minimize direct impacts on San Joaquin Kit Fox as a result of covered activities, the San Joaquin Kit Fox Preconstruction Survey and Impact Minimization Program described below will be implemented. This program was developed based on the USFWS *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (U.S. Fish and Wildlife Service 1999).

Preconstruction Surveys

Prior to any ground disturbance related to covered activities, a USFWS/CDFG-approved biologist will conduct a preconstruction survey to identify San Joaquin kit foxes and/or habitat features (e.g., dens) and evaluate use by kit foxes in accordance with USFWS survey guidelines (U.S. Fish and Wildlife Service 1999). These surveys will be conducted by project proponents in any area identified by the habitat model as suitable core habitat or suitable low-use habitat for kit fox. Project proponents may conduct a planning survey to document whether suitable kit fox habitat occurs on a site (Conservation Measure 1.2.1). If the planning survey documents absence of suitable kit fox habitat on a site and the Implementing Entity, USFWS, and CDFG concur with the results of the survey, then no preconstruction surveys for kit fox will be necessary.

Preconstruction surveys will be conducted no less than 14 days and no more than 30 days prior to any ground disturbance. The biologist will survey within the proposed disturbance footprint and a 200-foot radius from the perimeter of the proposed footprint to identify San Joaquin kit foxes and/or habitat features. The status of all dens will be determined and mapped. Written results of preconstruction surveys will be submitted to USFWS within 5 working days after survey completion and before the start of ground disturbance.

If San Joaquin kit foxes and/or habitat features are identified in the survey area, the measures described below will be implemented.

Measures to Minimize or Avoid Take

1. If dens are identified in the proposed disturbance footprint areas during the survey, they will be excavated by hand according to USFWS guidelines (summarized below). If an occupied or previously active San Joaquin kit fox den is discovered, the den will be monitored for 3 days by a USFWS/CDFG–approved biologist using a tracking medium or an infrared beam camera to determine if the den is currently being used.
2. If no kit fox activity is observed during this period, the den should be destroyed immediately to prevent subsequent use.
3. If kit fox activity is observed at the den during this period, the den will be monitored for at least 5 consecutive days from the time of the observation to allow any resident animal to move to another den during its normal activity.
4. If a natal or pupping den is found, USFWS and CDFG will be notified immediately. The den will not be destroyed until the pups and adults have vacated, and then only after further consultation with USFWS and CDFG.
5. For dens other than natal or pupping dens, use of the den can be discouraged during this period by partially plugging its entrance with soil in such a manner that any resident animal can escape easily. Only when the den is determined to be unoccupied may the den be excavated under the direction of the biologist. If the animal is still present after 5 or more consecutive days of plugging and monitoring, the den may have to be excavated when, in the judgment of a biologist, it is temporarily vacant (i.e., during the animal’s normal foraging activities).
6. If dens are identified in the survey area and outside of the proposed disturbance footprint, exclusion zones around each den entrance or cluster of entrances will be demarcated. No covered activities will occur within the exclusion zones. The configuration of exclusion zones should be circular, with a radius measured outward from the den entrance(s). Exclusion zones for potential and atypical dens will be at least 50 feet, and will be demarcated with four to five flagged stakes. Exclusion zones for known dens will be at least 100 feet, and will be demarcated with staking and flagging that encircles each den or cluster of dens but does not prevent access to the den by kit fox. If a natal/pupping den is found, USFWS will be notified immediately.

Tricolored Blackbird

Many of the landscape-level and community-level conservation measures are designed specifically to benefit Tricolored Blackbird. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.1.1, 1.1.2, and 1.1.3). The Preserve System will protect 60–83 acres of modeled core habitat, 21,987–30,278 acres of primary foraging habitat, and 1,177–1,852 acres of secondary foraging habitat (Table 6-17) (Conservation Measure 1.3.1). The Preserve System will also protect at least 7 of the 13 ponds in Subzone 2c, all of which provide potential breeding habitat for Tricolored Blackbird. This Subzone has a particularly dense concentration of unprotected ponds. Planning surveys (Conservation Measure 1.2.1) will be conducted to confirm habitat suitability and identify habitat occupied by Tricolored Blackbird in potential preserve lands; results of these surveys will be used to guide acquisition of preserves to include occupied habitat to the maximum extent practicable.

Conservation easements acquired in Zone 6 (Conservation Measure 1.3.1) will benefit Tricolored Blackbird by providing foraging habitat. Within Zone 6, the Implementing Entity will focus on acquiring conservation easements on cultivated agricultural lands that provide suitable foraging habitat for Tricolored Blackbird and other covered species. The Implementing Entity will acquire conservation easements on at least 6,250 acres of cropland or pasture in Zone 6. Conservation easements will require landowners to modify existing agricultural-related practices to enhance the value of agricultural lands for Tricolored Blackbird and other covered species. Because Tricolored Blackbirds require nesting habitat near suitable foraging habitat, areas preserved as Tricolored Blackbird breeding habitat will include both elements. For example, preservation, restoration, creation, or enhancement to compensate for loss of breeding habitat will occur near suitable foraging habitat that will also be protected.

The enhancement, restoration, and creation of ponds within preserves will benefit Tricolored Blackbird (see Conservation Measures 2.2.1 and 2.2.2) by enhancing, restoring, and creating suitable breeding habitat for this species adjacent to suitable foraging habitat (annual grassland). Establishing buffers between urban development and breeding habitat for Tricolored blackbird (Conservation Measure 1.3.2) will help to maintain existing breeding colonies of this species and encourage new colonies to form in restored or created habitat.

Several preserve management measures will benefit Tricolored Blackbird. Agricultural lands will be managed to maintain or enhance suitable foraging habitat for Tricolored Blackbird when close to breeding colonies (Conservation Measures 1.4.1, 1.4.4, and 2.7.1). Habitat enhancement on agricultural lands (e.g., planting blackberries or other vegetation along ditches and canals to provide suitable nesting sites) will also benefit Tricolored Blackbird.

Note to reader: Species-specific conservation measures for Tricolored Blackbird to come.

Golden Eagle

Many of the landscape-level and community-level conservation measures will benefit Golden Eagle. The development conditions will ensure that indirect impacts on this species from covered activities are avoided or minimized. Conservation Measure 1.1.4 prohibits the taking of Golden Eagle individuals. The Preserve System will protect 30,595–42,810 acres of modeled foraging habitat for Golden Eagle (Table 6-17), including a network of large blocks of high-quality grassland habitat. Nearly the entire Preserve System will provide suitable foraging and breeding habitat for Golden Eagle. New preserves will be linked to existing protected land, which will result in large areas of contiguous foraging habitat for Golden Eagle. Acquisition of at least 6,250 acres of conservation easements in agricultural areas (Zone 6) will benefit Golden Eagle by providing foraging habitat. Focused acquisitions will protect most of the remaining alkali grassland, alkali wetlands, and alkali sink scrub in Zone 6 (Conservation Measure 1.3.1), providing additional foraging habitat for Golden Eagle.

Several preserve management measures will benefit Golden Eagle. Preserves will be managed to enhance the prey base for raptors, including Golden Eagle (Conservation Measure 2.3.2). Annual grassland that is managed to decrease the cover and extent of exotic plants (Conservation Measure 1.4.1) and to increase the cover and extent of native grasslands (Conservation Measures 1.4.3 and 2.3.1) will benefit Golden Eagle by reducing overall vegetative cover and increasing foraging opportunities in grasslands. Management of agricultural lands will be designed to enhance and increase foraging and nesting habitat for covered species, including Golden Eagle (Conservation Measures 1.4.4 and 2.7.1). These measures contain specific techniques and goals that will be incorporated into agricultural management plans and conditions of the conservation easements purchased on agricultural lands.

The following additional measures are required to achieve the biological goals and objectives for Golden Eagle.

Measure 3.4.1. Protect Golden Eagle Nest Sites

Measure

Planning surveys in potential preserve lands (see Conservation Measure 1.2.1) will be conducted to determine habitat suitability and identify active Golden Eagle nest sites. Results of these surveys will be used to guide acquisition of occupied nesting habitat to the maximum extent practicable. The Implementing Entity will evaluate ongoing land uses in or adjacent to occupied habitat relative

to future threats to nests or habitat. Occupied habitat that is considered threatened will be a high priority for acquisition and management.

Rationale

Although foraging habitat for Golden Eagle is common in the inventory area, suitable nest sites are relatively rare. To contribute to the recovery of Golden Eagle, active or potential nest sites should be acquired within preserves to protect these important sites.

Measure 3.4.2. Avoid Disturbances to Golden Eagle Nest Sites During the Breeding Season

Measure

Prior to any ground disturbance related to covered activities, a qualified biologist will conduct a preconstruction survey to identify potential nests of Golden Eagles (see Conservation Measure 1.2.3). A 0.5-mile buffer will be established around active nest sites; covered activities will be prohibited within this buffer during the nesting season. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be implemented, the Implementing Entity will coordinate with CDFG/USFWS to determine the appropriate buffer size.

Rationale

No known Golden Eagle nest sites occur within or near the ULL. However, some activities within preserves (e.g., habitat restoration, preserve infrastructure maintenance) have the potential to disturb Golden Eagle nest sites. To ensure that these nest sites are not abandoned or otherwise disturbed, covered activities will be limited in space and time to minimize impacts on Golden Eagles.

Western Burrowing Owl

Many of the landscape-level and community-level conservation measures are designed specifically to benefit and prevent the listing of Western Burrowing Owl. Development conditions ensure that impacts on this species from covered activities are avoided or minimized (Conservation Measures 1.1.1 and 1.1.2). The conservation strategy will protect 17,930–24,395 acres of suitable habitat and 4,670–6,970 acres of suitable low-use habitat for Western Burrowing Owl in the inventory area (Table 6-17). A network of core Preserves will protect large blocks of grassland habitat. New linkages at least 0.5 mile wide will be created in blocks of suitable Western Burrowing Owl habitat to facilitate dispersal and colonization throughout the Preserve System, colonization of the inventory area from adjacent areas, and dispersal from within to outside the inventory area. The Preserve System will incorporate into its design the existing protected lands in the Inventory Area. New preserves will be established adjacent to or near and linked to existing protected land. This approach will result in large areas of contiguous habitat. Because Western Burrowing Owl population viability is

likely sensitive to the extent of available habitat area, large areas of contiguous habitat provide greater opportunities to meet the conservation objectives for this species. Planning surveys (Conservation Measure 1.2.1) will be conducted to confirm habitat suitability and identify habitat occupied by Western Burrowing Owl in potential preserves; results of these surveys will be used to guide acquisition of occupied habitat to the maximum extent practicable.

Several preserve management measures will benefit Western Burrowing Owl. For example, Conservation Measures 1.4.1, 1.4.3, and 2.3.2 will enhance habitat quality for Western Burrowing Owl in preserves through increased nesting habitat and prey base.

Measure 3.5.1. Conduct Preconstruction Survey for Western Burrowing Owl

Prior to any ground disturbance related to covered activities, a qualified biologist will conduct a preconstruction survey to identify Western Burrowing Owls and/or habitat features (e.g., burrows) and to evaluate use by Burrowing Owls in accordance with current CDFG survey guidelines (California Department of Fish and Game 1995). These surveys will be conducted by project proponents in any area identified by the habitat model as suitable habitat or suitable low-use habitat for Burrowing Owl. Project proponents may conduct a planning survey to document whether suitable Burrowing Owl habitat occurs on a site (Conservation Measure 1.2.1). If the planning survey documents the absence of Burrowing Owl habitat on a site and the Implementing Entity, CDFG, and USFWS approve the results of this survey, then no preconstruction surveys for Western Burrowing Owl will be necessary.

Surveys will be conducted within the proposed disturbance footprint and a 500-foot radius of the disturbance footprint perimeter. For construction activities occurring during the Burrowing Owl breeding season (February 1–August 31), surveys will be conducted during the breeding season and within 30 days prior to construction. The breeding season surveys will document whether Burrowing Owls are nesting on or directly adjacent to disturbance areas. For project activities occurring during the nonbreeding season (September 1–January 31), surveys will be conducted during the nonbreeding season and within 30 days prior to construction. The surveys will document whether Burrowing Owls are using the area during the nonbreeding season on or directly adjacent to any disturbance area. Survey results will be valid only for the season during which the survey is conducted.

If Burrowing Owls are found during the breeding or nonbreeding season, the measures described below will be implemented.

Measure 3.5.2. Avoid or Minimize Take of Western Burrowing Owl

Measure

- If Burrowing Owls are found during the breeding season (February 1–August 31), the project proponent will avoid all Burrowing Owl nest sites that could otherwise be disturbed by project construction during the breeding season or while the nest is occupied by adults or young. Avoidance will include establishment of a nondisturbance buffer zone of at least 250 feet around each nest site. The buffer zone will be delineated by highly visible temporary construction fencing. Construction may occur during the breeding season if a qualified biologist monitors the nest and determines that the nest site is no longer used by Burrowing Owls.
- If Burrowing Owls are found during the nonbreeding season (September 1–January 31), the project proponent should avoid the owls and the burrows they are using. Avoidance will include the establishment of at least a 160-foot nondisturbance buffer zone around each burrow being used. The buffer will be delineated by highly visible temporary construction fencing. If burrowing owls cannot be avoided, the project proponent will conduct passive relocation by installing one-way doors in suitable burrow entrances that are used or may be used by the owls and that would be collapsed or degraded by construction activities. This measure is described below. The burrows can then be excavated to prevent reoccupation by owls after the one-way doors have been installed and owls are not using the burrows after a 1-week monitoring period. Artificial burrows will be created according to the conservation measures established for this species.

In order to displace Burrowing Owls without destroying eggs, young, or adults, one-way doors will be installed on owl burrows before February 1 prior to disturbance, and each burrow will be monitored following CDFG's protocol (California Department of Fish and Game 1995). This measure includes monitoring the burrow for a 48-hour period after the one-way doors are installed. The doors will be checked every 24 hours following installation to determine whether they are still intact. If the one-way door is still correctly installed after a continuous 48-hour period (i.e., no animals have dug up the door and rendered it useless), then the one-way door will be removed and the burrows will be excavated using hand tools and plastic tubing to maintain an escape route for any animals still inside the burrow.

Rationale

This measure incorporates avoidance and minimization guidelines from the California Department of Fish and Game Staff Report on Burrowing Owl Mitigation (California Department of Fish and Game 1995).

Measure 3.5.3. Purchase Temporary Conservation Easements to Encourage Western Burrowing Owls to Leave Development Sites

Measure

To minimize impacts on Burrowing Owls that have colonized sites at which covered activities are planned, the Implementing Entity will conduct measures to encourage these owls to abandon their nests in some cases. Where feasible and beneficial, the Implementing Entity will enter into temporary conservation agreements with landowners to protect *stepping-stone*, or transition, habitats to attract owls out of occupied sites scheduled for development and to direct those owls toward preserves. Stepping stones are defined as suitable habitat for burrowing owls at least 100 acres in size. If natural burrows are not present in stepping-stone habitats, artificial burrows will be established to encourage colonization by owls (see Conservation Measure 3.5.4). Once owls move into burrows in stepping-stone easements, burrows in development sites will be collapsed or removed to prevent owls from reoccupying the site. Where feasible, this method would be implemented in time for owls to explore stepping-stone habitat during the dispersal phase of their next breeding season (August–October). Once owls have abandoned their burrows on the development site and the burrows have been collapsed, the site would be available for development. Once owls have left the stepping-stone sites and become established within preserves, any artificial burrows created on the temporary site would also be collapsed and the Implementing Entity will terminate the easement.

The need for stepping stones to facilitate movement of owls between affected areas and preserve lands will be coordinated with CDFG on a case-by-case basis, as will the appropriate distance between affected lands and stepping stones. These determinations will depend on several factors, including the distance between affected lands and available preserve lands, the amount of open space in the surrounding area, and the suitability of habitat for burrowing owls in areas adjacent to affected lands. Where nearby lands could function as stepping stones without entering into temporary easements, the Implementing Entity may choose not to purchase an easement. The adaptive management program will include studies to determine if the stepping-stone approach is effective. If the measure does not appear to be effective, then it could be discontinued in favor of experimenting with and implementing other measures.

Rationale

During some parts of their reproductive cycle (especially in early fall), Burrowing Owls may use a number of burrows sequentially, exploring and adopting new burrows as they become available. This behavior can be exploited by preserve managers. Providing numerous burrows between a source and target location can maximize the likelihood that owls will find the target area and stay there.

Measure 3.5.4. Create Artificial Burrows in Grasslands

Measure

Preserved grasslands will be enhanced as needed for Western Burrowing Owl by installing artificial burrows. Where natural burrows are limited in number in preserves or where management is unsuccessful in increasing ground squirrel populations (and therefore the availability of burrows) (see Conservation Measure 2.3.2), the Implementing Entity will create artificial burrows. Artificial burrows may encourage Western Burrowing Owls to use a site where natural burrows are absent or scarce, particularly when the artificial burrow is constructed close to a source population or occurrence (Trulio 1995). Although it is unknown whether artificial burrows directly enhance the long-term productivity of Burrowing Owls (Haug et al. 1993), this technique has been successful in attracting Burrowing Owls to sites in northern California (Trulio 1995; Jones pers. comm.). Artificial burrows will be used to attract Burrowing Owls to preserves or temporary sites (see Conservation Measure 3.5.2); this application is considered a temporary habitat enhancement measure. Artificial burrows will be maintained until natural burrows (e.g., ground squirrel burrows) become established and colonized by Burrowing Owls.

In addition, artificial burrows may be installed to mitigate covered activities that result in owl displacement and habitat loss, as well as to attract owls from areas that are scheduled for development into preserved habitat. See Conservation Measure 3.5.3 for a discussion of attracting owls from areas that are scheduled for development. Periodic maintenance of artificial burrows will be required to ensure that the burrows provide suitable nest sites for Western Burrowing Owls. Maintenance activities will include removing vegetation around burrow entrances and unplugging and repairing burrow entrances, tunnels, and chambers as needed. Maintenance activities will occur immediately before the nesting season.

Where covered activities result in the loss of an occupied burrow or eliminate foraging habitat adjacent to an occupied burrow, a minimum of five artificial burrows will be established and maintained in preserves to compensate for each burrow affected. Artificial burrow sites will be chosen within preserves that contain suitable but unoccupied habitat. The ratio of burrows created to burrows lost may be adjusted according to the success of artificial burrows and the colonization rates of preserved areas. The effects of artificial nest burrows on reproductive success have not been well studied. Techniques for creating artificial burrows will be improved over time through the Adaptive Management Program.

Rationale

Burrow availability limits the extent of year-round habitat available to Burrowing Owls. Because Burrowing Owls need other animals to dig their burrows, the loss of fossorial rodents (e.g., ground squirrels) from much of historical Burrowing Owl habitat and the concomitant reduction in burrow availability has resulted in a widespread reduction of habitat suitability for this species.

Measure 3.5.5. Establish Artificial Perches

Measure

The Implementing Entity will install artificial perches in preserves that lack owl perch sites but that otherwise support suitable habitat. The effectiveness of artificial perches will be tested and improved through the adaptive management process. Initially, perches will be no more than 5 feet high to reduce their attractiveness to large raptors.

Rationale

In addition to artificial burrows to improve habitat, Burrowing Owls can often be enticed to remain at a set of burrows if suitable perches are erected to provide a vantage point (Johnson pers. comm.).

Swainson's Hawk

Many of the landscape-level and community-level conservation measures will benefit Swainson's Hawk. The development conditions will ensure that impacts on this species from covered activities are avoided or minimized (Conservation Measures 1.1.1 and 1.1.2). The Preserve System will protect 7,513–10,700 acres of modeled foraging habitat (Table 6-17), including buffers (see Conservation Measure 1.3.2) and a large block of grassland habitat in Zone 5, some of which is suitable as foraging habitat for Swainson's Hawk. New preserves will be linked to existing protected land, resulting in large areas of contiguous habitat. Acquisition of conservation easements on agricultural lands in Zone 6 will benefit Swainson's Hawk by protecting and enhancing foraging habitat. The Implementing Entity will acquire conservation easements on at least 6,250 acres of cropland or pasture within Zone 6 (Conservation Measure 1.3.1).

Planning surveys (Conservation Measure 1.2.1) will be conducted to determine nesting habitat suitability in potential preserve lands and identify active or historic Swainson's Hawk nest sites; nesting habitat for Swainson's Hawk will be protected to the maximum extent practicable. The loss of riparian woodland/scrub, all of which is considered suitable for nesting by Swainson's Hawk, will be mitigated through in-kind protection of riparian woodland (Conservation Measure 1.3.1) and enhancement and restoration of riparian woodland/scrub within preserves or existing protected areas (Conservation Measure 2.6.1).

The Implementing Entity will acquire riparian woodland/scrub within preserves at the ratios in Table 6-7. Compensation for loss of riparian woodland will be achieved at a 1:1 ratio (Table 6-16). In addition, the Implementing Entity will restore ___ acres of riparian woodland/scrub restoration regardless of the level of impact [*Note to reader: the amount of riparian restoration required to contribute to species recovery has not yet been determined. It will likely be in the range of 25–100 acres*]. Riparian woodland within 10 miles of suitable foraging habitat for Swainson's Hawk is expected to provide suitable nesting habitat.

Because Swainson's Hawks require nesting habitat near suitable foraging habitat, areas preserved as Swainson's Hawk breeding habitat will include both elements. For example, preservation, restoration, creation, or enhancement of woodlands or trees to compensate for loss of breeding habitat will occur near suitable foraging habitat that will also be protected.

Several preserve management measures will benefit Swainson's Hawk. Preserves will be managed to enhance the prey base for raptors, including Swainson's Hawk (Conservation Measure 2.3.2). Annual grassland that is managed to decrease the cover and extent of exotic plants (Conservation Measure 1.4.1) and to increase the cover and extent of native grasslands (Conservation Measures 1.4.3 and 2.3.1) will benefit Swainson's Hawk by reducing overall vegetative cover and increasing foraging opportunities in grasslands. Management of agricultural lands will be designed to enhance and increase foraging and nesting habitat for Swainson's Hawk (Conservation Measures 1.4.4 and 2.7.1). These measures contain specific techniques and goals that will be incorporated into agricultural management plans and conditions of the conservation easements purchased on agricultural lands. In addition, the Conservation Measure below will be implemented.

Measure 3.6.1. Avoid Disturbance to Swainson's Hawk Nest Sites During the Breeding Season

Measure

Prior to any ground disturbance related to covered activities, a qualified biologist will conduct a preconstruction raptor survey to identify active nests of Swainson's Hawk. A 0.5-mile buffer will be established around active nest sites; when practicable, covered activities will be prohibited within this buffer during the nesting season. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be implemented, the Implementing Entity will coordinate with CDFG/USFWS to determine the appropriate buffer size.

Rationale

This measure is required by CDFG of all projects within the range of Swainson's Hawk to avoid disturbance to Swainson's Hawk nests (California Department of Fish and Game 1994).

Silvery Legless Lizard

Many of the landscape-level and community-level conservation measures at the will benefit silvery legless lizard. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.1.1., 1.1.2, and 1.1.3). The conservation strategy will protect 265–437 acres of modeled habitat for silvery legless lizard in the inventory area (Table 6-18), including all modeled suitable habitat for silvery

legless lizard in Subzones 2a (37 acres) and 2e (43 acres). However, the suitability of modeled habitat for silvery legless lizard has not been verified in the field. Planning surveys (Conservation Measure 1.2.1) will be conducted to confirm habitat suitability and identify habitat occupied by silvery legless lizard in sites of covered activities and potential preserve lands; results of these surveys will be used to guide acquisition of occupied or suitable habitat to the maximum extent practicable.

Several preserve, vegetation, and recreation management measures will be implemented to avoid or minimize impacts on silvery legless lizards and suitable habitat (particularly soils) in preserves. For example, restrictions on recreation in protected habitat will be implemented (Conservation Measure 1.4.2). These measures include limiting or prohibiting vehicle traffic in lizard habitat; limiting activities allowed in protected habitat to hiking, bicycling, and horseback riding; and minimizing the number of trails in suitable habitat. Also, pesticide use, which threatens this species by affecting its insect prey base, will be controlled in preserves (see Conservation Measure 1.4.3). Buffers between protected habitat and the urban edge will benefit silvery legless lizard by discouraging intrusion by domestic predators (Conservation Measure 1.1.2 and 1.3.2).

Existing landscape-level and community-levels measures are sufficient to meet the biological goals and objectives for silvery legless lizard. There are no additional species-level measures proposed for this species.

Alameda Whipsnake

Many of the landscape-level and community-level conservation measures are designed specifically to benefit and contribute substantially to the recovery of Alameda whipsnake. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (Construction Measures 1.1.1 and 1.1.2). The conservation strategy will protect 1,185–1,476 acres of core and perimeter habitat and 12,145–16,707 acres of movement habitat for Alameda whipsnake in the inventory area (Table 6-18).

Land acquisition in Zones 3 and 4 target suitable habitat for Alameda whipsnake. For example, the Implementing Entity will acquire at least 90% of the suitable core habitat for Alameda whipsnake in Subzone 3a in order to protect the largest block of chaparral/scrub in the inventory area outside public lands. Protecting 90% of this patch and protecting movement habitat surrounding it will provide a key linkage between existing protected Alameda whipsnake habitat in Mount Diablo State Park and Black Diamond Mines Regional Park. Also, acquisitions in Subzone 3b will increase the width of the linkage between the large chaparral patch and other chaparral patches in Mount Diablo State Park. All land acquired in this Subzone will contribute to this linkage; at least 50% of this land must also be connected to Clayton Ranch through existing public lands or HCP/NCCP preserves. Land acquired in this Subzone will contribute to the recovery of Alameda whipsnake by protecting important movement habitat between known

populations. Also, acquisition of portions of Marsh Creek in Zone 4 will protect modeled movement habitat for Alameda whipsnake. Establishment of buffer zones between urban development and patches of chaparral/scrub in Zones 1 and 2 (Conservation Measure 1.3.2) will also preserve existing habitat for Alameda whipsnake.

Several preserve management measures will benefit Alameda whipsnake. For example, movement habitat for Alameda whipsnake will be enhanced through better management of oak woodland, oak savanna, and annual grassland (Conservation Measures 1.4.3, 2.3.1, 2.4.2). Control of exotic plants (Conservation Measure 1.4.1) and recreational uses (Conservation Measure 1.4.2) will also benefit Alameda whipsnake. Recreational controls to benefit whipsnakes include prohibiting vehicle traffic in whipsnake habitat; limiting activities allowed in whipsnake habitat to hiking and horseback riding; and minimizing the number of trails in suitable habitat. Wildfire prevention measures such as fuel breaks or prescribed burns will be designed to minimize impacts on Alameda whipsnakes (see Conservation Measure 1.4.3 and associated appendix).

Management of chaparral/scrub (Conservation Measure 2.5.1) will be conducted to minimize impacts on Alameda whipsnake but still provide the diversity of successional stages that are likely necessary to support the species. Alameda whipsnakes require canopy gaps in which to thermoregulate; these gaps will be maintained within core habitat to the maximum extent practicable through management of this land cover type. The following additional measures are needed to achieve the biological goals and objectives for Alameda whipsnake.

Measure 3.8.1. Relocate Alameda Whipsnakes from Development Areas

Measure

To minimize mortality associated with development in suitable Alameda whipsnake habitat, whipsnakes will be captured and removed from construction areas using methods approved by USFWS by a USFWS-approved biologist. Alameda whipsnakes will be located and captured during preconstruction and construction monitoring surveys (Conservation Measures 1.2.3 and 1.2.4). Captured individuals will be released into suitable core habitat within preserves. Selection of relocation sites for Alameda whipsnakes captured from impact areas will be based on habitat quality, patch size, proximity to the impact area, and whether the relocation site is already occupied by whipsnakes. If Alameda whipsnake is encountered during any project activity, work will cease until the snake is removed and relocated by a USFWS-approved biologist.

Rationale

Under Impact Scenario 2, only up to 8 acres of modeled suitable core habitat could be affected by covered activities. Despite this low impact, dispersing Alameda whipsnakes could move through or temporarily occupy construction sites and be at risk of injury or mortality. Relocating Alameda whipsnakes from

development areas is expected to avoid or minimize construction-related take. However, the effectiveness of this technique is not well known. Alameda whipsnakes exhibit strong site fidelity and are known to return to capture sites from relocation sites over long distances (e.g., up to 0.5 mile) (Swaim pers. comm). Accordingly, the effectiveness of alternative relocation approaches will be evaluated as part of the Adaptive Management Plan.

Measure 3.8.2. Minimize Adverse Effects of Preserve Management on Alameda Whipsnakes

Measure

To minimize mortality that could result from preserve management activities that remove suitable Alameda whipsnake habitat (e.g., prescribed burning; see Conservation Measure 2.5.1), whipsnakes will be captured and removed from affected areas by a USFWS-approved biologist. Captured individuals will be released into suitable core habitat nearby within habitat Preserves. Selection of relocation sites for Alameda whipsnakes captured from impact areas will be based on guidelines outlined in measure 3.8.1. If an Alameda whipsnake is encountered during any management activity that could harm or harass it, work will cease in that location until the best course of action to avoid or minimize effects on the species is determined. Options include postponing activities until the whipsnake moves through the area (for a dispersing snake) or relocating the snake to another location. The need for relocation will be determined on a case-by-case basis. In determining whether relocation is warranted, the risk of harm to the individual from the management activity will be weighed against the risk to the individual from the relocation. As discussed in Construction Measure 3.8.1, the effectiveness of relocation and alternative approaches will be evaluated as part of the Adaptive Management Plan.

Rationale

Management activities will avoid and minimize impacts on covered species to the maximum extent practicable. Because of the rarity of Alameda whipsnake in the inventory area, management activities must be particularly sensitive to the needs of this species.

Giant Garter Snake

Some of the landscape-level and community-level conservation measures will benefit giant garter snake. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (Conservation Measures 1.1.1, 1.1.2, and 1.1.3). No records of giant garter snake have been documented within the inventory area. However, suitable habitat occurs in the slough areas and drainage network associated with agricultural fields in the northeast section of the County (U.S. Fish and Wildlife Service 1999); moreover, the lack of records from the inventory area may be due to a lack of survey efforts. Modeled foraging, movement, and core habitat occurs in agricultural lands in

Zone 6; modeled habitat also occurs north of Zone 6 outside of Acquisition Analysis Zones. However, the suitability of modeled habitat for giant garter snake has not been verified in the field. Giant garter snake occurrence and habitat suitability in these areas will be determined and mapped during planning surveys (Conservation Measure 1.2.1).

The Implementing Entity will acquire conservation easements on at least 6,250 acres of cropland or pasture within Zone 6. Some of these lands will include sloughs and ditches that may provide suitable habitat for giant garter snake. Because of the uncertainty in the habitat model for this species, the amount of suitable habitat for giant garter snake to be preserved is also uncertain. However, a higher priority for acquisition in Zone 6 will be given to lands supporting suitable habitat for giant garter snake.

Several preserve management measures will benefit giant garter snake. For example, Conservation Measures 1.4.2, 1.4.3, and 1.4.4 will enhance habitat for giant garter snake in preserves.

Measure 3.9.1 Avoid or Minimize Impacts on Giant Garter Snake Habitat

Measure

To the maximum extent practicable, impacts on giant garter snake habitat as a result of covered activities will be avoided. Buffers will be established adjacent to suitable giant garter snake habitat. Giant garter snake habitat is defined as suitable aquatic habitat (e.g., slough, ditch, or channel) and 200 feet of adjacent uplands, measured from the outer edge of each bank. The buffer will be at least 100 feet from the outer edge of giant garter snake upland habitat. Construction and other ground disturbances will be prohibited within established buffers.

If impacts on giant garter snake habitat as a result of covered activities cannot be avoided, the following measures will be implemented to minimize the effects on giant garter snakes. These measures are based on the USFWS's *Standard Avoidance and Minimization Measures during Construction Activities in Giant Garter Snake Habitat* (U.S. Fish and Wildlife Service 1999).

- To the maximum extent practicable, all covered activities that could disturb or remove giant garter snake habitat will be conducted between May 1 and October 1, the active period for giant garter snakes. Conducting covered activities during this period reduces direct impacts on the species because snakes are active and can avoid danger. If activities are necessary in giant garter snake habitat between October 2 and April 30, the USFWS Sacramento Office will be contacted to determine if additional measures are necessary to minimize and avoid take.
- Limit vegetation disturbance or removal within 200 feet of the banks of suitable aquatic habitat to the minimal area necessary.

- Confine the movement of heavy equipment within 200 feet of the banks of suitable aquatic habitat to existing roadways.
- After April 15, any dewatered habitat must remain dry for at least 15 consecutive days before workers excavate or fill the dewatered habitat.
- A USFWS-approved biologist will conduct a preconstruction survey no more than 24 hours before construction in suitable habitat, and will be on site during construction activities in potential aquatic and upland habitat. The biologist will provide USFWS with a field report form documenting the monitoring efforts within 24 hours of commencement of construction activities. The monitor will be available thereafter. If a snake is encountered during construction activities, the monitor will have the authority to stop construction activities until appropriate corrective measures have been completed or it is determined that the snake will not be harmed. Giant garter snakes encountered during construction activities should be allowed to move away from the construction area on their own. Only personnel with a USFWS recovery permit pursuant to Section 10(a)(1)(A) of the Endangered Species Act will have the authority to capture and/or relocate giant garter snakes that are encountered in the construction area. The project area will be reinspected whenever a lapse in construction activity of 2 weeks or more has occurred.
- Construction personnel will participate in a USFWS-approved worker environmental awareness program. A qualified biologist approved by USFWS will inform all construction personnel about the life history of giant garter snakes; the importance of irrigation canals, marshes/wetlands, and seasonally flooded areas such as rice fields to giant garter snakes; and the terms and conditions of the Implementing Agreement.
- To ensure that construction equipment and personnel do not affect nearby aquatic habitat for giant garter snake outside of construction areas, erect orange barrier fencing to clearly define the aquatic habitat to be avoided; restrict working areas, spoils, and equipment storage and other project activities to areas outside of aquatic or wetland habitat; and maintain water quality and limit construction runoff into wetland areas through the use of hay bales, filter fences, vegetation buffer strips, or other appropriate methods.

Measure 3.9.2 Compensate for Impacts on Giant Garter Snake Habitat

Measure

If impacts on giant garter snake habitat as a result of covered activities cannot be avoided (Conservation Measure 3.9.1), compensation for temporary and permanent losses of suitable habitat will be achieved using the standard USFWS compensation formula as specified in the USFWS guidelines (U.S. Fish and Wildlife Service 1999). Replacement ratios vary from 1:1 to 3:1, depending on the duration of the impact (i.e., number of seasons the site is affected by

construction); whether the habitat affected is aquatic or upland; and whether the impact is temporary or permanent. There are two options for implementing this compensation requirement: (1) by selecting, acquiring, and managing in perpetuity a local mitigation site that is approved by USFWS for the sole purpose of compensating project impacts on giant garter snake, or (2) by participating in a local USFWS-approved mitigation bank. The bank will develop a compensation cost using the USFWS guidelines and their long-term management costs. If a local mitigation site is selected, the site will be incorporated into the HCP/NCCP Preserve System and managed by the Implementing Entity to support or enhance habitat for giant garter snake. *[Note to reader: the funding mechanism for this conservation measure has not been developed yet. Funding may come solely from project proponents that affect occupied impact giant garter snake habitat, because this impact would occur infrequently and perhaps not at all. Whatever the source, funding must address both land acquisition and long-term management costs.]*

California Tiger Salamander

Many of the landscape-level and community-level conservation measures are designed specifically to benefit California tiger salamander. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.1.1 and 1.1.3). The Preserve System will protect 27–38 acres of potential breeding habitat, including most of the ponds in Subzone 2c (Conservation Measure 1.3.1); this Subzone has a particularly dense concentration of unprotected ponds. In addition, the conservation strategy will protect 24,479–33,282 acres of migration/aestivation habitat (Table 6-18). Planning surveys (Conservation Measure 1.2.1) will be conducted to confirm habitat suitability and identify habitat occupied by California tiger salamanders in potential preserve lands; results of these surveys will be used to guide acquisition of occupied habitat to the maximum extent practicable.

Acquisition of all wetlands, ponds, and streams will be determined in the field prior to impacts and land acquisition in accordance with Conservation Measure 1.2.6. To mitigate impacts on these aquatic habitat types, the Implementing Entity will acquire aquatic habitats in-kind within preserves at the ratios in Table 6-5. Many of the acquired ponds are expected to be suitable habitat for California tiger salamander. Mitigation will also include creation, restoration, or enhancement of aquatic land cover types as described in Conservation Measures 2.2.1 and 2.2.2. Creation, restoration, and enhancement will be designed to support the life history requirements of covered aquatic species, including California tiger salamander. In order to contribute to the recovery of covered aquatic species, the Implementing Entity will also create or restore key aquatic land cover types within preserves above and beyond the compensation requirements. These requirements are also described in Measure 2.1.1.

Because California tiger salamanders require habitat complexes that include both suitable breeding and upland habitat, areas preserved to achieve the biological goals and objectives for tiger salamander will include both elements. For example, preservation, restoration, creation, or enhancement of wetlands or ponds to compensate for loss of breeding habitat will occur adjacent to suitable and accessible upland habitat that will also be protected. Likewise, upland habitat targeted for tiger salamander conservation must occur adjacent to a protected suitable breeding site.

A network of core preserves will protect large blocks of aestivation/migration habitat. New linkages at least 0.5 mile wide will be created in blocks of suitable habitat to facilitate dispersal and colonization throughout the preserve system, colonization of the inventory area from adjacent areas, and dispersal from within to outside the inventory area. New preserves will be established adjacent to or near and linked to existing protected land. This approach will result in large areas of contiguous habitat and the potential to maintain contiguous wetland-upland complexes. Because the viability of California tiger salamander populations is likely sensitive to the extent and quality of habitat and connectivity among aquatic breeding sites, large areas of contiguous habitat provide greater opportunities to meet the conservation objectives for this species.

Several preserve management measures were designed to benefit California tiger salamander. For example, Conservation Measures 1.3.2, 1.3.3, 1.4.1, 2.1.1, 2.2.1, 2.2.2, 2.2.5, 2.3.1, and 2.3.2 will enhance habitat quality for California tiger salamander in Preserves.

The landscape-level and community-level conservation measures described above will achieve the biological goals and objectives for the California tiger salamander, with one exception. Conservation Measure 3.10.1 is necessary to help minimize impacts on this species from covered activities.

Measure 3.10.1. Remove California Tiger Salamanders From Impact Areas

Preconstruction surveys using CDFG survey protocols for California tiger salamander (California Department of Fish and Game 1997) will be conducted in suitable habitat that could be affected by construction-related activities. [*Note to reader: the CDFG protocol requires 2 years of surveys; this protocol may be modified in the context of this HCP/NCCP*] To minimize direct mortality associated with implementing covered activities in occupied habitat, California tiger salamander egg masses, larvae, juveniles, and adults will be captured and removed from construction areas by qualified biologists using hand-capture, seine, and dip net methods.

Selection of relocation sites for California tiger salamanders captured from impact areas will be based on the availability of relocation sites when the

construction impacts occur. Relocation sites will be selected based on the prioritized criteria listed below.

1. Where projects will affect a small portion of an occupied pond, construct a barrier excluding California tiger salamanders from the work area and release captured salamanders into the unaffected portion of the pond.
2. If habitat is not available for release of California tiger salamanders immediately adjacent to project sites as described above, identify suitable (e.g., no predators, surface water is present throughout the breeding period in most years) unoccupied existing ponds or ponds to be created in the Preserve System.
3. If all available suitable habitat for relocation of California tiger salamanders is occupied, coordinate with USFWS/CDFG to identify options for relocation. For example, develop criteria in coordination with USFWS/CDFG for identifying occupied habitats where release of California tiger salamanders would minimize potential for adverse effects on salamanders existing at release sites, or seek opportunities for establishing new populations in unoccupied habitat within the species' historical range to assist with rangewide recovery of the species.

The effectiveness of California tiger salamander capture-relocation has not been well studied. The Adaptive Management Program will include studies to assess the effects of relocation. If the measure does not appear to be effective, or if the measure is found to be detrimental to existing subpopulations, then it will be discontinued.

Rationale

Where covered activities cannot avoid occupied habitat, the only available method to minimize the likelihood for mortality of individuals is to capture, remove, and relocate individuals from project sites. Although the long-term success of relocating California tiger salamanders is not well known, effective capture, transport, and release techniques have been used in the Los Vaqueros Watershed.

California Red-Legged Frog

Many of the landscape-level and community-level conservation measures are designed specifically to benefit and contribute to the recovery of California red-legged frog. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.1.1 and 1.1.3). The Preserve System will protect 27–38 acres of potential breeding habitat, including at least seven of the 13 ponds in Subzone 2c (see Conservation Measure 1.3.1); this Subzone has a particularly dense concentration of unprotected ponds. In addition, the Preserve System will also protect 27,925–38,803 acres of migration/aestivation habitat (Table 6-18). Planning surveys (see Conservation Measure 1.2.1) will be conducted to confirm habitat suitability and

identify habitat occupied by California red-legged frog in potential preserve lands; results of these surveys will be used to guide acquisition of preserves to include occupied habitat to the maximum extent practicable.

Acquisition of all wetlands, ponds, and streams will be determined in the field prior to impacts and land acquisition in accordance with Conservation Measure 1.2.6. To mitigate impacts on these aquatic habitat types, the Implementing Entity will acquire aquatic habitats in-kind within preserves at the ratios in Table 6-5. Many of the acquired ponds are expected to be suitable habitat for California red-legged frog. Mitigation will also include creation, restoration, or enhancement of aquatic land cover types as described in Conservation Measures 2.2.1 and 2.2.2. Creation, restoration, and enhancement will be designed to support the life history requirements of covered aquatic species, including California red-legged frog. In order to contribute to the recovery of covered aquatic species, the Implementing Entity will also create or restore key aquatic land cover types within preserves above and beyond the compensation requirements. These requirements are also described in Measure 2.1.1.

Because red-legged frogs require habitat complexes that include both suitable breeding and upland habitat, areas preserved to achieve the biological goals and objectives for California red-legged frog will include both elements. For example, preservation, restoration, creation, or enhancement of wetlands or ponds to compensate for loss of breeding habitat will occur adjacent to suitable and accessible upland habitat that will also be protected. Likewise, upland habitat targeted for red-legged frog conservation must occur adjacent to a protected suitable breeding site.

A network of core preserves will protect large blocks of aestivation/migration habitat. New linkages at least 0.5-mile wide will be created in blocks of suitable habitat to facilitate dispersal and colonization throughout the Preserve System in Zones 2 and 5, colonization of the inventory area from adjacent areas, and dispersal from within to outside the inventory area. New preserves will be established adjacent to or near and linked to existing protected land. This approach will result in large areas of contiguous habitat and the potential to maintain contiguous wetland-upland complexes. Because the viability of California red-legged frog populations is likely sensitive to the extent and quality of habitat and connectivity among aquatic breeding sites, large areas of contiguous habitat will better meet the biological objectives for this species.

Several Preserve management measures were designed to benefit California red-legged frog. For example, Conservation Measures 1.3.2, 1.3.3, 1.4.1, 2.1.1., 2.2.1, 2.2.2, 2.2.5, 2.3.1, and 2.3.2 will enhance habitat quality for California red-legged frog in Preserves.

The landscape-level and community-level conservation measures described above will achieve the biological goals and objectives for the California red-legged frog, with one exception. Conservation Measure 3.11.1 is necessary to help minimize impacts on this species from covered activities.

Measure 3.11.1. Remove California Red-Legged Frogs From Impact Areas

Preconstruction surveys using USFWS survey protocols for California red-legged frog will be conducted in suitable habitat that could be affected by construction-related activities. To minimize direct mortality associated with implementing covered activities in occupied habitat, California red-legged frog egg masses, larvae, juveniles, and adults will be captured and removed from construction areas using hand-capture, seine, and dip net methods. Red-legged frogs will be located and captured during daytime or night-time spotlighting surveys. Only qualified biologists with a USFWS recovery permit pursuant to section 10(a)1(A) of the Endangered Species Act will have the authority to capture and/or relocate red-legged frogs that are encountered in the construction area.

Selection of relocation sites for red-legged frogs captured from impact areas will be based on the availability of relocation sites when the construction impacts occur. Relocation sites will be selected based on the prioritized criteria listed below.

1. Where projects will affect occupied stream corridors and suitable habitat is present upstream and downstream of the affected reach, construct barriers upstream and downstream of the work area to exclude red-legged frogs from the impact area. Red-legged frogs removed from the work area will be released upstream or downstream of the barriers in locations that support suitable pools.
2. Where projects will affect a small portion of an occupied pond, construct a barrier excluding red-legged frogs from the work area and release captured red-legged frogs into the unaffected portion of the pond.
3. If habitat is not available for release of red-legged frogs immediately adjacent to project sites as described above, identify suitable (e.g., no predators, surface water is present throughout the breeding period in most years) unoccupied existing ponds or ponds created in preserves under Conservation Measures 2.1.1 and 2.1.3.
4. If all available suitable habitat for relocation of red-legged frogs is occupied, coordinate with USFWS to identify options for relocation, such as developing criteria for identifying occupied habitats for release of red-legged frogs that minimizes potential for adverse effects on red-legged frogs existing at release sites or seeking opportunities for establishing new populations in unoccupied habitat within the species' historical range to assist with rangewide recovery.

The effectiveness of California red-legged frog capture-relocation has not been well studied. The Adaptive Management Program will include studies to assess the effects of relocation. If the measure does not appear to be effective, or if the measure is found to be detrimental to existing subpopulations, then it will be discontinued.

Rationale

Where covered activities cannot avoid occupied habitat, the only available method to minimize the likelihood for mortality of individuals is to capture, remove, and relocate individuals from project sites. Although the long-term success of relocating red-legged frogs is not well known, effective capture, transport, and release techniques are well established (Contra Costa Water District 2002).

Foothill Yellow-Legged Frog

The landscape-level and community-level conservation measures will benefit foothill yellow-legged frog and achieve the biological goals and objectives for this species. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.1.1 and 1.1.3). Planning surveys (see Measure 1.2.1) will be conducted to assess habitat suitability and identify habitat occupied by foothill yellow-legged frog in potential preserve lands; results of these surveys will be used to guide acquisition of preserves to include occupied habitat to the maximum extent practicable.

Preservation of streams will be accomplished according to stream type. Impacts on perennial streams, including suitable foothill yellow-legged frog habitat, will be mitigated at a preservation ratio of 2:1. Mitigation will also entail stream restoration. Stream restoration will be attempted through the restoration of existing streams (e.g., creating meanders in channelized streams, removing concrete lining) but may be accomplished out-of-kind. Restoration compliance for impacts on perennial streams can be accomplished through enhancement of riparian woodland/scrub; such restoration will be designed to support the life history requirements of covered aquatic species, including foothill yellow-legged frog. In all cases, the Implementing Entity will restore more streams than strictly required for mitigation in order to enhance habitat for and prevent the future listing of foothill yellow-legged frog. Importantly, land acquisition in Zone 4 will be focused along Marsh Creek, especially in the upper reaches, where modeled suitable breeding and dispersal habitat for yellow-legged frog is present. As much as possible of the creek bed and an adequate buffer zone will be acquired. The buffer zone acquired will be consistent with the requirements in Conservation Measure 1.2.3.

Several preserve management measures will benefit foothill yellow-legged frog. For example, Conservation Measures 1.3.3, 1.4.1, 1.4.2, 1.4.3, 2.1.1, 2.2.3, and 2.2.4 will enhance habitat for foothill yellow-legged frogs in preserves.

Longhorn Fairy Shrimp

Note to reader: Analysis and conservation measures to come for this species.

Vernal Pool Fairy Shrimp

Note to reader: Analysis and conservation measures to come for this species.

Midvalley Fairy Shrimp

Note to reader: Analysis and conservation measures to come for this species.

Vernal Pool Fairy Shrimp

Note to reader: Analysis and conservation measures to come for this species.

Measures for Multiple Plant Species

The following Conservation Measures apply to all plant species or to subsets of plant species. Species-specific Conservation Measures are listed after these general plant measures.

Measure 3.17.1. Plant Salvage when Impacts are Unavoidable

Measure for Perennial Covered Plants

Where impacts on covered plant species cannot be avoided and plants will be removed by approved covered activities, salvage actions will be conducted. Salvage methods for perennial species will be tested for whole individuals, cuttings, and seeds. Salvage measures will include the evaluation of techniques for transplanting or germinating seed in garden or greenhouse and then transplanting to suitable habitat sites in the field. Techniques will be tested for each species, and appropriate methods will be identified through research and adaptive management. Where plants are transplanted or seeds distributed to the field they will be located in preserves in suitable habitat to establish new populations. Field trials will be conducted to evaluate the efficacy of different methods and determine the best methods to establish new populations. New populations will be located such that they constitute separate populations and do not become part of an existing population of the species, as measured by the potential for genetic exchange among individuals through pollen or propagule (e.g., seed, fruit) dispersal. Transplanting within the preserves will only minimally disturb existing native vegetation and soils. Supplemental watering may be provided as necessary to increase the chances of successful establishment, but must be removed following initial population establishment. See also *Measures for All Covered Plants* below.

Measure for Annual Covered Plants

Where impacts on covered annual plant species cannot be avoided and plants will be removed by approved covered activities, salvage actions will be conducted. Mature seeds will be collected from all individuals for which impacts cannot be avoided (or if the population is large, a representative sample of individuals). If storage is necessary, seed storage studies will be conducted to determine the best storage techniques for each species. If needed, studies will be conducted on seed germinated and plants grown to maturity in garden or greenhouse to propagate larger numbers of seed. Seed propagation methods will ensure that genetic variation is not substantially affected by propagation (e.g., selection for plants best adapted to cultivated conditions). Field studies will be conducted through the Adaptive Management Program to determine the efficacy and best approach to dispersal of seed into suitable habitat. Where seeds are distributed to the field, they will be located in preserves in suitable habitat to establish new populations. New populations will be located such that they constitute separate populations and do not become part of an existing population of the species, as measured by the potential for genetic exchange among individuals through pollen or propagule (e.g., seed, fruit) dispersal. See also *Measures for All Covered Plants* below.

Measures for All Covered Plants

Investigations may be conducted into the efficacy of salvaging seeds from the soil seed bank for both perennial and annual species. The soil seed bank may add to the genetic variability of the population. Covered species may be separated from the soil through garden/greenhouse germination or other appropriate means. Topsoil taken from impact sites will not be distributed into preserves because of the risk of spreading new nonnative and invasive plants to preserves. Transplanting or seeding “receptor” sites (i.e., suitable habitat to establish a new population) should be carefully selected based on physical, biological, and logistical considerations (Fiedler and Laven 1996), such as:

- soil type;
- soil moisture ;
- topographic position, including slope and aspect;
- site hydrology;
- mycorrhizal associates (e.g., this may be important for Mount Diablo manzanita);
- presence or absence of typical associated plant species;
- presence or absence of herbivores or plant competitors; and
- site accessibility for establishment, monitoring, and protection from recreation.

Rationale

- For most rare plant species, transplanting efforts have a high failure rate in California (Howald 1996). Transplanting or seeding to establish new populations is a last resort where the loss of covered plant populations is

unavoidable. For all species, transplanting and seeding serve as experimental techniques that are an additional mitigation measure, beyond bringing existing populations of the species under protection within new preserves (see Conservation Measures 1.2.2 and 1.3.1).

- Transplanting and seeding should be used when studies and test trials have shown that the effort has a reasonable chance for success and that the new population can provide a substantial benefit to the species as a whole.

Measure 3.17.2. Conduct Experimental Management to Enhance Covered Plant Populations

Measure

The Implementing Entity will initiate a program within the Preserve System to experiment with different management techniques to benefit covered plants; this program will be conducted as part of the Adaptive Management Program. A pilot study will be designed and implemented for each covered plant to determine the best methods to enhance its populations. Management techniques will be selected for application and manipulation based on the ecological requirements of the species and hypotheses about which ecological factors may be most important to the species. For example, conceptual ecological models could be developed for each species to identify mechanisms of effects, potential positive or negative effects of management techniques on each plant life stage, and gaps in current knowledge (Elzinga et al. 1998). All of these factors will help guide the design of the pilot studies.

Pilot studies will only be carried out on relatively large populations (e.g., > 1,000 individuals), and treatments will be applied to only a portion of those populations to minimize the potential adverse effects of the treatments. The results of these pilot studies will be used to alter preserve management and enhance populations of covered plants. In addition, these pilot studies will help identify gaps in the existing knowledge of the ecology of covered plants. The Preserve Manager will work with local colleges and universities to encourage students and professors to conduct research on preserve lands to fill these data gaps.

It is expected that livestock grazing will be an important management tool in these pilot studies. Conservation Measure 3.17.3 below describes special considerations for the use of this management technique.

Rationale

- Several objectives of this HCP/NCCP state that populations of covered plants within HCP/NCCP Preserves will be enhanced to increase the long-term probability of survival of these species and help to prevent their listing.
- As described in the species profiles, there are large gaps in the existing knowledge of the ecological requirements of covered plants. Furthermore, the effects of most proposed management techniques on these species is also unknown.

- Experimentation is required to determine the best techniques to enhance covered plants within preserves. Alternatively, results may indicate that covered plant populations are relatively stable and enhancement measures are not needed or not effective.
- Creating new populations of rare plants in an experimental setting is very time consuming and expensive (e.g., Pavlik et al. 1993). Well-designed pilot studies of existing populations of covered plants may yield results more quickly and more cost effectively than creating a new population, but limits must be placed on these pilot studies to minimize adverse effects.

Measure 3.17.3. Determine the Benefits of Livestock Enclosures for Herbaceous Covered Plant Species

Measure

To determine the grazing regime most beneficial to herbaceous covered plant species, livestock grazing will be manipulated and evaluated as part of the Adaptive Management Program. Livestock enclosures will be established around populations of herbaceous covered plants within preserves. The purpose of these enclosures is to: (1) evaluate the effect of livestock grazing on the growth and reproduction of herbaceous covered plants, and (2) provide temporary protection for those species found to be adversely affected by grazing. In each population, a portion of the population will be left accessible to livestock to provide a comparison with the portion of the population within the enclosure. Protocols for establishing enclosures, monitoring plants within them, and analyzing the data will be developed during HCP/NCCP implementation. If it is found that the current grazing regime is adversely affecting the covered plant, the grazing regime will be modified or the enclosure will be expanded to permanently exclude livestock around the covered plant population. If it is found that grazing has beneficial effects on the covered plant, the grazing regime will continue unchanged and the enclosure will be removed.

Because the grazing program is intended to achieve many goals (e.g., fire hazard reduction, enhancement of native biological diversity, enhancement of covered wildlife and plants), it may not be possible to maximize the benefits of grazing (or lack of grazing) for covered plants and still meet the other goals of the grazing program. The results of the livestock enclosure experiments will have to be evaluated in light of the other goals of the program. The grazing program should be adjusted to maximize the benefits to covered plants while not substantially reducing the ability of the grazing program to meet other goals. For example, if it is found that excluding grazing from a covered plant population has dramatic positive effects on this population, and the population is relatively small in geographic extent, then the benefits of the livestock enclosure for the covered plant may outweigh the benefits of grazing for fuel hazard reduction and control of exotic plants.

Rationale

- In 1991, Jones & Stokes biologists established five approximately 0.2-acre livestock exclosures in the Los Vaqueros Watershed to study the effects of grazing on alkali vegetation communities (Jones & Stokes 1992b). San Joaquin spearscale occurred in one of these exclosures in large enough densities to compare the population inside and outside the exclosure. Although the study was unreplicated, the results suggested that livestock grazing negatively affects the growth and reproduction of San Joaquin spearscale, at least in the short term (monitoring was conducted for two seasons). Other researchers on the same populations have noted similar effects (Bainbridge 1999, 2000).
- Brittscale is closely related, has similar morphology, and presumably has similar palatability to San Joaquin spearscale. Therefore, this species may also be negatively affected by grazing.
- The effects of livestock grazing on other herbaceous covered plants is largely unknown. Because livestock grazing will be one of the primary tools used to manage grassland vegetation communities, it is important to determine the effects of grazing on these herbaceous covered plants so that the grazing program can be adjusted to benefit these species.

Mount Diablo Manzanita

Many of the landscape-level and community-level conservation measures will directly benefit Mount Diablo manzanita. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.2.2 and 3.17.1). No impacts on known occurrences² of Mount Diablo manzanita are expected to result from covered activities. However, if a new population³ is found that is expected to be removed by covered activities, Conservation Measure 1.2.2 ensures that a population as healthy or healthier⁴ than the one proposed for removal will be protected within HCP/NCCP preserves. The two known occurrences of Mount Diablo manzanita in the inventory area outside of public lands will be protected by the Preserve System (Table 6-18) (see Conservation Measure 1.3.1). Moreover, between 547 and 747 acres of the modeled species range⁵ for Mount Diablo manzanita will be

² A plant occurrence is defined in the same way as an “element occurrence” is defined by CDFG: a location record of a plant in the CNDDDB that is a population or group of populations within 0.25 mile and not separated by significant habitat discontinuities.

³ A population is defined as a group of individuals that are separated biologically from other groups of individuals by topographic barriers, habitat barriers, or other important ecological features. Populations may be less than 0.25 mile apart, so they may or may not be the same as an occurrence. Known occurrences can be evaluated in the field as to whether they constitute one or more populations.

⁴ See Conservation Measure 1.1.2 for definition of a “healthy” population.

⁵ For covered plants, the species distribution models represent the potential range of the species within the inventory area, not necessarily the amount of suitable habitat present. Plants, especially rare plants, tend to occur in distinctive

protected within the Preserve System (Table 6-20). This protected species range represents between 59% and 81%, respectively, of the remaining species range that is available for preservation (Table 6-20).

Management of HCP/NCCP preserves will also benefit Mount Diablo manzanita. Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within preserves. For example, visitors to parks within the East Bay Regional Park District system illegally harvest branches of manzanitas for decorative purposes (Olson pers. comm.). Public access to known populations of Mount Diablo manzanita within Preserves will be controlled to avoid such illegal collection. Vegetation management actions (see Conservation Measures 1.4.3 and 2.5.1) will ensure that the condition of the chaparral vegetation community that supports Mount Diablo manzanita will be maintained. Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measure 3.17.2).

All the biological goals and objectives for Mount Diablo manzanita are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Brittlescale

Many of the landscape-level and community-level conservation measures will directly benefit brittlescale. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.2.2 and 3.17.1). Impacts on one known population of brittlescale are expected from covered activities. Conservation Measure 1.2.2 ensures that populations as healthy or healthier than the populations removed will be protected within HCP/NCCP preserves. Four of the five known occurrences of brittlescale in the inventory area that are presently not in protected lands will be brought under protection by the Preserve System (Table 6-18) (see Conservation Measure 1.3.1). In addition, between 676 and 767 acres of the modeled species range for brittlescale will be protected within the Preserve System (Table 6-20). This protected species range represents between 72% and 81%, respectively, of the species range that is available for preservation (Table 6-20).

Management of HCP/NCCP preserves will benefit brittlescale. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within preserves. Vegetation management and enhancement within alkali grassland (Conservation Measures 2.1.1 and 2.3.1) and alkali wetlands (Conservation Measures 2.1.1, 2.2.1, and 2.2.2) will benefit

microhabitats (e.g., slope, aspect, plant association, soil type) that cannot be mapped at a regional scale. These variables were not incorporated into the species distribution models, so the models should be viewed as an estimate of the plant species' potential range in the inventory area within which suitable habitat and plant populations would likely be found.

brittlescale by maintaining or enhancing suitable habitat for this species. Up to 12 acres of alkali wetlands will be restored within preserves (Table 6-16). One objective of alkali wetland restoration is to provide additional suitable habitat for brittlescale (e.g., in alkali meadows). Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for brittlescale are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

San Joaquin Spearscale

Many of the landscape-level and community-level conservation measures will directly benefit San Joaquin spearscale. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.2.2 and 3.17.1). The only known population of San Joaquin spearscale outside of public lands was recently found in Antioch during development of the Sand Creek Specific Plan (Mundie & Associates and City of Antioch 2002). This population may be extirpated by covered activities; however, Conservation Measure 1.2.2 ensures that populations as healthy or healthier than populations lost will be protected within HCP/NCCP preserves. All 31 known occurrences of this species are within the Los Vaqueros Watershed. Although rare in California, the species is relatively common in the Los Vaqueros Watershed, where extensive surveys have been conducted (Jones & Stokes Associates 1989). It is expected that other populations will be found within the inventory area, particularly on alkali soils in Zone 5.

No species distribution model was developed for this species because of the difficulty in predicting its occurrence relative to conditions that could be mapped at a regional scale. This species often co-occurs with brittlescale, so it is anticipated that protection of suitable habitat for the species will be largely coincidental with protection of habitat suitable to support brittlescale.

Management of HCP/NCCP preserves will benefit San Joaquin spearscale. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within preserves. Vegetation management and enhancement within alkali grassland (Conservation Measures 2.1.1, 2.3.1) and alkali wetlands (Conservation Measures 2.1.1, 2.2.1, 2.2.2) will benefit San Joaquin spearscale by maintaining or enhancing suitable habitat for this species. Up to 12 acres of alkali wetlands will be restored within preserves (Table 6-16). One objective of alkali wetland protection is to provide additional suitable habitat for San Joaquin spearscale (e.g., in alkali meadows). Experimental management techniques will be applied to populations of this species within preserves to

determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for San Joaquin spearscale are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Big Tarplant

Many of the landscape-level and community-level conservation measures will directly benefit big tarplant. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.2.2 and 3.17.1). One population of big tarplant is expected to be lost to covered activities. However, five of the six known occurrences of big tarplant in the inventory area outside of public lands will be protected by the Preserve System (Table 6-19) (see Conservation Measure 1.3.1). Measure 1.2.2 ensures that at least one of these five populations will be as healthy as or healthier than the lost population. In addition, between 16,373 and 22,043 acres of the modeled species range will be protected within the Preserve System (Table 6-20). This protected species range represents between 51% and 69%, respectively, of the species range available for preservation (Table 6-20).

Management of HCP/NCCP Preserves will benefit big tarplant. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within preserves. Vegetation management and enhancement within native grassland (Conservation Measures 2.1.1, 2.3.1) and oak savanna/woodland (Conservation Measures 2.1.1, 2.4.2) will benefit big tarplant by maintaining or enhancing suitable habitat for this species. Up to 202 acres of oak savanna will be restored within preserves (Table 6-16) (Conservation Measure 2.4.3). One objective of oak savanna/woodland protection is to provide additional suitable habitat for big tarplant. Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for big tarplant are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Mount Diablo Fairy Lantern

Many of the landscape-level and community-level conservation measures will directly benefit Mount Diablo fairy lantern. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized

(see Conservation Measures 1.2.2 and 3.17.1). No known populations of Mount Diablo fairy lantern are expected to be lost to covered activities. The one known occurrence of Mount Diablo fairy lantern in the inventory area outside of public lands will be protected by the Preserve System, if this occurrence is still extant (Table 6-19) (see Conservation Measure 1.3.1). If this population, in Subzone 4b, has been extirpated, Conservation Measure 1.2.2 will ensure that no other population will be removed until a new, high-quality population is found within the preserves. Moreover, between 12,744 and 17,455 acres of the modeled species range will be protected within the Preserve System (Table 6-20). This protected species range represents between 52% and 71%, respectively, of the species range available for preservation (Table 6-20).

Management of HCP/NCCP preserves will benefit Mount Diablo fairy lantern. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within preserves. Vegetation management and enhancement within native grassland (Conservation Measures 2.1.1, 2.3.1), oak savanna/woodland (Conservation Measures 2.1.1, 2.4.2), and chaparral (Conservation Measures 2.1.1, 2.5.1) will benefit Mount Diablo fairy lantern by maintaining or enhancing suitable habitat for this species. Up to 202 acres of oak savanna will be restored within preserves (Table 6-16) (see Conservation Measure 2.4.3). One objective of oak savanna restoration is to provide additional suitable habitat for Mount Diablo fairy lantern. Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for Mount Diablo fairy lantern are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Recurved Larkspur

Many of the landscape-level and community-level conservation measures will directly benefit recurved larkspur. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.2.2 and 3.17.1). Impacts on one known population of recurved larkspur are expected from covered activities. Measure 1.2.2 ensures that a population as healthy or healthier than the population removed will be protected within HCP/NCCP preserves. Two of the three known occurrences of recurved larkspur in the inventory area outside of public lands will be brought under protection by the Preserve System (Table 6-19) (see Conservation Measure 1.3.1). Moreover, between 983 and 1,119 acres of the modeled range for this species will be protected within the Preserve System (Table 6-20). This protected species range represents between 69% and 78%, respectively, of the species range available for preservation (Table 6-20).

Management of HCP/NCCP Preserves will benefit recurved larkspur. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within Preserves. Vegetation management and enhancement within alkali grassland (Conservation Measures 2.1.1, 2.3.1) and alkali wetlands (Conservation Measures 2.1.1, 2.2.1, 2.2.2) will benefit recurved larkspur by maintaining or enhancing suitable habitat for this species. Up to 12 acres of alkali wetlands will be restored within Preserves (see Table 6-16). One objective of alkali wetland restoration is to provide additional suitable habitat for recurved larkspur (e.g., in alkali meadows). Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for recurved larkspur are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Diablo Helianthella

Many of the landscape-level and community-level conservation measures will directly benefit Diablo helianthella. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.2.2 and 3.17.1). No impacts on known populations of Diablo helianthella are expected from covered activities. However, Conservation Measure 1.2.2 ensures that if a population is discovered within impact areas, a population as healthy or healthier than that removed will be protected within HCP/NCCP preserves. Both of the known occurrences of Diablo helianthella in the inventory area outside of public lands will be brought under protection by the Preserve System (Table 6-19) (see Conservation Measure 1.3.1). Moreover, between 7,590 and 10,745 acres of the modeled range for this species will be protected within the Preserve System (Table 6-20). This modeled species range represents between 50% and 70%, respectively, of the species range available for preservation (Table 6-20).

Management of HCP/NCCP preserves will benefit Diablo helianthella. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within preserves. Vegetation management and enhancement within oak savanna/woodland (Conservation Measures 2.1.1, 2.4.2) and chaparral (Conservation Measures 2.1.1, 2.5.1) will benefit Diablo helianthella by maintaining or enhancing suitable habitat for this species. Up to 202 acres of oak savanna will be restored within preserves (Table 6-16) (see Conservation Measure 2.4.3). One objective of oak savanna restoration is to provide additional suitable habitat for Diablo helianthella. Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for Diablo helianthella are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Brewer's Dwarf Flax

Many of the landscape-level and community-level conservation measures will directly benefit Brewer's dwarf flax. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see Conservation Measures 1.2.2 and 3.17.1). No impacts on known populations of Brewer's dwarf flax are expected from covered activities (Table 6-19). However, Conservation Measure 1.2.2 ensures that if a population is discovered within impact areas, a population as healthy or healthier than that removed will be protected within HCP/NCCP Preserves. All of the three known occurrences of Brewer's dwarf flax in the inventory area outside of public lands will be brought under protection by the Preserve System (Table 6-19) (see Conservation Measure 1.3.1). Between 9,981 and 14,026 acres of the modeled range for this species will be protected within the Preserve System (Table 6-20). This protected species range represents between 50% and 71%, respectively of the species range available for preservation (Table 6-20).

Management of HCP/NCCP Preserves will also benefit Brewer's dwarf flax. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within Preserves. Vegetation management and enhancement within native grassland (Conservation Measures 2.1.1, 2.3.1), oak savanna/woodland (Conservation Measures 2.1.1, 2.4.2), and chaparral (Conservation Measures 2.1.1, 2.5.1) will benefit Brewer's dwarf flax by maintaining or enhancing suitable habitat for this species. Up to 202 acres of oak savanna will be restored within preserves (Table 6-16) (see Conservation Measure 2.4.3). One objective of oak savanna restoration is to provide additional suitable habitat for Brewer's dwarf flax. Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for Brewer's dwarf flax are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Showy Madia

Many of the landscape-level and community-level conservation measures will directly benefit showy madia. Development conditions will ensure that impacts on this species from covered activities are avoided or minimized (see

Conservation Measures 1.2.2 and 3.17.1). No populations of this species are known from the inventory area. A historic record of showy madia in Antioch was not relocated during recent surveys (Mundie & Associates and City of Antioch 2002). Until more populations are found and protected in HCP/NCCP preserves (see Conservation Measure 1.2.2), no impacts on this species will be allowed. No species distribution model was developed for showy madia because of the difficulty in predicting its occurrence relative to conditions that could be mapped at a regional scale.

If populations of showy madia are found within preserves, management of these preserves will benefit this species. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within preserves. Vegetation management and enhancement within native grassland (Conservation Measures 2.1.1, 2.3.1) and oak savanna (Conservation Measures 2.1.1, 2.4.2) may also benefit showy madia by maintaining or enhancing potential suitable habitat for this species. Up to 202 acres of oak savanna will be restored within preserves (Table 6-16) (see Conservation Measure 2.4.3). One objective of oak savanna restoration is to provide additional suitable habitat for showy madia. Experimental management techniques will be applied to populations of this species within preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for showy madia are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Adobe Navarretia

Many of the landscape-level and community-level conservation measures will directly benefit adobe navarretia. The only known records of this species in the inventory area are two historic collections in and near Antioch from 1888 and 1907 (Jepson Herbarium 2003). These populations are assumed to have been extirpated. Until these populations are relocated or more populations are found and protected in HCP/NCCP preserves, no impacts on this species will be allowed (see Conservation Measure 1.2.2). No species distribution model was developed for adobe navarretia because the suitable habitat of this species is poorly known.

If populations of adobe navarretia are found within preserves, management of the preserves will benefit this species. For example, Conservation Measures 1.4.1 and 1.4.2 ensure that exotic plants and recreational use will be controlled within Preserves. Vegetation management and enhancement within native grassland (Conservation Measures 2.1.1, 2.3.1) may benefit adobe navarretia by maintaining or enhancing potential suitable habitat for this species. Experimental management techniques will be applied to populations of this species within

preserves to determine the best means to enhance population health and viability (see Conservation Measures 3.17.2 and 3.17.3).

All the biological goals and objectives for adobe navarretia are addressed through landscape-level measures, community-level measures, and measures that apply to all covered plants. No additional species-specific measures are required to meet the species goals and objectives.

Alternative Conservation Strategies

This section presents outlines of two alternative conservation strategies to assist the HCPA in choosing a preferred alternative. This section will be revised and expanded to become the alternatives chapter of the HCP/NCCP. Alternatives in an HCP can vary in several ways. Alternatives can vary in the extent of covered activities (e.g., acreage, type of activity); the location of these activities (i.e., the permit area); the type and level of conservation proposed to mitigate these activities; the type and level of conservation measures proposed to contribute to recovery of covered species and communities; and various combinations of these elements.

The alternative conservation strategies presented below vary the extent and location of proposed land acquisition. Alternative A describes an alternative design for the Preserve System under Impact Scenario 2 (All Nonprotected Areas Within ULL). Alternative B describes a Preserve System under Impact Scenario 1 (Development Designation in ULL). For a description of these impact scenarios and their assumptions, see the Preliminary Impact Analysis memorandum dated January 23, 2003. For both Alternatives, all other aspects of the conservation strategy (e.g., preserve management, conditions on development, avoidance and minimization measures) are the same as the proposed conservation strategy.

The final alternatives in the HCP/NCCP and the EIR/EIS may include the two alternative conservation strategies presented here or a variation on these alternatives. Similarly, the final proposed conservation strategy could be a combination of one of the alternatives and the current proposed strategy. Both documents will also include a description of the No Project/No Action Alternative. Under this alternative, it is assumed that no regional HCP/NCCP is approved and no regional ESA, NCCPA, or Section 404 permits issued. Under the No Project/No Action Alternative, development and other activities would continue in the inventory area as they have in the past with permits issued or denied on a project-by-project basis. The No Project/No Action Alternative will be evaluated in the EIR/EIS.

Alternative A

Design of Alternative A

Alternative A was designed to mitigate the impacts of Impact Scenario 2 and to create a Preserve System that meets the biological goals and objectives of the HCP/NCCP, including contributing to recovery of covered species. The preserve design under Alternative A differs substantially from the proposed preserve design.

A common practice in mitigation design is to conduct mitigation measures as close as possible to the impact area, preferably on site. This approach is based on the assumption that the resources closest to the impact area are most similar to the resources lost (or can be enhanced to be most similar). The underlying assumption is that wildlife displaced by a project will use nearby mitigation habitat that is similar to the habitat affected or removed by the project. This approach was followed more rigorously in developing Alternative A than in developing the proposed conservation strategy. Land acquisition requirements in Alternative A provide mitigation for impacts and contribute to recovery at sites closer to impact areas than those provided under the proposed conservation strategy.

Alternative A takes a different approach to preserving movement routes for San Joaquin kit fox in Zone 2 than does the proposed conservation strategy. In the proposed conservation strategy, two of the four potential movement routes would be protected (Figure 6-4), with a secondary and partial route protected through Horse Valley. In Alternative A, three of the four potential corridors are preserved to maintain the connection between Black Diamond Mines Regional Park and Los Vaqueros Watershed/Cowell Ranch State Park. This approach is based on the assumption that the Roddy Ranch Golf Course is a barrier to kit fox movement, and therefore that land acquisition is required on the north side of the golf course to maintain the northernmost movement route.

Summary of Alternative A

The extent of land acquisition required under Alternative A is the same as under the proposed conservation strategy (Table 6-21), with one exception. The requirement for preservation of chaparral is reduced by 200 acres (36%) to account for the shift in acquisition away from Subzones with the most chaparral/scrub land cover (Figure 6-6). Alternative A focuses land acquisition in Zones and Subzones closest to the expected impact area under Impact Scenario 2. Alternative A entails more land acquisition in Subzones 1d, 1e, 2d, 2g, 2h, 3b, 4c, and 6a and less land acquisition in Subzones 4a, 4h, 5a, 5b, and 6b than does the proposed conservation strategy. These differences in the location of land acquisition under Alternative A compared to the Proposed Conservation Strategy result in:

- increased protection of annual grassland, oak woodland, and ponds in the center of the inventory area to benefit California red-legged frog, California tiger salamander, and Tricolored Blackbird;
- increased protection of potential primary movement routes of San Joaquin kit fox between Black Diamond Mines Regional Preserve and the Los Vaqueros Watershed/Cowell Ranch State Park;
- potentially increased protection of preserves in Zones 1 and 2 by increasing the width of buffers between existing and future development and high-quality habitat within preserves;
- reduced protection of chaparral/scrub in the inventory area and a reduction in the contribution to recovery for Alameda whipsnake and Mount Diablo manzanita; and
- reduced protection of suitable breeding and movement habitat for San Joaquin kit fox, California red-legged frog, California tiger salamander, Western Burrowing Owl, and Golden Eagle in Zone 6.

The overall size of the Preserve System under Alternative A would be similar to that under the proposed conservation strategy. The minimum and maximum sizes are estimated to be 32,802 and 42,574 acres, respectively. These acreages reflect a variance of less than 2% from the estimated sizes of the proposed Preserve System (see Table 6-9). The estimated minimum and maximum protection of terrestrial land cover types is similar between Alternative A and the proposed conservation strategy (Table 6-22). The protection of plant populations would be the same under Alternative A as under the proposed conservation strategy. The estimated minimum and maximum preservation of modeled suitable habitat for covered species under Alternative A is similar to those under the proposed conservation strategy (Table 6-23). For example, despite a shift in preservation of annual grassland throughout all Zones, the estimated minimum preservation of modeled suitable core habitat for San Joaquin kit fox is less than 2% lower in Alternative A than in the proposed conservation strategy.

Description of Alternative A

Figure 6-6 shows the land acquisition emphasis in Alternative A. Table 6-24 describes Alternative A in relation to the proposed conservation strategy and Alternative B. The rationales for land acquisition requirements in Alternative A are the same as those for the proposed conservation strategy when the requirements are the same. The rationales for different requirements are described below for each Zone.

Acquisition Requirements for Zone 1

Land acquisition requirements in Zone 1 differ from those under the proposed conservation strategy by increasing the protection of annual grassland at the

urban-wildland interface on the southern boundary of Bay Point and Pittsburg (Subzones 1d and 1e) (Table 6-24). The increased extent of land protection in Zone 1 will increase the protection of potential suitable habitat for San Joaquin kit fox; Western Burrowing Owl; Golden Eagle; California red-legged frog (ponds, streams, and upland habitat); and California tiger salamander (ponds and upland habitat). Increased land acquisition in this area will also provide a wider buffer between existing and future urban development and the core existing protected areas of the Concord Naval Weapons Station and Black Diamond Mines Regional Preserve.

Acquisition Requirements for Zone 2

Land acquisition requirements in Zone 2 differ from those under the proposed conservation strategy by increasing protection of annual grassland, oak woodland, and ruderal land cover near Antioch and Brentwood (Subzones 2e, 2g, 2h) (Table 6-24). In order to ensure a viable movement route around the Roddy Ranch Golf Course, all of Subzone 2g and almost all of Subzone 2h would be acquired. Preservation in Subzone 2e is also increased to provide a wider buffer between development in Brentwood and the kit fox movement route. Preservation of these areas will ensure that San Joaquin kit fox will have a movement route mostly more than 0.5 mile wide between Black Diamond Mines Regional Park and the Los Vaqueros Watershed. The long-term viability of this route, however, is uncertain because of the expected expansion of Antioch to the south and the indirect effects on this preserve from adjacent development (see the January 23, 2003, memo on preliminary impacts for a discussion of indirect effects).

Acquisition Requirements for Zone 3

Land acquisition requirements in Zone 3 are similar to those under the proposed conservation strategy, but Alternative A requires twice the protection in Subzone 3b to ensure that more mitigation occurs near the expected development in Clayton near Marsh Creek Road (Table 6-24).

Acquisition Requirements for Zone 4

Under Alternative A, land acquisition within Zone 4 shifts from Subzones 4a and 4h to Subzone 4c so that preservation occurs closest to the impact areas in Pittsburg, Antioch, and Brentwood. Increased land acquisition in Subzone 4c (Table 6-24) will increase protection of suitable breeding and movement/aestivation habitat for California red-legged frog and California tiger salamander and breeding/foraging habitat for Tricolored Blackbird because there is a higher density of ponds in Subzone 4c than in Subzones 4a and 4h. However, the requirement for protection of chaparral/scrub in Zone 4 would be substantially reduced (from 425 acres to 100 acres) under Alternative A because

much less chaparral occurs in Subzone 4c than in Subzones 4a and 4h. This approach would reduce the suitable core and movement habitat for Alameda whipsnake within preserves.

Acquisition Requirements for Zone 5

Land acquisition requirements in Zone 5 for annual grassland are substantially less under Alternative A than in the proposed conservation strategy because Zone 5 is relatively far from the expected impact areas (Table 6-24). Acquisition requirements for alkali grassland and alkali wetland remain the same to ensure adequate mitigation and contribute to recovery for populations of and suitable habitat for brittlescale, San Joaquin spearscale, and recurved larkspur.

Under the proposed conservation strategy, the preserve within Zone 5 would become a core preserve linked to the large protected areas of the Los Vaqueros Watershed and Cowell Ranch State Park. This preserve could potentially support 1–12 pairs of San Joaquin kit fox. Under Alternative A, the preserve would be reduced in size by approximately 40% to allow for increased protection of annual grassland closer to the covered activities (Zones 1 and 2 and Subzone 4c). The preserve in Zone 5 under Alternative A could potentially support 1–8 pairs of San Joaquin kit fox. The preserve would still provide the needed movement routes from Alameda County and the Byron Airport conservation easements.

Acquisition Requirements for Zone 6

Acquisition requirements in Zone 6 under Alternative A are similar to those under the proposed conservation strategy (Table 6-24). Alternative A shifts 1,000 acres of conservation easements from Subzone 6b to Subzone 6a so that more conservation occurs near Oakley. Development pressure is greater in Subzone 6a than in Subzone 6b (the Contra Costa County Agricultural Core), so foraging habitat for Swainson's Hawk and Western Burrowing Owl would be lost faster in Subzone 6a than in Subzone 6b. Subzone 6a also supports more modeled suitable habitat for giant garter snake than does any other Subzone. Increasing the protection of lands within this Subzone could increase protection for this covered species (although impacts on this species would be addressed directly through Conservation Measure 3.9.2). Requirements and priorities in the other Subzones in Zone 6 are the same in Alternative A as in the Proposed Conservation Strategy.

Alternative B

Design of Alternative B

Alternative B was designed to provide mitigation for the impacts under Scenario 1 (urban land use designations inside the ULL) and to contribute to the recovery of covered species and maintenance of biological diversity in the inventory area. Impact Scenario 1 assumes that up to 9,297 acres of covered vegetation communities would be affected by covered activities. This is approximately 36% less impact than assumed under Scenario 2 (i.e., the development scenario on which the proposed conservation strategy and Alternative A are based). The location of impacts under Scenario 1 also differ from those under Scenario 2. Under Scenario 1, covered activities would either not occur in the following locations or would occur to a much lesser degree than in Scenario 2 (see Figure 5 in the January 23, 2003, Preliminary Impact Analysis memo):

- Byron Airport,
- east of Discovery Bay,
- northeast corner of Oakley,
- between Brentwood and Cowell Ranch State Park, and
- hills south of Bay Point.

Under Scenario 1, there would be almost no impact on alkali grassland, 34% less impact on annual grassland, 39% less impact on oak savanna, 35% less impact on oak woodland, and 44% less impact on cropland or pasture than under Scenario 2 (Table 6-21). Under Alternative B, the land acquisition requirements for each land cover type take these differences in impact levels into account.

Because of the 36% reduction in impact under Scenario 1, a smaller Preserve System would be required by Alternative B than by the proposed conservation strategy. In comparison to parameters of the proposed conservation strategy, the approach taken in designing land acquisition requirements for Alternative B was to:

- maintain land acquisition requirements and priorities in Zones 1–4 to ensure that biological goals and objectives of the HCP/NCCP are met or exceeded;
- reduce land acquisition requirements in Zone 5 for annual grassland, alkali grassland, and alkali wetland to account for the substantial reduction in impacts on these land cover types in and near Zone 5; and
- reduce land acquisition requirements in Zone 6 in proportion to reduction in the impacts on cropland and pasture land cover types.

Summary of Alternative B

The land acquisition emphasis in Alternative B is shown in Figure 6-7. Land acquisition requirements under Alternative B are lower than those under the proposed conservation strategy (Table 6-21), reflecting the 36% reduction in expected impacts of covered activities. Alternative B requires less land acquisition in Zones 5 and 6 and the same amount of land acquisition in Zones 1–4 as the proposed conservation strategy.

The Preserve System would be approximately 25% smaller under Alternative B than under the proposed conservation strategy. The minimum and maximum sizes of the Preserve System under Alternative B are estimated to be 24,448 and 33,627 acres, respectively. The estimated minimum and maximum protection of annual grassland and alkali grassland land cover types would also be lower under Alternative B than under the proposed conservation strategy (Table 6-22). Protection of chaparral, oak woodland, and oak savanna would be approximately the same under Alternative B and the Proposed Conservation Strategy.

The mitigation ratio requirements for restoration or creation of wetlands, ponds, streams, oak savanna, and riparian woodland/scrub is the same under Alternative B and the proposed conservation strategy. [*Note to reader: Additional requirements for restoration or creation of wetlands, ponds, and riparian woodland/scrub to contribute to recovery of aquatic covered species have not been determined for Alternative B.*]. The protection of plant populations would be the same under Alternative B and the proposed conservation strategy. The estimated minimum preservation of modeled suitable habitat for covered species under Alternative B is the same as that under the Proposed Conservation Strategy for Alameda whipsnake and 20–35% lower for California red-legged frog, Swainson’s Hawk, Western Burrowing Owl, California tiger salamander, Golden Eagle, Tricolored Blackbird, and San Joaquin kit fox (Table 6-23). The land acquisition requirements for silvery legless lizard in the proposed conservation strategy are the same under Alternative B as the Proposed Conservation Strategy.

Description of Alternative B

Figure 6-7 shows the land acquisition emphasis in Alternative B. Table 6-24 describes Alternative B in relation to the proposed conservation strategy and Alternative A. The rationales for land acquisition requirements in Alternative B are the same as those for the proposed conservation strategy where the requirements are the same. The rationales for different requirements are described below for each Zone.

Acquisition Requirements for Zone 1

Acquisition requirements in Zone 1 are the same under Alternative B as under the proposed conservation strategy (Table 6-24) to ensure that habitat linkages

are created between Black Diamond Mines Regional Park and the Concord Naval Weapons Station.

Acquisition Requirements for Zone 2

Acquisition requirements in Zone 2 are the same under Alternative B as under the proposed conservation strategy (Table 6-24) because the amount and location of impacts on annual grassland, oak savanna, and oak woodland in and near this Zone would be similar under Impact Scenarios 1 and 2. Acquisition requirements and priorities within this Zone to protect likely movement routes for San Joaquin kit fox are the same under Alternative B as under the proposed conservation strategy.

Acquisition Requirements for Zone 3

Acquisition requirements in Zone 3 are the same under Alternative B as under the proposed conservation strategy (Table 6-24) because assumed maximum impacts near this Zone (i.e., within Clayton) would be the same under Impact Scenarios 1 and 2. Acquisition of land within Subzone 3a is needed to contribute to the recovery of Alameda whipsnake and Mount Diablo manzanita in the inventory area.

Acquisition Requirements for Zone 4

Requirements for land acquisition in Zone 4 are the same under Alternative B as under the proposed conservation strategy. Land acquisition within Subzones 4a, 4c, 4f, and 4h are critical to meeting recovery objectives of the HCP/NCCP for Alameda whipsnake. Land acquisition in these Subzones will protect core habitat for Alameda whipsnake and movement routes between patches of chaparral/scrub. The requirements for protection of chaparral/scrub are the same under Alternative B and the proposed conservation strategy because expected impacts on this land cover type are the same under both impact scenarios. Land acquisition in Zone 4 is also important to meet biological goals and objectives for California red-legged frog, foothill yellow-legged frog, California tiger salamander, and Golden Eagle.

Acquisition Requirements for Zone 5

Land acquisition requirements in Zone 5 are substantially less under Alternative B than under the proposed conservation strategy in order to maintain a rough proportionality between impacts and compensation, but are sufficient to ensure that the HCP/NCCP contributes to the recovery of covered species. Under Impact Scenario 1, there are almost no impacts on annual grassland or alkali grassland near Zone 5 (and almost no impacts on alkali grassland anywhere in

the inventory area). Land acquisition was deemphasized in this Zone because of a much lower threat of development under Scenario 1 than under Scenario 2.

Under Alternative B, the Implementing Entity will acquire at least 2,000 acres of annual grassland in Subzone 5a and at least 300 acres of alkali grassland in Subzones 5a or 5b. The requirement for acquisition of alkali wetland is up to 13 acres (50% of this land cover type in the Zone), a lesser amount than is required under the proposed conservation strategy. All other requirements for Zone 5 are the same as under the proposed conservation strategy. Land acquired in Zone 5 will contribute to the recovery of San Joaquin kit fox by creating important linkages between the Byron Airport conservation easements and the Los Vaqueros Watershed, and between Vasco Caves Regional Park and the county line. Land acquisition in this area is expected to support 0–3 pairs of kit fox (compared to 1–12 under the proposed conservation strategy). Land acquired in Zone 5 under Alternative B would contribute to existing protected areas but would not become a core preserve as it would under the proposed conservation strategy.

Protection of alkali wetlands and alkali grasslands in Zone 5 is substantially less than under the proposed conservation strategy; however, it exceeds the amount of expected impacts on these land cover types under Scenario 1 in order to ensure a substantial contribution to recovery of vernal pool invertebrates, brittlescale, San Joaquin spearscale, and recurved larkspur. Alkali grassland is underrepresented in existing protected areas in the inventory area. Parcels in Subzone 5a likely contain both annual grassland and alkali grassland; accordingly, requirements for both land cover types can be met with the same land acquisitions.

Acquisition Requirements for Zone 6

Under Alternative B, the Implementing Entity will acquire at least 4,000 acres of cropland or pasture in Zone 6 according to the acquisition priorities in Table 6-25. These requirements follow the proportions outlined in the proposed conservation strategy, with one exception. There is no land acquisition requirement in Subzone 6e because there are no expected impacts resulting from covered activities under Scenario 1 in this Subzone. Land that would have been acquired in Subzone 6e under the proposed conservation strategy (300 acres according to the proportions in the proposed conservation strategy) will be acquired under Alternative B in Subzone 6b, resulting in a larger core area of conservation easements that would provide suitable foraging habitat for Swainson's Hawk, Western Burrowing Owl, Golden Eagle, and Tricolored Blackbird. All other requirements in this Subzone are the same as in the Proposed Conservation Strategy.

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Table 6-1. Land Cover Types in Acquisition Analysis Zones

Land Cover Type	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Total
Terrestrial Land Cover Types*							
Annual grassland	6,892	10,315	430	3,596	10,905	55	32,193
Alkali grassland	0	0	0	0	1,110	323	1,433
Rock outcrop	0	0	0	0	0	0	0
Subtotal Grassland Vegetation Community**	6,892	10,315	430	3,596	12,015	378	33,626
Oak savanna	211	819	168	1,995	7	0	3,201
Oak woodland	386	2,750	862	8,170	21	32	12,220
Subtotal Oak Woodland Vegetation Community*	597	3,569	1,030	10,165	28	32	15,421
Chaparral/scrub	0	142	175	514	0	0	831
Riparian woodland/scrub	22	0	0	0	11	1	33
Wetlands, Ponds, and Streams							
Wetland (undetermined)	15	10	1	1	12	55	93
Alkali wetland	0	0	0	0	22	0	22
Seasonal wetland	8	0	0	0	0	0	8
Aquatic	0	0	0	0	7	16	23
Pond	1	17	1	19	11	23	73
Slough/channel	0	0	0	0	0	36	36
Streams***	30	47	5	51	40	31	204
Subtotal	54	74	7	72	92	161	459
Subtotal All Natural Land Cover Types	7,565	14,100	1,642	14,347	12,146	572	50,370
Cultivated Land Cover Types							
Cropland	2	160	0	0	4	19,811	19,978
Pasture	0	0	0	0	41	1,986	2,026
Orchard	0	124	0	41	0	2,806	2,971
Vineyard	0	0	0	0	0	894	894

Land Cover Type	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Total
Subtotal	2	284	0	41	45	25,497	25,869
Other Land Cover Types							
Aqueduct	5	0	0	0	37	128	171
Landfill	333	0	0	0	0	0	333
Nonnative woodland	0	0	0	0	0	0	0
Wind turbines	0	0	0	0	158	0	158
Turf	0	0	0	0	0	4	4
Urban	206	38	59	358	144	2,019	2,824
Ruderal	104	339	52	152	751	895	2,292
Subtotal	648	377	111	510	1,090	3,042	5,782
TOTAL	8,185	14,714	1,748	14,847	13,241	29,084	81,817

*Number may not add exactly due to rounding

**Excludes wetland or other waters land cover types

***Assumes an average streambed width of 5 feet; stream data not included in Subzone totals because it is an overlay data set (i.e., it overlaps with the land cover type data).

Table 6-2. Conservation Measures and the Contribution to Biological Objectives [Table Contents to Come]

Measure	Community Objectives	Wildlife Objectives	Plant Objectives
1.1.1	Minimize Development Footprint		
1.1.2	Urban-Wildland Interface Design Elements		
1.1.3	Maintain Hydrologic Conditions and Minimize Erosion		
1.1.4	Avoid Direct Impacts on Extremely Rare Plants or Fully Protected Wildlife Species		
1.2.1	Planning Surveys for Suitable Habitat for Covered Wildlife in Impact Areas and Potential Preserves		
1.2.2	Planning Survey for Plants in Impact Areas and Potential Preserves		
1.2.3	Preconstruction Surveys for Wildlife		
1.2.4	Construction Monitoring		
1.2.5	Planning Surveys for Vegetation Communities, Rare Vegetation Types, and Rare Landscape Features		
1.2.6	Delineation of Waters of the United States		
1.3.1	Acquire Lands for Preserve System		
1.3.2	Establish Buffer Zones to Protect Preserved Uplands and Wetlands		
1.3.3	Establish Buffer Zones between Streams and Development		
1.4.1	Prepare and Implement an Exotic Plant Control Program for the Preserve System		
1.4.2	Prepare and Implement a Recreation Plan		
1.4.3	Prepare Preserve Management Plans for Non-Agricultural Lands		
1.4.4	Prepare Preserve Management Plans for Agricultural Lands		
2.1.1	Enhance, Restore, and Create Land Cover Types and Species Habitat to Compensate for Impacts and Contribute to Recovery		
2.2.1	Wetland and Pond Enhancement and Management Program		
2.2.2	Wetland Restoration and Pond Creation Program		

Measure	Community Objectives	Wildlife Objectives	Plant Objectives
2.2.3	Wetland, Pond, and Stream Avoidance and Minimization Measures		
2.3.1	Enhance Native Grassland Alliances		
2.3.2	Enhance Prey Base and Natural Burrow Availability in Grasslands		
2.4.1	Minimize Effects on Oak Woodland		
2.4.2	Maintain and Enhance Oak Woodland and Oak Savanna Vegetation		
2.4.3	Restore Oak Savanna		
2.5.1	Maintain or Improve Quality of Chaparral/Scrub Habitat		
2.6.1	Stream and Riparian Woodland/Scrub Enhancement Program		
2.6.2	Stream and Riparian Woodland/Scrub Restoration Program		
2.7.1	Enhance Agricultural Lands to Benefit Covered Species		
3.1.1	Conduct Preconstruction Survey and Minimize Impacts on Townsend’s Big-Eared Bat during Sensitive Periods		
3.2.1	Implement Preconstruction Survey and Impact Minimization Program for San Joaquin Kit Fox		
3.4.1	Tricolored Blackbird		
3.4.1	Protect Golden Eagle Nest Sites		
3.4.2	Avoid Disturbances to Golden Eagle Nest Sites During the Breeding Season		
3.5.1	Conduct Preconstruction Survey for Western Burrowing Owl		
3.5.2	Avoid or Minimize Take of Western Burrowing Owl		
3.5.3	Purchase Temporary Conservation Easements to Encourage Western Burrowing Owls to Leave Development Sites		
3.5.4	Create Artificial Burrows in Grasslands		
3.5.5	Establish Artificial Perches		

Measure	Community Objectives	Wildlife Objectives	Plant Objectives
3.6.1	Avoid Disturbance to Swainson’s Hawk Nest Sites During the Breeding Season		
	Silvery Legless Lizard		
3.8.1	Relocate Alameda Whipsnakes from Development Areas		
3.8.2	Minimize Adverse Effects of Preserve Management on Alameda		
3.9.1	Avoid or Minimize Impacts on Giant Garter Snake Habitat		
3.9.2	Compensate for Impacts on Giant Garter Snake Habitat		
3.10.1	Remove California Tiger Salamanders From Impact Areas		
3.11.1	Remove California Red-Legged Frogs From Impact Areas		
	Foothill Yellow-Legged Frog		
	Longhorn Fairy Shrimp		
	Vernal Pool Fairy Shrimp		
	Midvalley Fairy Shrimp		
	Vernal Pool Fairy Shrimp		
3.17.1	Plant Salvage when Impacts are Unavoidable		
3.17.2	Conduct Experimental Management to Enhance Covered Plant Populations		
3.17.3	Determine the Benefits of Livestock Exclosures for Herbaceous Covered Plant Species		
	Mount Diablo Manzanita		
	Brittlescale		
	San Joaquin Spearscale		
	Big Tarplant		
	Mount Diablo Fairy Lantern		
	Recurved Larkspur		
	Diablo Helianthella		
	Brewer’s Dwarf Flax		
	Showy Madia		
	Adobe Navarettia		

Table 6-3. No-Take Species (Extremely Rare Plants and Fully Protected Species)

Common Name	Status ¹		Rationale
Scientific Name	State	Federal	
Plants			
Large-flowered fiddleneck <i>Amsinckia grandiflora</i>	SE	FE	No natural populations occur in the inventory area; if one were discovered, it would be highly significant and should be preserved.
Alkali milkvetch <i>Astragalus tener</i> ssp. <i>tener</i>	1B	–	Thought to be extirpated from Contra Costa County; suitable habitat may be present in the inventory area; if any populations are found, they would have to be preserved.
Mount Diablo buckwheat <i>Eriogonum truncatum</i>	1A	–	Presumed extinct; if any populations were discovered in the inventory area, they would have to be preserved.
Diamond-petaled poppy <i>Eschscholzia rhombipetala</i>	1B	–	Known from only two populations in the world; not seen in the inventory area since 1889. Any populations found in the inventory area would be highly significant.
Contra Costa goldfields <i>Lasthenia conjugens</i>	1B	FE	All known populations in inventory area have been extirpated; if new populations were discovered, they would have to be preserved.
Caper-fruited tropidocarpum <i>Tropidocarpum capparideum</i>	1A	–	Presumed extinct; historic occurrences in the inventory area; if discovered, population would have to be preserved.
Birds			
White-tailed Kite <i>Elanus leucurus</i>	FP	–	No take is allowed because species is fully protected.
Peregrine Falcon <i>Falco peregrinus</i>	FP	–	No take is allowed because species is fully protected.
Golden Eagle <i>Aquila chrysaetos</i>	FP	BGPA	No take is allowed because species is fully protected.
¹ Status:		State	
Federal		SE	State Listed as Endangered
FE	Federally Listed as Endangered	ST	State Listed as Threatened
FT	Federally Listed as Threatened	CSC	California Special Concern Species
FSC	Federal Species of Concern	SR	State Rare (plants)
BGPA	Bald Eagle and Golden Eagle Protection Act	FP	Fully Protected
		California Native Plant Society	
		1A	Presumed Extinct
		1B	Rare or Endangered in California and Elsewhere

Table 6-4. Jump Start Requirements

Land Cover Type	Jump Start Requirement for Land Acquisition (acres)	Special Conditions
Annual grassland	250	Must be suitable core habitat for San Joaquin kit fox
Chaparral	50	Must be suitable core habitat for Alameda whipsnake
Cropland or pasture	100	Cropland or pasture must be suitable Swainson's Hawk habitat or capable of being managed to support such habitat
Seasonal wetland	8	
Perennial wetland	2	
Ponds	3	Must be suitable habitat for California red-legged frog or California tiger salamander or both these species
Riparian woodland/scrub	10	
Stream	TBD	
Other land cover types	77	Must contribute to requirements of HCP/NCCP
Total	500	

Table 6-5. Example of Jump Start and Stay Ahead Provisions for Annual Grassland

Year	Hypothetical Impacts (acres)	% of Total Impacts	% Preservation Required for Stay Ahead	Preservation Requirement (acres) ¹
0	0	0%	N/A	250 (Jump Start)
5	550	10%	15%	2,475
10	2,000	36%	41%	6,766
15	3,000	55%	60%	9,902
20	4,000	73%	78%	12,872
25	5,000	91%	96%	15,842
30	5,501 ²	100%	100%	16,500

Notes:

¹ Preservation requirement only for annual grassland land cover type. More annual grasslands may need to be required to meet other requirements (e.g., for habitat for covered species). See Table 6-7 for land cover acquisition requirements.

² Maximum impact estimated under Impact Scenario 2.

Table 6-6. Land Acquisition Requirements by Acquisition Analysis Zone

Land Cover	HCP/NCCP Requirements Can Be Met in					
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Annual grassland	•	•	•	•	•	
Alkali grassland		1			•	
Oak savanna	•	•	•	•	•	
Oak woodland	•	•	•	•	•	
Riparian woodland/scrub	•	•		1		•
Chaparral/scrub	1	•	•	•		
Wetlands, Ponds, Streams						
Alkali wetland					•	
Seasonal wetland	•	•	•	•	•	
Ponds	•	•	•	•	•	
Perennial wetlands	•	•	•	•	•	•
Slough/channel						•
Streams	•	•	•	•	•	
Open water	•	•	•	•	•	•
Cultivated agriculture						
Cropland						•
Pasture						•

Notes:

- 1 Although this land cover type was not mapped in this Zone for the HCP/NCCP, small patches are known to occur there (Mundie & Associates and City of Antioch 2002; B. Olson, B. Errter, J. Kopchik, C. Wilcox, pers. comms.).

Table 6-7. Required Preservation Ratios and Estimated Acquisition Amounts for Aquatic Land Cover Types¹

Aquatic Land Cover Type	Estimated Impact under Scenario 2 (acres)	Required Preservation Ratio	Estimated Preservation Amounts ¹ (acres)	Estimated Available in Acquisition Analysis Zones (acres)
Alkali wetland	3	3:1	9	22
Wetlands (undetermined)	36	1:1 or 3:1 ²	Min. 36 Max. 108	93 ²
Seasonal wetlands	8	3:1	24	8 ²
Perennial wetlands	N/A	1:1	N/A	N/A
Ponds	15	2:1	30	73
Slough/channel	88	1:1	88	36
Aquatic (open water)	40	1:1	40	23
Riparian woodland/scrub	99	2:1	198	33
Streams (acres) ³	138	2:1 or 1:1 ⁴	138 ³	204 ⁴
Total Aquatic Land Cover Types	427		Min. 563 Max. 635	492

Notes:

¹ Values are estimates based on the maximum impact under Scenario 2. Actual acquisition requirements will be based on field delineated resources at impact sites and application of the required preservation ratios in this table. Restoration, creation, and enhancement of aquatic land cover is required in addition to preservation of aquatic land cover as compensation for impacts. See Conservation Measures 2.1.1 and 2.2.2 for these requirements.

² Undetermined wetlands could be seasonal wetlands or perennial wetlands (e.g., freshwater marsh). Seasonal wetlands will be mitigated at a preservation ratio of 3:1; perennial wetlands will be mitigated at a preservation ratio of 1:1. There are likely more seasonal wetlands available for preservation in the AAZs than the mapping data suggest. Some of the undetermined wetlands are likely seasonal wetlands, and the overall extent of seasonal wetlands was underestimated by the mapping (see chapter 3 for details).

³ Assumes an average streambed width of 5 feet.

⁴ Stream preservation will be required at a 2:1 ratio for perennial streams, and a 1:1 ratio for ephemeral or intermittent streams. Perennial streams in the inventory are either within existing protected areas (e.g., Los Vaqueros Watershed) or in the upper watersheds away from expected direct impacts of covered activities under Impact Scenario 2. Therefore, all preservation of streams is assumed to occur for either ephemeral or intermittent streams at a 1:1 ratio. Actual impacts to streams of all types are expected to be much less than the maximum impact shown here. See the Preliminary Impact Analysis memo dated January 23, 2003, for more details.

Table 6-8. Land Acquisition Requirements for Terrestrial Land Cover Types (acres)

	Total in Inventory Area	Inside Public Lands (%)	Outside Public Lands	Estimated Impact ¹ (% of Outside)	Available in Zones ²	HCP/NCCP Preservation Requirement for Compensation and Recovery ⁵ (% of Zone)	Minimum Preserved ³ (% of Remaining)
Annual grassland	57,190	24,171 (42%)	33,019	5,501 (17%)	32,193	16,500 (51%)	40,671 (79%)
Alkali grassland	1,989	435 (22%)	1,554	229 (15%)	1,433	1,000 (72%)	1,435 (81%)
Oak savanna	5,835	2,627 (45%)	3,208	202 (6%)	3,201	400 (13%)	3,027 (54%)
Oak woodland	24,190	11,562 (48%)	12,628	220 (2%)	12,220	440 (4%)	12,002 (50%)
Chaparral/scrub	2,862	2,003 (70%)	859	1 (<<1%)	831	550 (66%)	2,553 (89%)
Cropland and pasture	27,546	459 (2%)	27,087	6,322 (23%)	22,004	6,250 (28%)	6,709 (32%)
Total	119,612	41,257	78,355	12,475	71,882	25,140	66,397

Notes:

- ¹ Assumes the ULL Impact Scenario (Impact Scenario 2). This value does not “discount” impacts by any conservation that might occur within the ULL. The percentage is the proportion of the land cover type outside public lands.
- ² Available outside of public lands, watershed lands, and other public open space (excluding lands designated as public facilities) with conservation value.
- ³ Min. preserved = HCP/NCCP requirement + existing public lands, watershed lands, and open space. More of each land cover type is expected to be preserved due to need to acquire parcels rather than specific areas of each land cover type. The percentage is the proportion of the land cover type preserved in existing public lands and HCP/NCCP Preserves after full HCP/NCCP implementation (i.e., after impacts have occurred).
- ⁴ To meet preservation requirements, riparian woodland/scrub will have to be acquired outside the AAZs (i.e., within the ULL) or more riparian woodland/scrub will have to be found than was mapped by this HCP/NCCP.
- ⁵ These acreage requirements represent the minimum required under the HCP/NCCP to compensate for impacts of covered activities and contribute to the recovery of covered species. Actual acquisition of these land cover types may be greater than the minimum requirements due to parcel boundaries including non-target land cover types. These requirements were developed based on the assumption of full buildout of Impact Scenario 2.

Table 6-9. Estimated Minimum and Maximum Size of Preserve System (acres)

Zone	Estimated Minimum	Estimated Maximum
1	1,948	3,269
2	8,321	11,522
3	599	1,025
4	6,547	9,731
5	8,661	10,538
6	6,534	6,951
Total	32,610	43,036

Table 6-10. Estimates of Minimum and Maximum Acquisition of Terrestrial Vegetation Community in Preserve System (acres)¹

Zone	Alkali Grassland		Annual Grassland		Chaparral		Oak Savanna		Oak Woodland	
	Est. Min.	Est. Max.	Est. Min.	Est. Max.	Est. Min.	Est. Max.	Est. Min.	Est. Max.	Est. Min.	Est. Max.
1	0	0	1,872	2,793	0	0	86	116	140	186
2	0	0	5,515	7,801	127	142	501	659	1,477	2,456
3	0	0	118	225	133	168	42	84	273	483
4	0	0	1,660	2,527	293	405	856	1,264	3,537	5,253
5	776	999	7,321	8,812	0	0	1	3	13	16
6	258	323	17	23	0	0	0	0	9	17
Total	1,034	1,322	16,504	22,182	553	715	1,486	2,127	5,450	8,412

Notes:

¹ Agricultural land cover types (cropland or pasture) are not shown because acquisition of these land cover types is expected to be the same or similar to the land acquisition requirements. Agricultural parcels usually include only agricultural lands. Numbers may not add exactly due to rounding.

Table 6-11. Land Acquisition Requirements for Zone 4 for Natural Land Cover Types

Subzone	Subzone Size (acres)	Min. Acquisition Requirement (%)	Min. Acquisition Requirement (acres)
4a	2,878	75%	2,158
4b	1,641	30%	492
4c	4,130	30%	1,239
4d	1,619	60%	971
4e	754	20% ¹	151 ¹
4f	2,035	20% ¹	407 ¹
4g	757	20% ¹	151 ¹
4h	1,030	75%	772
Total	14,844		6,341

Notes:

¹ The 20% requirement for Subzones 4e, 4f, and 4g applies to the three subzones as a whole. The requirement to acquire 709 acres can be met in any of the three subzones.

Table 6-12. Conservation Easement Acquisition Requirements for Zone 6 (acres)

Subzone	Subzone Size	Cropland and Pasture Mapped	Cropland or Pasture Acquisition Requirement
6a	7,415	5,480	550 (10%)
6b	8,004	5,831	2,900 (50%)
6c	3,318	1,737	940 (54%)
6d	4,273	3,449	1,385 (40%)
6e	4,994	4,751	475 (10%)
6f	789	548	0 (0%)
Total	28,793	21,796	6,250 (29%)

Table 6-13. Minimum Land Acquisition Requirements for Annual Grassland in Zone 2 (acres)

Subzone	Subzone Size	Annual Grassland in Subzone	Min. Acquisition Requirement (acres)
2a	1,862	1,240	875 (71%)
2b	1,527	668	400 (60%)
2c	1,608	701	525 (74%)
2d	2,083	1,287	835 (65%)
2e	1,010	797	600 (75%)
2f	1,590	1,270	1,000 (79%)
2g	470	430	230 (53%)
2h	1,262	1,018	750 (74%)
2i	3,308	2,903	300 (10%)
Total	14,614	7,411	5,515 (74%)

Table 6-14. Buffer Requirements for Preserved Lands

Preserved Land Cover	Buffer Objective	Suitable Buffer Land Cover Types	Recommended Buffer Width ¹	Comments
Adjacent to Existing Development				
Existing alkali, seasonal, or perennial wetlands or ponds	Avoid or minimize the adverse effects on preserved wetlands and ponds that result from adjacent new or existing development such that these ponds and wetlands maintain function as covered species habitat and maintain existing biodiversity.	Annual grassland	0.25 mile	<ol style="list-style-type: none"> The buffer width may be reduced if assessment of site-specific conditions indicates that a width of less than 0.25 mile is sufficient to protect the site from development-associated disturbances (e.g., presence of a hill between the development and the site that visually screens development-related activity from the site; presence of a physical feature that serves as a barrier to site access from the development; design of and types and level of disturbances associated with the development are such that adverse effects on preserved lands and associated covered species are minimal). If a wetland or pond provides important values for covered species and is in need of preservation, but site is within 0.25 mile of development and does not meet conditions described in Comment 1, conduct an assessment of ongoing adverse effects of the adjacent development on the site and identify and implement appropriate site-specific measures to eliminate or minimize adverse effects (e.g., fencing to prevent access, planting oak trees to create barriers to visual disturbances, measures described in Measure 1.1.2 Urban-Wildland Interface Design Elements).
		Alkali grassland		
		Oak savanna		
		Oak woodland		
		Ruderal		

Table 6-14. Continued

Preserved Land Cover	Buffer Objective	Suitable Buffer Land Cover Types	Recommended Buffer Width ¹	Comments
Enhanced, restored, or created alkali, seasonal, and perennial wetlands, ponds, annual grassland, alkali grassland, oak woodland or savanna, or riparian woodland/scrub	Maximize the value of preserved habitat for covered species and other wildlife by minimizing the likelihood for exposure of enhanced, restored, and created land cover types to human disturbances associated with developments and reduce the likelihood for inputs of contaminants associated with urban runoff into wetlands and ponds.	Annual grassland Alkali grassland Oak savanna Oak woodland Ruderal	0.25 mile	The buffer width may be reduced if assessment of site-specific conditions indicates that a width of less than 0.25 mile is sufficient to protect enhanced, restored, and created habitat sites from development-associated disturbances (e.g., presence of a hill between the development and the site that visually screens development-related activity from the site; presence of a physical feature that serves as a barrier to site access from the development) and urban runoff into wetlands and ponds.
Adjacent to Future Development				
Existing alkali, seasonal, or perennial wetlands or ponds	Ensure acquired wetlands and ponds, in conjunction with implementation of Measure 1.1.2 Urban-Wildland Interface Design Elements, will be relatively free of disturbances that could be associated with developments, thus increasing the likelihood that preserved wetlands and ponds will provide relatively higher values for covered species and other wildlife than sites that are closer to developments.	Annual grassland Alkali grassland Oak savanna Oak woodland Ruderal	300 feet	If a wetland or pond provides important values for covered species and is in need of preservation, but site is within 300 feet of a development, identify and implement appropriate site-specific measures on preserve lands or incorporate additional design features into design of the development to eliminate or minimize adverse effects (e.g., fencing to prevent access, planting oak trees to create barriers to visual disturbances).

Table 6-14. Continued

Preserved Land Cover	Buffer Objective	Suitable Buffer Land Cover Types	Recommended Buffer Width ¹	Comments
Enhanced, restored, or created alkali, seasonal, and perennial wetlands, ponds, annual grassland, alkali grassland, oak woodland or savanna, or riparian woodland/scrub	Maximize the value of preserved habitat, in conjunction with implementation of Measure 1.1.2 Urban-Wildland Interface Design Elements, for covered species and other wildlife by minimizing the likelihood for exposure of enhanced, restored, and created land cover types to human disturbances associated with developments and reduce the likelihood for inputs of contaminants associated with urban runoff into wetlands and ponds.	Annual grassland Alkali grassland Oak savanna Oak woodland Ruderal	300 feet	
Agricultural Lands				
Existing alkali, seasonal, or perennial wetlands or ponds	Reduce the likelihood for exposure of acquired wetlands and ponds to potential contamination from application of pesticides.	All land cover types	Fields treated with aerially applied pesticides: 500 feet Fields treated with ground applied pesticides: 100 feet	<ol style="list-style-type: none"> 1. No buffers are required adjacent to agricultural lands that are not treated with pesticides. 2. If a wetland or pond provides important values for covered species and is in need of preservation, but buffer land is not available, the Implementing Entity may enter into conservation easements with willing landowners to preclude application of pesticides on fields within 100 or 500 feet (depending on application method) of the preserve boundary.

Table 6-14. Continued

Preserved Land Cover	Buffer Objective	Suitable Buffer Land Cover Types	Recommended Buffer Width ¹	Comments
Enhanced, restored, or created alkali, seasonal, and perennial wetlands, ponds, annual grassland, alkali grassland, oak woodland or savanna, or riparian woodland/scrub	Maximize the value of preserved habitat for covered species and other wildlife by reducing the likelihood for exposure of enhanced, restored, and created land cover types to potential contamination from application of pesticides.	Annual grassland	Fields treated with aerially applied pesticides: 500 feet	No buffers are required adjacent to agricultural lands that are not treated with pesticides.
		Alkali grassland		
		Oak savanna	Fields treated with ground applied pesticides: 100 feet	
		Oak woodland		
		Ruderal		

Notes:

¹ The recommended buffer widths could be reduced based on site-specific conditions such as barriers to human access and topography. Actual buffer widths will be determined by the Implementing Entity based on site conditions.

Table 6-15. Requirements for Enhancement, Restoration, and Creation of Land Cover Types

Land Cover Type	Enhancement	Restoration	Creation		For Details, See Measures
			In-kind	Out-of-kind/ like-function	
Native grassland (within annual grassland)	●				2.3.1, 2.3.2
Alkali grassland	●				2.3.1, 2.3.2
Oak savanna	●	●			2.4.2, 2.4.3
Oak woodland	●				2.4.2
Chaparral	●				2.5.1
Riparian woodland/scrub	●	●			2.6.1, 2.6.2
Wetlands, Ponds, and Streams					
Alkali wetland	●	●			2.2.1, 2.2.2
Seasonal wetland	●	●			2.2.1, 2.2.2
Ponds	●		●		2.2.1, 2.2.2
Perennial wetlands	●	●			2.2.1, 2.2.2
Slough/channel	●			●	2.2.2
Streams	●	●		●	2.6.1, 2.6.2
Open water	●		●		2.2.1, 2.2.2

Table 6-16. Restoration and Creation Requirements for Land Cover Types

Land cover type	Estimated Impact ¹ (acres)	Required Compensation Ratio		Est. Compensation (acres)	Restoration or Creation Required to Contribute to Recovery (acres)	Est. Total Restoration or Creation (acres)
		Restoration	Creation			
Oak savanna	202	1:1	–	202	None	
Riparian woodland/scrub	99	1:1	–	99	TBD	
Wetlands, Ponds, and Streams						
Wetlands (undet.)	36	1:1 or 2:1 ²	–	Na/	N/a	N/a
Alkali wetland	3	2:1	–	6	6	12
Seasonal wetland	Min. 8 Max. 44 ³	2:1	–	Min. 16 Max. 88	32	Min. 48 Max. 120
Ponds	15	–	1:1	15	20	35
Perennial wetlands	Min. 0 Max. 36 ³	1:1	–	Min. 0 Max. 36	20	Min. 20 Max. 56
Slough/channel	88	–	1:1	88	0	88
Streams	138 ⁴	1:1 ⁵	1:1 ⁵	138	0	138
Open water	40	–	1:1	40	0	40
Total	TBD					TBD

Notes:

- ¹ Assumes the ULL Impact Scenario (Senario 2). This value does not “discount” impacts by conservation that might occur within the ULL. Because of the limitations in wetland mapping, estimated impacts to wetlands should be considered as an order of magnitude estimate. Actual impacts to wetlands may be greater than that shown.
- ² Undetermined wetlands are either seasonal wetlands or perennial wetlands. Mitigation of seasonal wetlands will be accomplished through restoration at 2:1. Mitigation of perennial wetlands will be accomplished through in-kind creation at 1:1.
- ³ Minimum/maximum values assume that all undetermined wetlands are either seasonal wetland or perennial wetlands.
- ⁴ Assumes average streambed width of 5 feet.
- ⁵ Streams will be restored where feasible. Where stream restoration is not feasible, out-of-kind creation of seasonal wetlands or permanent wetlands will be required to replace some of the functions of the lost stream. See measure 2.2.3 for more details.

Table 6-17. Partial List of Potential Management Measures to Enhance Covered Species Habitat on Agricultural Lands

Covered Species	Potential Management Measures
Golden Eagle, Western Burrowing Owl, San Joaquin kit fox	1. Eliminate or reduce the application of rodenticides on agricultural lands that are adjacent to large tracts of grasslands and other natural foraging habitats preserved under the HCP/NCCP to increase prey abundance.
Swainson’s Hawk	<p>1. Eliminate or reduce the application of rodenticides on enrolled lands to increase prey availability.</p> <p>2. Establish and maintain cover strips along field margins, ditches, canals, roads, and other infrastructure to provide escape cover for rodents to maintain or enhance rodent abundance and increase prey availability for raptors.</p> <p>3. On lands that lack nesting sites, but are within 1 mile of suitable foraging habitat, plant isolated trees along field margins or interior roads to provide nesting sites. Trees could also serve as windbreaks for farming operations.</p>
Tricolored Blackbird	<p>1. On agricultural lands that are within flight distance of nesting colonies:</p> <ul style="list-style-type: none"> ▪ delay harvest of all or a portion of forage crops until after young have fledged ▪ where feasible, reduce or avoid use of pesticides that are known to be toxic to the species during the nesting period <p>2. Where conditions permit, establish stands of emergent vegetation, blackberry, or other vegetation along ditches and canals to provide suitable nesting structure on agricultural lands that support forage crops within the dispersal range of existing colonies but lack vegetation for nesting</p>
Giant garter snake	<p>On agricultural lands that support habitat connected to occupied habitat:</p> <ul style="list-style-type: none"> ▪ avoid maintenance or other ground/vegetation disturbing activities within 200 feet of canals and ditches that support habitat ▪ when feasible and consistent with maintaining delivery and drainage of irrigation water, encourage the establishment of emergent vegetation in canals and ditches to enhance cover

Table 6-18. Estimates of Modeled Habitat for Covered Wildlife Species Included in HCP/NCCP Preserves (acres)

Species	Est. Minimum ¹	Est. Maximum ¹
Alameda whipsnake		
Core and perimeter habitat	1,185	1,476
Movement habitat	12,145	16,707
Total	13,330	18,183
California red-legged frog		
Potential breeding habitat ²	27	38
Potential migration/aestivation	27,925	38,803
Total	27,952	38,841
Swainson's Hawk		
Potential breeding habitat	7	13
Potential foraging habitat	7,513	10,700
Total	7,520	10,713
Western Burrowing Owl		
Suitable habitat	17,930	24,395
Suitable low use habitat	4,670	6,960
Total	22,600	31,355
San Joaquin Kit Fox		
Suitable core habitat	18,007	24,586
Suitable low use habitat	4,523	6,612
Total	22,530	31,198
California tiger salamander		
Potential breeding habitat	22	30
Suitable migration/aestivation habitat	24,479	33,282
Total	24,501	33,312
Silvery legless lizard		
Suitable habitat	265	437
Golden Eagle		
Potential foraging habitat	30,595	42,810

Table 6-18. Continued

Species	Est. Minimum ¹	Est. Maximum ¹
Tricolored Blackbird		
Suitable core habitat	60	83
Primary foraging habitat	21,987	30,278
Secondary foraging habitat	1,177	1,852
Total	23,224	32,213

Notes:

¹ Minimum and maximum habitat for covered wildlife species estimated based on the minimum and maximum proportion of each subzone that would be preserved to meet land acquisition targets. Actual habitat acquisition requirements were used in some subzones for San Joaquin kit fox, Alameda whipsnake, and silvery legless lizard.

² Excludes streams.

Table 6-19. Protection Requirements for Covered Plants in Conservation Measure 1.3.1.

Species	Number of Known Occurrences ¹	Number of Occurrences in Public Lands	Number of Occurrences Protected by HCP/NCCP ²	Known Occurrences that May Be Removed by Covered Activities	Occurrence Impact Limit if More Occurrences Are Found ³
Mount Diablo manzanita	12	10	2	0	2
Brittlescale	9	4	4	1	4
San Joaquin spearscale	32	31	0	1	0
Big tarplant	12	6	5	1	5
Mount Diablo fairy lantern	12	11	1 ⁴	0	1 ⁴
Recurved larkspur	4	1	2	1	2
Diablo helianthella	30	28	2	0	2
Brewer's dwarf flax	13	10	3	0	3
Showy madia	0 ⁵	0	0 ⁵	0	0 ⁵
Adobe navarretia	0 ⁶	0	0 ⁶	0	0 ⁶
Total	124	101	19	4	19

Notes:

- 1 Known occurrences within the inventory area are based on CNDDDB data and recent surveys of large tracts (e.g., Jones & Stokes 1989; Mudie & Associates and City of Antioch 2002); occurrences shown in the CNDDDB within large urban areas are assumed to be extirpated and are excluded from this table. All remaining occurrences are assumed to be extant, except where noted. Occurrence records may or may not be the same as individual populations.
- 2 Assumes that willing sellers are available.
- 3 This column provides the limit of impacts, by number of occurrences, on plant species allowable under the HCP/NCCP. The occurrence impact limit assumes that no new occurrences of the species are discovered in HCP/NCCP Preserves (Preserves) and that occurrences removed are of lower health than those protected within Preserves, as defined by Conservation Measure 1.1.2. If additional occurrences are discovered within Preserves and these occurrences are of higher conservation value than occurrences in the permit area, then the impact limit may, following approval by USFWS and CDFG, be increased proportionally to the number of new occurrences found.
- 4 The status of the one occurrence of Mount Diablo fairy lantern outside public lands, in Subzone 4b, is uncertain. If this population is still extant, it will be protected under this HCP/NCCP. If not, no take of this species will be allowed under the HCP/NCCP until a new, high-quality population is found within Preserves.

Notes Continued

- 5 A historic record of showy madia listed in the CNDDDB in Antioch was not re-located during recent surveys (Mudie & Associates and City of Antioch 2002). Until more populations are found and protected in HCP/NCCP Preserves, no impacts on this species will be allowed.
 - 6 The only known records of this species in the inventory area are from two historic collections in and near Antioch. We assume these occurrences have been extirpated. Until these populations are re-located or more populations are found and protected in HCP/NCCP Preserves, no impacts on this species will be allowed.
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Table 6-20. Estimates of the Range of Selected Covered Plant Species Included in HCP/NCCP Preserves (acres)

Species	Est. Impact ¹	Available for Preservation ²	Range Included in Preserve System	
			Est. Minimum ³	Est. Maximum ³
Mount Diablo manzanita				
Suitable range	0	927	547	747
Brittlescale				
Suitable range	147	943	676	767
Big tarplant				
Suitable range	2,367	20,019	10,754	14,081
Suitable low potential range	5,377	11,898	5,619	7,963
Total	7,744	31,917	16,373	22,044
Mount Diablo fairy lantern				
Suitable range	267	24,683	12,744	17,455
Recurved larkspur				
Suitable range	229	1,433	983	1,119
Diablo helianthella				
Suitable range	45	15,317	7,590	10,745
Brewer's dwarf flax				
Suitable range	222	13,052	6,384	9,087
Suitable low potential range	365	6,754	3,597	4,939
Total	587	19,806	9,981	14,026

Notes:

- ¹ Estimated impacts under Impact Scenario 2.
- ² Land within preserve Acquisition Analysis Zones based on models developed for the HCP/NCCP.
- ³ Minimum and maximum habitat for covered wildlife species estimated based on the minimum and maximum proportion of each subzone that would be preserved to meet land acquisition requirements described in measure 1.3.1.

Table 6-21. Comparison of Impacts and Land Acquisition Requirements under Conservation Strategy Alternatives (acres)

Land Cover Type	Proposed Conservation Strategy		Alternative A		Alternative B	
	Estimated Maximum Impact ¹ (Scenario 2)	Land Acquisition Requirement ²	Estimated Maximum Impact ¹ (Scenario 2)	Land Acquisition Requirement ²	Estimated Maximum Impact ¹ (Scenario 1)	Land Acquisition Requirement ²
Annual grassland	5,501	16,500	5,501	16,500	3,645	10,900
Alkali grassland	229	1,000	229	1,000	2	560
Oak savanna	202	400	202	400	124	250
Oak woodland	220	440	220	440	143	300
Chaparral/scrub	1	550	1	350	1	550
Cropland or pasture	6,322	6,250	6,322	6,250	3,532	4,000
Total	12,475	25,140	12,475	24,920	7,447	16,560

Notes:

¹ Estimated maximum impacts are based on the assumptions for each Impact Scenario. Impact Scenario 1 assumes full buildout to the Urban Limit Line (ULL) in areas currently designated for development by local general plans. Impact Scenario 2 assumes full buildout to the ULL, regardless of land use designation (except for urban parks, which remain as parks). See the Preliminary Impact Analysis memorandum dated January 16, 2003 for more details on the impact scenarios and their assumptions.

² Assumes full implementation of the particular impact scenario.

Table 6-22. Estimates of Minimum and Maximum Acquisition of Terrestrial Vegetation Community in Preserve System, by Alternative (acres)¹

Alternative	Alkali Grassland		Annual Grassland		Chaparral		Oak Savanna		Oak Woodland	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Proposed Conservation Strategy	1,034	1,322	16,504	22,182	553	715	1,486	2,127	5,450	8,412
Alternative A	1,034	1,160	16,023	21,095	409	565	1,487	2,105	4,863	7,864
Alternative B	567	689	11,621	16,335	553	715	1,485	2,125	5,442	8,396

Notes:

¹ Agricultural land cover types (cropland or pasture) are not shown because acquisition of these land cover types is expected to be the same or similar to the land acquisition requirements. Agricultural parcels usually include only agricultural lands.

Table 6-23. Estimates of Modeled Habitat for Covered Wildlife Species Included in HCP/NCCP Preserves under each Alternative (acres)

Species	Proposed Conservation Strategy		Alternative A		Alternative B	
	Est. Minimum ¹	Est. Maximum ¹	Est. Minimum ¹	Est. Maximum ¹	Est. Minimum ¹	Est. Maximum ¹
Alameda whipsnake						
Core and perimeter habitat	1,185	1,476	801	1,200	1,185	1,476
Movement habitat	12,145	16,707	11,771	16,326	12,145	16,707
Total	13,330	18,182	12,572	17,527	13,330	18,182
California red-legged frog						
Potential breeding habitat ²	27	38	32	41	22	31
Potential migration/aestivation	27,925	38,803	26,978	36,611	21,781	30,973
Total	27,953	38,842	27,010	36,652	21,803	31,004
Swainson's Hawk						
Potential breeding habitat	7	13	12	20	6	9
Potential foraging habitat	7,513	10,700	7,891	9,853	5,069	6,385
Total	7,520	10,712	7,903	9,872	5,075	6,393
Western Burrowing Owl						
Suitable habitat	17,930	24,395	17,239	22,967	12,118	17,459
Suitable low use habitat	4,670	6,960	5,923	7,016	4,086	5,099
Total	22,599	31,355	23,163	29,984	16,204	22,559
San Joaquin kit fox						
Suitable core habitat	18,007	24,586	17,681	23,541	12,230	17,730
Suitable low use habitat	4,523	6,612	4,755	6,092	3,775	4,871
Total	22,530	31,199	22,436	29,632	16,005	22,601
California tiger salamander						
Potential breeding habitat	22	30	23	31	17	24
Suitable migration/aestivation habitat	24,479	33,282	22,493	30,722	19,005	26,727
Total	24,500	33,312	22,516	30,753	19,022	26,752
Silvery legless lizard						
Suitable habitat	265	437	276	432	223	293
Golden Eagle						
Potential foraging habitat	30,595	42,810	30,628	40,900	24,144	33,959
Tri-Colored Blackbird						
Suitable core habitat	60	83	75	92	46	64
Primary foraging habitat	21,987	30,278	22,457	28,933	15,801	21,934
Secondary foraging habitat	1,177	1,852	1,230	1,463	1,275	1,494
Total	23,225	32,213	23,762	30,488	17,122	23,492

Notes:

¹ Minimum and maximum habitat for covered wildlife species estimated based on the minimum and maximum proportion of each subzone that would be preserved to meet land acquisition targets. Actual habitat acquisition requirements were used in some subzones for San Joaquin kit fox, Alameda whipsnake, and silvery legless lizard.

² Excludes streams.

Table 6-24. Comparison of Land Acquisition Requirements Among Alternatives

Zone and Subzone	Proposed Conservation Strategy	Alternative A	Alternative B
Zone 1			
1a	<ul style="list-style-type: none"> Acquire 367 acres of annual grassland 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
1b	<ul style="list-style-type: none"> Annual grassland acquired incidentally counts toward overall requirement and requirement in Subzone 1c 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
1c	<ul style="list-style-type: none"> Acquire 1,100 acres of annual grassland, at least 0.5 miles wide 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
1d	<ul style="list-style-type: none"> Acquire 25% of Subzone, focusing on northern half of Subzone 	<ul style="list-style-type: none"> Acquire 50% of Subzone, focusing on northern half of Subzone 	<ul style="list-style-type: none"> Same as Proposed Strategy
1e	<ul style="list-style-type: none"> Land acquired in Subzone must be contiguous with land acquired in Subzones 1a or 1c 	<ul style="list-style-type: none"> Acquire 800 acres of annual grassland Land acquired in Subzone must be contiguous with land acquired in Subzones 1a or 1c 	<ul style="list-style-type: none"> Same as Proposed Strategy
Multiple Subzones in Zone 1	<ul style="list-style-type: none"> Lands outside of Blast Zone are higher priority in Subzones 1a, 1b, 1c, and 1e than lands inside the Blast Zone 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
Zone 2			
2a	<ul style="list-style-type: none"> Acquire 875 acres of annual grassland and 50% of Subzone, focused in the northwestern and southeastern corners Protect the known occurrence of Mount Diablo manzanita Acquire all 37 acres of modeled suitable habitat for silvery legless lizard 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
2b	<ul style="list-style-type: none"> Acquire 400 acres of annual grassland 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
2c	<ul style="list-style-type: none"> Acquire 525 acres of annual grassland Acquire 7 of 13 ponds 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
2d	<ul style="list-style-type: none"> Acquire 835 acres of annual grassland 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
2e	<ul style="list-style-type: none"> Acquire 600 acres of annual grassland Acquire all modeled suitable habitat for silvery legless lizard (43 acres) 	<ul style="list-style-type: none"> Acquire 90% of Subzone (up to 797 acres of annual grassland) Acquire all modeled suitable habitat for silvery legless lizard (43 acres) 	<ul style="list-style-type: none"> Same as Proposed Strategy

Zone and Subzone	Proposed Conservation Strategy	Alternative A	Alternative B
2f	<ul style="list-style-type: none"> • Acquire 1,000 acres of annual grassland • Protect the two known occurrences of big tarplant in Deer Valley • Where possible, acquire lands supporting alkali soils in Deer Valley 	<ul style="list-style-type: none"> • Same as Proposed Strategy 	<ul style="list-style-type: none"> • Same as Proposed Strategy
2g	<ul style="list-style-type: none"> • Acquire 230 acres of annual grassland 	<ul style="list-style-type: none"> • Acquire 100% of Subzone (= 430 acres of annual grassland) 	<ul style="list-style-type: none"> • Same as Proposed Strategy
2h	<ul style="list-style-type: none"> • Acquire 750 acres of annual grassland and 75% of Subzone • Protect the known occurrences of Mount Diablo manzanita and Brewer’s dwarf flax • Protect all modeled suitable habitat for silvery legless lizard (86 acres) 	<ul style="list-style-type: none"> • Acquire 90% of Subzone (up to 1,019 acres of annual grassland) • Protect the known occurrences of Mount Diablo manzanita and Brewer’s dwarf flax • Protect all modeled suitable habitat for silvery legless lizard (86 acres) 	<ul style="list-style-type: none"> • Same as Proposed Strategy
2i	<ul style="list-style-type: none"> • Acquire 300 acres of annual grassland 	<ul style="list-style-type: none"> • Same as Proposed Strategy 	<ul style="list-style-type: none"> • Same as Proposed Strategy
Multiple Subzones in Zone 2	<ul style="list-style-type: none"> • Acquire 90% (124 acres) of the chaparral in Subzones 2a, 2b, and 2c • Acquire land in Subzone 2b, 2c, or both to connect Black Diamond Mines and Clayton Ranch • Acquire the four known occurrences of big tarplant in Subzones 2g and 2h outside the ULL • Acquire land with suitable habitat for vernal pool shrimp wherever practicable • Acquire land in Deer Valley (Subzones 2e and 2f) to create a continuous band of modeled suitable core or low use habitat for kit fox between Cowell Ranch and Black Diamond Mines at least 0.5 mile wide • Acquire land in Briones Valley (Subzones 2c, 2d, 4d) to create a continuous band of modeled suitable core or low use habitat for kit fox between Cowell Ranch and Black Diamond Mines 0.5 mile wide 	<ul style="list-style-type: none"> • Same as Proposed Strategy 	<ul style="list-style-type: none"> • Same as Proposed Strategy

Zone and Subzone	Proposed Conservation Strategy	Alternative A	Alternative B
Zone 3			
3a	<ul style="list-style-type: none"> Acquire 90% (212 acres) of suitable core habitat for Alameda whipsnake 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
3b	<ul style="list-style-type: none"> Acquire 25% of Subzone (369 acres), focused in the eastern half of the Subzone 50% of the acquired land must be connected to Clayton Ranch 	<ul style="list-style-type: none"> Acquire 50% of Subzone (738 acres) 50% of the acquired land must be connected to Clayton Ranch 	<ul style="list-style-type: none"> Same as Proposed Strategy
Zone 4			
4a	<ul style="list-style-type: none"> Acquire 75% of Subzone (2,158 acres) Protect the known occurrence of Diablo helianthella and Brewer’s dwarf flax If land acquisition occurs at the southern border of the inventory area, any natural land cover types incidentally acquired outside the inventory area can be counted towards the acreage requirements for this Zone and Subzone 	<ul style="list-style-type: none"> Acquire 20% of Subzone (576 acres) Protect the known occurrence of Diablo helianthella and Brewer’s dwarf flax 	<ul style="list-style-type: none"> Same as Proposed Strategy
4b	<ul style="list-style-type: none"> Acquire 30% of Subzone (492 acres) Protect the known occurrence of Mount Diablo fairy lantern, if it is still extant 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
4c	<ul style="list-style-type: none"> Acquire 30% of Subzone (1,239 acres) 	<ul style="list-style-type: none"> Acquire 60% of Subzone (2,478 acres) All chaparral/scrub within 0.5 mile of Clayton Ranch will be acquired 	<ul style="list-style-type: none"> Same as Proposed Strategy
4d	<ul style="list-style-type: none"> Acquire 60% of Subzone (971 acres) Acquire land in Briones Valley (Subzones 2c, 2d, 4d) to create a continuous band of modeled suitable core or low use habitat for kit fox between Cowell Ranch and Black Diamond Mines 0.5 mile wide 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
4e	<ul style="list-style-type: none"> Acquire 20% of Subzone (151 acres) 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
4f	<ul style="list-style-type: none"> Acquire 20% of Subzone (407 acres) Protect the occurrence of Brewer’s dwarf flax 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
4g	<ul style="list-style-type: none"> Acquire 20% of Subzone (151 acres) 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
4h	<ul style="list-style-type: none"> Acquire 75% of Subzone (772 acres) Acquisition must link the Morgan Territory Ranch with Morgan Territory Preserve and Mount Diablo State Park 	<ul style="list-style-type: none"> Acquire 10 % of Subzone (103 acres) Land acquired must be connected to existing protected areas 	<ul style="list-style-type: none"> Same as Proposed Strategy

Zone and Subzone	Proposed Conservation Strategy	Alternative A	Alternative B
Multiple Subzones in Zone 4	<ul style="list-style-type: none"> • Land acquisition will be focused along Marsh Creek, where possible, especially in the upper reaches where modeled suitable breeding habitat for foothill yellow-legged frog occurs • Acquire 425 acres of chaparral/scrub in Zone • Acquisition in Subzones 4a and 4h must include 90% (518 acres) of the modeled suitable core habitat for Alameda whipsnake • 	<ul style="list-style-type: none"> • Land acquisition will be focused along Marsh Creek, where possible • Acquire 100 acres of chaparral/scrub in Zone 	<ul style="list-style-type: none"> • Same as Proposed Strategy
Zone 5			
5a	<ul style="list-style-type: none"> • Create a continuous habitat connection 0.5 mile wide linking the Byron easements with Los Vaqueros Watershed • Protect the four known occurrences of brittlescale that occur outside existing protected lands • Protect two occurrences of recurved larkspur in Subzone 5a or Subzone 6d • Acquire the seasonal and alkali wetlands along the Contra Costa–Alameda County line south of the California Aqueduct to link with CDFG lands in Alameda County 	<ul style="list-style-type: none"> • Same as Proposed Strategy 	<ul style="list-style-type: none"> • Acquire 2,000 acres of annual grassland • All other requirements are the same as Proposed Strategy
5b	<ul style="list-style-type: none"> • Create a link 0.5 mile wide between Vasco Caves Regional Preserve and the County line 	<ul style="list-style-type: none"> • Same as Proposed Strategy 	<ul style="list-style-type: none"> • Same as Proposed Strategy
5c	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Same as Proposed Strategy 	<ul style="list-style-type: none"> • Same as Proposed Strategy
Multiple Subzones in Zone 5	<ul style="list-style-type: none"> • Acquire 80% (7,120 acres) of annual grassland in Subzones 5a and 5b • Acquire 70% (776 acres) of alkali grassland in Subzones 5a and 5b • Acquire 90% (23 acres) of alkali wetlands in Subzones 5a and 5b • All land preserved in Subzones 5a and 5b must be connected to other Preserve lands within Zone 5 or to existing public lands • Give priority to acquiring sites with suitable habitat for vernal pool invertebrates • Land acquisition in areas with existing San Joaquin kit fox habitat conservation easements will not count 	<ul style="list-style-type: none"> • Acquire 45% (4,000 acres) of annual grassland in Subzones 5a and 5b • Remaining requirements same as Proposed Strategy 	<ul style="list-style-type: none"> • Acquire 300 acres of alkali grassland in Subzones 5a and 5b • Acquire 50% (13 acres) of alkali wetlands in Subzones 5a and 5b • Give priority to acquiring sites with suitable habitat for vernal pool invertebrates • Land acquisition in areas with existing San Joaquin kit fox habitat conservation easements or within incompatible wind turbine easements will not count • All land preserved in Subzones 5a

Zone and Subzone	Proposed Conservation Strategy	Alternative A	Alternative B
	<ul style="list-style-type: none"> Land cover types within incompatible wind turbine easements will not count 		and 5b must be connected to other Preserve lands within Zone 5 or to existing public lands
Zone 6			
6a	<ul style="list-style-type: none"> Acquire 550 acres of cropland or pasture 	<ul style="list-style-type: none"> Acquire 1,550 acres of cropland or pasture 	<ul style="list-style-type: none"> Acquire 350 acres of cropland or pasture
6b	<ul style="list-style-type: none"> Acquire 2,900 acres of cropland or pasture 	<ul style="list-style-type: none"> Acquire 1,900 acres of cropland or pasture 	<ul style="list-style-type: none"> Acquire 2,150 acres of cropland or pasture
6c	<ul style="list-style-type: none"> Acquire 940 acres of cropland or pasture 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Acquire 600 acres of cropland or pasture
6d	<ul style="list-style-type: none"> Acquire 1,385 acres of cropland or pasture Protect two occurrences of recurved larkspur in Subzone 5a or Subzone 6d 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Acquire 900 acres of cropland or pasture Protect two occurrences of recurved larkspur in Subzone 5a or Subzone 6d
6e	<ul style="list-style-type: none"> Acquire 475 acres of cropland or pasture Priority for land acquisition will be given to lands adjacent to the San Joaquin River and to lands acquired across the river in San Joaquin County 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> None
6f	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy
Multiple Subzones in Zone 6	<ul style="list-style-type: none"> Lands will be managed to support new or improve existing foraging habitat for Swainson's Hawk, Western Burrowing Owl, Golden Eagle, or Tricolored Blackbird. Adjustments to management will be compatible with an economically viable agricultural operation. Acquire 80% (258 acres) of the alkali grassland in Zone 6 Conservation easements in Subzones 6c and 6d will also protect 938 acres of suitable low-use habitat for San Joaquin kit fox 	<ul style="list-style-type: none"> Same as Proposed Strategy 	<ul style="list-style-type: none"> Same as Proposed Strategy

Table 6-25. Conservation Easement Acquisition Requirements for Zone 6 under Alternative B (acres)

Subzone	Subzone Size	Cropland and Pasture Mapped	Cropland or Pasture Acquisition Requirement
6a	7,415	5,480	350 (6%)
6b	8,004	5,831	2,150 (37%)
6c	3,318	1,737	600 (35%)
6d	4,273	3,449	900 (26%)
6e	4,994	4,751	0 (0%)
6f	789	548	0 (0%)
Total	28,793	21,796	4,000 (18%)

Use of Livestock Grazing and Controlled Burns to Manage Vegetation

This appendix describes conditions and considerations for use of livestock grazing and controlled burns to achieve vegetation management objectives and will be used to guide development of individual preserve management plans (Conservation Measure 1.4.3).

Livestock Grazing

Existing grazing leases on new preserves will continue until the vegetation management plan is prepared for the preserve and approved by the Implementing Entity. It is expected that livestock grazing will be used throughout the preserves in Zones 1–5 to manage annual grassland vegetation. If livestock grazing is used within a preserve, it will be compatible and consistent with the goals and objectives of the HCP/NCCP. The stocking density or timing of grazing may be changed in some instances to ensure that the goals and objectives of the HCP/NCCP are met. Fencing and other infrastructure (e.g., watering tanks) may require modification to support a grazing regime that will provide the maximum benefit to covered species and native biological diversity. Infrastructure changes should also support fuel load management and emergency response needs as necessary to improve the implementation of prescribed burns and reduce the risk of wildfires.

If livestock grazing is introduced to a preserve, the Implementing Entity will enter into a lease agreement with the livestock operator that specifies the timing and duration of permitted grazing, the stocking density, and the responsibilities for maintaining preserve infrastructure (e.g., fences, watering facilities). Grazing rights should be leased for periods no longer than 5 years. At the expiration of the lease, the Implementing Entity will review its monitoring data to determine whether the lease should be reissued with no changes in grazing management, reissued with changes in the grazing regime, or not reissued. All existing grazing leases at the time of preserve formation will be brought into compliance with these terms as soon as the lease expires after approval of the preserve management plan. All new and renewed leases will include conditions of agricultural use and covenants to protect resources, including:

- grazing capacity and stocking rates,
- residual dry matter guidelines,
- conditions under which desired stocking rate can be changed or exceeded,
- grazing and livestock practices,
- pest control restrictions, and
- reporting requirements.

Rationale

Vegetation management is the primary method for maintaining and enhancing habitat for most covered species and the condition of vegetation communities in the preserves. Livestock grazing is an important management tool currently used in the inventory area on a regional scale by land management agencies such as the East Bay Regional Park District to enhance vegetation, reduce fuel loads, and reduce the biomass and spread of exotic plants. Grazing is an important economic and cultural activity in the inventory area that is consistent with good stewardship of grassland and oak woodland communities.

In general, moderate livestock grazing can benefit many plants and animals, including covered species. After extensive field work in the Los Vaqueros Watershed, biologists have observed that many special-status wildlife species either benefit by grazing or are unaffected by it (Jones & Stokes 1989, 1992a; Contra Costa Water District 1993; Brady & Associates 1996). For example, moderate intensities of livestock grazing tends to increase densities of California ground squirrels (Fitch 1948; Jones & Stokes 1992a), which in turn benefits San Joaquin kit fox, Western Burrowing Owl, California tiger salamander, and California red-legged frog among other species. Because cattle do not graze in chaparral or coastal sage scrub, species such as Alameda whipsnake may be largely unaffected by grazing. In the Los Vaqueros Watershed, Jones & Stokes (1992a) recommended that grazing the area to maintain moderate grass biomass (measured as residual dry matter, or RDM) in some areas and taller grass in other area would maximize the benefits to special-status species while maintaining a healthy population of ground squirrels to support them. A similar approach could be taken on HCP/NCCP preserve lands.

Livestock grazing may be compatible with the maintenance and even the enhancement of native plant communities, including oak woodlands and some native grassland associations. For example, moderate grazing levels may help to maintain purple needlegrass (*Nasella pulchra*) (Menke 1992), a major component of many native grassland associations. Extensive research on the observed low regeneration of oak trees, particularly blue oak (*Quercus douglasii*) and valley oak (*Q. lobata*), has generated mixed results concerning the contribution of grazing. While livestock grazing can reduce acorn germination and seedling survival, other factors, such as deer and rodent predation of acorns, seedlings, and saplings and water competition from herbaceous annual plants, significantly

reduce recruitment of oak trees (see Conservation Measure 2.4.2). Because of the uncertainty regarding the effects or importance of grazing on oaks, measures must be developed based on site-specific conditions and using an adaptive management approach.

Grazing in certain sensitive vegetation communities, however, may be inappropriate or may need to be reduced to maintain or enhance these communities. For example, in 1991 Jones & Stokes established five approximately 0.2-acre grazing exclosures in alkali vegetation communities and alkali scalds in the Los Vaqueros Watershed to study the effects of grazing exclusion on vegetation biomass and composition (Jones & Stokes 1992b). The results of this experiment suggest that alkali grasslands and meadows interspersed with barren scalds respond quickly to the exclusion of grazing through increases in native plant biomass, density, and species diversity. Other alkali plant communities may also benefit from grazing exclusion or reduction in intensity. Similarly, grazing in riparian areas will need to be reduced or eliminated in some areas due to the adverse affect grazing can have on this habitat and the impacts of cattle on water quality of rivers and streams.

Controlled Burning

In preserves where controlled burning (also known as prescribed burning) is used as a vegetation management or fuel-load reduction technique, the preserve management plan will include the following provisions:

- igniting, controlling, and extinguishing the fire;
- smoke control and management;
- contingency measures in the event of an uncontrolled fire; and
- required weather conditions.

For larger burns, a site-specific Burn Plan will be required to implement the burn safely and effectively. Planning for controlled burns will be coordinated with existing fuel-load management and fire suppression activities employed on lands adjacent to preserves. The Burn Plan will also identify measures to rehabilitate areas following burns (e.g., native seed mix requirements), if necessary. Prescribed burns and wildfires will be controlled using measures that minimize adverse effects on covered species and that adhere to the requirements below.

- To avoid impacts on covered amphibians, ponds and wetlands may not be used as water sources for wildfire control.
- Prescribed burning in chaparral, if it is determined to be appropriate (see Conservation Measure 2.5.1), will be timed to minimize effects on the Alameda whipsnake. Some adverse effects are expected, but the risk of a catastrophic fire (without chaparral fuel management) could adversely affect whipsnake more severely than prescribed burns.

- Occasional fires are expected to benefit most covered plants. However, prescribed fires in areas where covered plants occur should be designed to avoid some portions of the plant populations in the event that the fire has unexpected adverse effects on the population. This measure will ensure that the population can recover from the fire.
- Establish fuel breaks around oak savanna restoration sites to allow seedlings and saplings to mature before being exposed to a fire.

All use of fire as a management tool will follow an adaptive management approach such that effects and effectiveness of burns can be determined and controlled burn techniques are improved over time.

Rationale

Fire is an important ecological factor for many natural communities in the inventory area. Fire can be used as a management tool in preserves far from urban development to improve wildlife habitat, enhance native vegetation, reduce fuel loads, reduce the risk of catastrophic fires, and control exotic plants. The use of fire as a management tool in preserves close to urban development is not likely to be practicable because of air quality issues, wildfire risks, and other public concerns. The East Bay Regional Park District prepares and implements Burn Plans in many of its parks, including the Round Valley Regional Preserve. Prescribed burning should be used with caution in some land cover types such as chaparral and coastal sage scrub (see Conservation Measure 2.5.1) and alkali grassland (where the effectiveness of fire in meeting HCP/NCCP goals has not been determined).

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