East Contra Costa County Habitat Conservation Plan Association

DATE: September 13, 2002

TO: HCPA Science Advisory Panel (SAP)

FROM: John Kopchik, Staff Coordinator for the HCPA

SUBJECT: **Second** Set of Background Materials of September 20 Meeting of the Science Advisory Panel

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As Erica Fleishman indicated in her earlier email to the Panel, background materials for the Science Advisory Panel meeting on September 20 will be sent to you in two installments. This is the second installment.

Attached please find the following documents (all were prepared by Jones and Stokes, lead project consultants for the HCPA):

- 19 Preliminary Draft Habitat Models
- 3 Memos describing the purpose and methods for the 19 habitat models (models were presented to the stakeholder committee over a series of meetings, thus the work was contained in three memos rather than one)
- Draft Biological Goals for Covered Species and Natural Communities
- Memo on Options to Address New Scientific Requirements of NCCP Act
- 11x17 flowchart showing the process for developing the HCP/NCCP

I will also send these documents to you in electronic form in case you prefer to review them in that fashion or wished to add comments to the text.

Please feel free to contact me at the Contra Costa County Community Development Department at (925)335-1227(email: jkopc@cd.co.contra-costa.ca.us) with any questions on these background materials.

cc: Erica Fleishman

Attachments.

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Jones & Stokes

Memorandum

Date: July 10, 2002 (updated September 3, 2002)

To: East Contra Costa County HCPA c/o John Kopchik

cc:

From: Ed West and David Zippin, Jones & Stokes

Subject: **ECCC HCP/NCCP Covered Species Distribution Models (1st of 3 memos)**

This memorandum summarizes our proposed methodology for developing models of the distribution of most covered species in the East Contra Costa County HCP/NCCP. We also present preliminary results of four example models to illustrate their function.

Background

Habitat conservation plans (HCPs) are required to estimate the level of take of all covered species. In small HCPs, this is typically done by estimating the maximum number of individuals that could be harmed, harassed, or killed by covered activities. In larger HCPs, this method is usually not possible because of the uncertainty in the location and extent of covered activities, a lack of data on the population status of covered species (i.e., population sizes and locations), or a combination of both. An alternative method to quantifying take is to determine the amount of habitat for each covered species that will be removed. This method is widely used in regional HCPs and is an acceptable alternative to the U.S. Fish and Wildlife Service (FWS) to estimating the number of individuals or populations taken. This is the method that will be employed in the East Contra Costa County HCP/NCCP.

Section 2820a of the California Natural Community Conservation Planning Act of 2001 requires applicants for incidental take permits provide natural community conservation plans that will:

- contribute to the recovery of listed covered species;
- support sustainable populations of covered species;
- provide range of environmental gradients and habitat diversity to support shifting species distributions; and
- sustain movement of species among reserves.

The covered species distribution models will also be used to satisfy the requirements of the NCCP Act.

Purpose of the Models

The purpose of these models is to identify areas within the inventory area where covered species occur, or could occur based on known habitat requirements. We will use these models to quantify impacts from covered activities on covered species. Impact on covered species will be quantified by intersecting the GIS-based map of assumed development in the inventory area with each model of covered species distribution. The models will also be used to develop conservation measures for each covered species. We will evaluate alternative reserve and restoration designs against each covered species model to ensure that regulatory standards and biological goals for each species are met and that conservation for each is maximized. This information will also be used to frame alternative Conservation Strategies. These strategies will be evaluated on the basis of costs, conservation, and other factors to arrive at a preferred conservation strategy.

Model Structure and Development Methodology

The species models being developed for the ECCC HCP/NCCP are designed to accurately and effectively define key habitat characteristics of each species, be repeatable and scientifically defensible while remaining as simple as possible.The models are based on identification of land cover types that provide important habitat for these species (See the Administrative Draft of Chapter 3 of the HCP/NCCP for details of the land cover mapping). For each species, land cover types were identified as suitable habitat based on known or presumed habitat requirements and use patterns of each species. When supported by data, the models were refined by physical parameters such as elevation limits. In some cases, perimeter zones were used to designate habitat use a certain distance from a land cover type. For example, red-legged frogs use upland habitat for aestivation (summer hibernation) and dispersal, but the probability of use decreases with increasing distance from suitable breeding sites (e.g., ponds, streams). For wildlife, land cover types considered to be suitable habitat were classified by habitat use. Land cover types used for breeding were designated as core use areas. Other important habitats that may or may not include the core areas include foraging areas, aestivation areas, and migration, movement, or dispersal corridors.

Determinations of suitable land cover types and additional physical parameters were based on available data from survey reports, environmental documents, and peer-reviewed scientific literature. These data are summarized in the detailed biological profiles for each speices in the HCP/NCCP. When data were inconclusive or contradictory, we assumed conservative values to estimate suitable habitat. Documented occurrences of covered species within the inventory area were used to validate and refine the models. Sources of occurrence data were:

- California Natural Diversity Database
- Biodiversity data (a compilation of sightings of published studies and environmental

documents from a previous study by Jones & Stokes),
- occurrence records from the East Bay Regional Park District's (EBRPD) biological database, and
- records in the Contra Costa Breeding Bird Atlas

Individual occurrences that fall outside a model's predicted habitat distribution were evaluated separately to determine if they indicate flaws in the model or are anomalous points. We examined the original aerial photos to try to explain serious outlier points.

Model Limitations

The precision of the species distribution models is limited to the 10-acre/1 acre minimum mapping units used to map land cover types (land cover types smaller than 10 acres were not mapped, except rock outcrops, riparian scrub/woodland, wetlands, and wind turbines, which were mapped to 1 acre; ponds were mapped wherever they could be distinguished on the air photos, regardless of size). Areas of suitable habitat smaller than the mapping thresholds were not mapped and therefore could not be incorporated into the models. This constraint limited the degree of resolution of some habitat features potentially important to some species. For example, amphibians such as the California red-legged frog and the California tiger salamander require small ponds or other aquatic features for breeding. Suitable breeding habitat was therefore underestimated within the inventory area. The species distribution models are limited to distinguishing habitat uses based on key life history requirements such as breeding, foraging, or dispersal. These uses are then tied to land-cover types. The data do not allow for further distinctions of habitat quality on a regional scale. For example, California red-legged frogs disperse from breeding sites as their ponds or streams dry out during the summer. The movement corridors used by individuals may follow moisture gradients and associated wetland and/or swale vegetation. Including these features in our models was not possible. Accordingly, we used conservative estimates of movement/dispersal habitat requirements. This procedure will overestimate the actual extent of suitable or required habitat for this species, but is consistent with current conservation planning practices when data are limited (Noss et al. 1997).

Because of these limitations, models could not developed for all covered species. For some species, particularly the vernal pool invertebrates and some plants with highly restricted distribution and habitat requirements, available location data and the resolution capacity of the modeling procedure were insufficient to precisely identify potential habitat. The wetland habitat areas used by the invertebrate species were of such small size or specific physical condition (e.g, pond duration, depth) that they could not be mapped from aerial photography. By assuming they occur in mapped ponds and other aquatic sites, we would greatly over-represent their true distribution. Similar limitations were characteristic of several plant species. For this reason, models for these species will not be developed for the HCP/NCCP. Instead, take of these species will likely be estimated based on known occurrences (i.e., populations) and a take "ceiling" deemed reasonable based on knowledge of the inventory area. Take of these species will need to

be verified during site-specific surveys during HCP/NCCP implementation.

Representative models, assumptions, and results

Models for the Alameda whipsnake, California red-legged frog, Swainson's hawk and burrowing owl are presented here to illustrate the methodology, assumptions and results of the modeling process. Each model is based on a set of assumptions that define the mapping parameters used to identify the land cover areas important to each species. Rationales for the assumptions are also provided. The model results are presented in color Figures 1-4 and described below.

Alameda whipsnake

Model Assumptions

1. All chaparral and scrub land cover within the inventory area was considered core habitat for Alameda whipsnake. In addition, a perimeter zone of all adjacent grassland, oak savanna and oak woodland within 500 feet of the scrub areas was also considered core habitat for this species. Core habitat for Alameda whipsnake is defined as home range areas in which individuals find shelter, breed, hibernate, and spend the majority of their time foraging.

2. All areas of annual grassland, oak woodland, oak savannah, riparian woodland/scrub and stream channels within a 1-mile radius of core Alameda whipsnake habitat were considered suitable movement habitat for this species.

Rationale

Core Habitat: Direct observations of Alameda whipsnakes and radio telemetry data on their movement patterns have shown that individuals tend to establish home ranges primarily within coastal scrub habitat, but also frequently move into adjacent grassland, oak savanna and occasionally oak woodland (Jennings 1983, Stebbins 1985, Swaim 1994). Most telemetry locations are within 170 feet of scrub habitat, but individuals have been tracked out to 500 feet (Swaim 1994). Whipsnakes can remain in grasslands for periods ranging from a few hours to several weeks. Male whipsnakes use grasslands primarily during the mating season in spring; females use these areas mostly after mating, possibly in their search for suitable egg-laying sites (Swaim 1994). Rock outcrops are also important habitat to whipsnakes in providing sites for efficient thermoregulation, shelter retreats, and foraging. Within the core areas, Alameda whipsnakes most commonly occur on east, south, southeast and southwest facing slopes (Swaim 1994), but may also use north facing slopes in more open stands of scrub habitat (McGinnis 1990, Swaim, pers. comm. in USFWS 2000a).

Movement habitat and corridors: Adult male whipsnakes commonly move long distances

away from their core areas during the breeding season (Swaim 2000). Also juveniles and hatchlings disperse annually away from their natal core areas in search of new habitats. A recent review of Alameda whipsnake locality data revealed that numerous Alameda whipsnakes have been observed at distances significantly greater than 500 feet from scrub habitat (Swaim 2000). These distances range from 0.1 mile to 4 miles. The 4 mile records appears to be anomalous; the next longest distance being 1.5 miles and all other records (9) were less than 1mile (mean for the 10 values = 0.46 miles).

Because the data on these whipsnake movements is limited (Swaim 2000), for the purposes of this model we used a conservative estimate of 1.0 mile to define the potential dispersal/movement distance of whipsnakes away from core coastal scrub habitat. Within this radius, however, it is unknown what pathways the snakes may take. Rock outcrops probably facilitate these long distance movements in these areas, but are apparently not essential (Swaim 1994, 2000). Individual whipsnakes have been located over 3,000 feet from scrub in areas where no significant rock outcrops were present between the closet patch of scrub and the location where the snake was found. Stream channels also are probably used as movement corridors between core areas (Swaim 2000). For these reasons we included all grassland and oak savanna areas within a 1-mile radius of all coastal scrub area in the inventory area as suitable Alameda whipsnake movement habitat. Furthermore, we considered all stream channels in and networked with channels within this 1-mile radius as potential dispersal/movement corridors for this species.

Results

Figure 1 shows the modeled potential habitat of the Alameda whipsnake within the ECCC HCP/NCCP inventory area. The habitat includes the eastern slopes of Mt. Diablo and much of the surrounding foothills in the western and southwestern portions of the inventory area. The documented occurrences of Alameda whipsnakes in this area correspond well to locations within core areas or in adjacent movement habitat and corridors. Two recently documented occurrences are located in grassland habitat north and northeast of Los Vaqueros Reservoir approximately 4 miles from the nearest potential chaparral/scrub habitat. We closely examined the aerial photos at these locations and found no visible features (e.g., small patch of scrub, small rock outcrop, etc.) that might explain the occurrence. The California Department of Fish and Game (DFG) has agreed to fund a trapping study of whipsnakes at those locations to verify them and to develop a better understanding of whipsnake habitat away from chaparral and coastal sage scrub stands. DFG staff agreed that the model could not be refined any more based on our current understanding of suitable habitat for this species and the data available.

A small area southeast of Mt. Diablo is not shown as suitable habitat for the Alameda whipsnake. This area is likely suitable movement habitat because of the proximity (less than 1 mile) of chaparral and scrub habitat outside the inventory that was not mapped.

The minimum home range size of adult male Alameda whipsnakes in coastal scrub habitat is approximately 5 acres. Habitat patches of this size within the inventory area could not be mapped due to the 10 acre minimum habitat resolution capacity of the model. Rock outcrop areas, which are important to the Alameda whipsnake within core areas and movement corridors, were not mapped if they were less than one acre in size. If small patches of these habitat occurred to the east of mapped suitable habitat, the dispersal range of this species would extend farther into the urban limit line. A close examination of the aerial photos found no such small patches within the grassland in or near the urban limit line that would extend the model to the north or east. The model provides reasonable conservative estimates for both core habitat and movement corridors/dispersal habitat.

California red-legged frog

Model Assumptions

1. Ponds and streams in riparian woodland/scrub, wetland or seasonal wetland, annual grassland, alkali grassland, oak savanna, oak woodland, non-urban ruderal (ruderal land cover areas outside existing urban land cover areas) and turf land-cover types were considered potential breeding habitat for California red-legged frog.
2. Streams in urban areas were also considered potential breeding habitat for this species.
3. All non-urban non-aquatic land cover types within 1 mile of potential breeding sites were considered potential migration and aestivation habitat for this species.
4. Ponds in urban areas with substantial areas of suitable aestivation habitat intact (>50% of 1-mile buffer) were considered to be suitable breeding habitat unless absence is verified by recent surveys.

Rationale

Breeding habitat: Breeding sites used by California red-legged frogs include a variety of aquatic habitats (Stebbins 1985, Hayes and Jennings 1988, USFWS 2000b). Larvae, tadpoles and metamorphs use streams, deep pools, backwaters within streams and creeks, ponds, and marshes. Breeding adults are commonly found in deep (more than 2 feet), still or slow-moving water with dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988). Adult frogs have also been observed in shallow sections of streams that are not shrouded by riparian vegetation. Generally, streams with high flows and cold temperatures in spring are unsuitable for eggs and tadpoles. Within the ECCC HCP/NCCP inventory area stock ponds are frequently used as breeding sites by this species if the ponds are managed to provide suitable hydroperiod, pond structure, vegetative cover, and control of nonnative predators. All existing ponds and streams within the inventory area were, therefore, considered potential suitable breeding habitats for California red-legged frogs.

Migration and aestivation habitat: During dry weather, California red-legged frogs are seldom found far from water. However, as ponds dry out these frogs disperse from their breeding sites to other areas with water or to temporary shelter or aestivation sites. This latter habitat may include small mammal burrows, incised stream channels, shelter under boulders, rocks, logs, leaf litter, agricultural drains, watering troughs, abandoned sheds or unused farm equipment (Jennings and Hayes 1994, USFWS 2000b). Movements of up to 1 mile from breeding sites to aestivation sites are apparently typical (Stebbins 2002), although some individual frogs have been found up to 2 miles away (USFWS 2000b). These dispersal and migration movements are generally straight-line, point-to-point migrations rather than following specific habitat corridors (USFWS 2000b, Stebbins 2002). They may be along long-established historic migratory pathways that provide specific sensory cues that guide the seasonal movement of the frogs (Stebbins 2002). Dispersal distances are believed to depend on the availability of suitable habitat and prevailing environmental conditions. However, because the actual movement patterns of California red-legged frogs in these habitats is generally not known, for this model we conservatively estimated that all non-urban land cover areas within a radius of 1 mile from all potential breeding sites were potential migration and/or aestivation habitats for California red-legged frogs.

Results

Figure 2 shows the modeled potential habitat of the California red-legged frog within the ECCC HCP/NCCP inventory area. The habitat includes approximately two-thirds of the inventory area, and is primarily located along the hilly portions of the western side of this area. All documented occurrence locations fit well within the boundaries of the model.

The large size of the habitat is due to the high number of ponds that provide potential breeding habitat and the potential dispersal distance of this species. Because the actual movement patterns of the frogs away from breeding sites is not known (but is believed to often be line-of-sight), we used conservative estimates of the movement/dispersal habitat requirements based on known distances of movement of individuals provided in available reports. We then included all potentially suitable habitats within a radius based on the mode of long-range distances moved by the frogs and classified these areas as suitable movement habitat for the species. Although the model underestimates the extent of ponds and other aquatic features, it is unknown whether the model underestimates or overestimates the extent of suitable breeding habitat for the California red-legged frog because, with the exception of the Los Vaqueros watershed and East Bay Regional Park lands, the suitability of these ponds (both mapped and unmapped) for this species is unknown.

Two aquatic sites in Brentwood are surrounded by urban development but may still support this species. The DFG and the U.S. Fish and Wildlife Service (FWS) have agreed to field verify these sites to determine if California red-legged frog are present. Until these surveys are complete, we will assume presence at these sites.

Swainson's hawk

Model Assumptions

1. Potential breeding habitat included all riparian woodland scrub and non-native woodland land cover types within the inventory area.
2. All cropland and pasture, within 10 miles of existing breeding sites or potential breeding habitat were considered potential Swainson's hawk foraging habitat.
3. Annual grassland, alkali grassland, and seasonal wetland land-cover types below 150 feet in elevation are also considered potential foraging habitat.

Rationale

Foraging Habitat: Historically, Swainson's hawks are believed to have foraged in upland and seasonally flooded perennial grasslands (Woodbridge 1998). In the Central Valley, Swainson's hawks now forage primarily in low-growing crop areas and perennial grasslands (Estep 1989, pers. comm. 2002). Preferred foraging habitats include alfalfa, fallow fields, beet, tomato, and other low-growing row or field crops, dry-land and irrigated pasture, rice land during the non-flooded period, and cereal grain crops (Estep 1989). Individual birds or nesting pairs may use over 15,000 acres of habitat or range up to 18 miles from the nest in search of prey (Estep 1989, Babcock 1993). The California Department of Fish and Game considers a 10-mile flight distance between active nest sites and suitable foraging habitats as a standard for direct impact analysis. This distance was used to identify all potential foraging Swainson's hawk foraging habitat within the ECCC HCP/NCCP inventory area. Swainson's hawks in the inventory do not forage above approximately 150 feet in elevation (Glover, pers. comm.; Sterling, pers. comm.), so a filter was used in this model to exclude these areas.

Breeding Habitat: In California, Swainson's hawks typically nest at the edge of narrow bands of riparian vegetation, in isolated oak woodland and in lone trees, roadside trees, or farmyard trees, as well as in adjacent urban residential areas (Estep 1989; England et al. 1995, 1997). The 10-acre resolution limitation of the land cover mapping allows for identification of only the largest riparian woodland/non-native woodland land cover areas within the implementation area.

Results

Figure 3 shows the modeled potential habitat of the Swainson's hawk within the ECCC HCP/NCCP inventory area. The habitat includes extensive areas of row-crop and pasture land cover within the inventory area. All of these areas are within the 10-mile foraging range of the species from potential nesting habitat. Only one occurrence record was available for this species within the inventory area digitally. This record was located within potential breeding habitat

identified by the model. Ten records identified in the Contra Costa Breeding Bird Atlas (Steve Glover, personal communication) all fall within the modeled habitat in the northeast corner of the inventory area.

Numerous other sites within agricultural and urban areas may also provide suitable breeding habitat for this species in the form of small woodlands and isolated trees. However, these areas could not be identified in this model because these small-scale features were not mapped.

Western burrowing owl

Model Assumptions

1. All annual grassland, alkali grassland, wind turbine, seasonal wetland, ruderal and turf land cover types within the inventory area were considered suitable breeding and foraging habitat for western burrowing owl.
2. All pasture and cropland land cover was considered occasional or limited use areas for western burrowing owl.

Rationale:

Western burrowing owls typically occur in dry, open, shortgrass, treeless plains often associated with burrowing mammals (Haug et al. 1993). Golf courses, cemeteries, road allowances within cities, levees, and ruderal borders around agricultural fields, airports, and vacant lots in residential areas are also used for both breeding and foraging. Within the ECCC HCP/NCCP inventory area these habitats are represented by the annual grassland, alkali grassland, wind turbine, seasonal wetland, ruderal and turf land cover types.

Burrowing owls are also known to use agricultural areas occasionally when they are fallow or continually in the margins of these fields. Many patches of ruderal land-cover type less than 10 acres in size (i.e., less than the minimum mapping unit) occur within areas mapped as cropland or pasture. These small patches are suitable for burrowing owls. To account for the occasional use by owls of fallow agricultural fields, and the low density use by owls of patches of ruderal areas, we mapped habitat as “occasional or limited use” in all cropland and pasture land-cover types.

Results

Figure 4 shows the modeled potential habitat of the western burrowing owl within the ECCC HCP/NCCP inventory area. The habitat includes large areas of grassland and ruderal habitat throughout the inventory area, and extensive areas of occasional or limited use in cropland and pasture. Most of the available occurrence records are included within the model boundaries.

Those outside the model are most likely in suitable habitat areas, but in areas smaller than the 10-acre resolution of the model. Suitable habitat smaller than 10 acres outside model boundaries (e.g., patches associated in residential areas and around airports), were not mapped and are therefore potentially under-represented. However, the model may compensate for this potential bias by conservatively estimating the amount of grassland, ruderal, cropland, and pasture habitat available to burrowing owls for breeding and foraging.

Western burrowing owls are almost certainly undersurveyed and underreported in the inventory area. Actual densities of owls may be low because of historic or current rodent control programs that reduce their prey base.

Literature Cited

Babcock, K. W. 1995. Home range and habitat use of breeding Swainson's hawks in the Sacramento Valley of California. J. Raptor Res. 29:193-197.

England, A. S., J. A. Estep, and W. R. Holt. 1995. Nest-site selection and reproductive performance of urban-nesting Swainson'' hawks in the Central Valley of California. J. Raptor. Rese. 29:179-186.

England, A. S., M. J. Bechard, and C. S. Houston. 1997. Swainson's hawk (*Buteo swainsoni*). *In* The birds of North America, No. 265 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D. C. 28 pp.

Estep, J. A. 1989. Biology, movements, and habitat relationships of the Swainson's hawk in the Central Valley of California, 1986-87. Calif. Dept. Fish Game, Nongame Bird and Mamal Sec. Report. 27 pp.

Hauge, E. A., B. A. Millsap, and M. S. Martell. 1993. Burrowing owl (*Speotyto cunicularia*). *In* The Birds of North america, No. 61 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D. C.: The American Ornithologists' Union.

Hayes, M. P. and M. R. Jennings. 1988. Habitat correlated of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): Implications for management. Pp. 144-158 *in* Proceedings of the symposium on the management of amphibians, reptiles, aand small mammals in North America. R. Sarzo, K. E. Severson, and D. R. Patton (technical coordinators). USDA Forest Service General Technical Report RM-166.

Jennings, M. R. 1983. *Masticophis lateralis*. Catalogue of American amphibians and reptiles 343.1-343.2.

Jennings, M. R. and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. Report prepared for the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, California. 255 pp.

McGinnis, S. M. 1990. Survey for the Alameda whipsnake (*Masticophis lateralis euryxanthus*) on the north-facing slope of the Kellog Creek watershed west of Vasco Road, Contra Costa County, California.

Noss, R. F., M. A. O'Connell, and D. D. Murphy. 1997. The science of conservation planning: Habitat conservation under the endangered species act. Island Press, Washington, D. C. 246 pp.
Stebibins, R. C. 1985. A field guide to western reptiles and amphibians. Second edition, revised. Houghten Mifflin Book Co., Boston. 336 pp.

Stebbins, R. C. 2002. Factors to consider in efforts to compensate for development impacts on the habitat of declining reptile and amphibian species. Unpublished document. May 30, 2002. 3 pp.

Swaim, K. E. 1994. Aspects of the ecology of the Alameda whipsnake (*Masticopis lateralis euryxanthus*). Masters Thesis, California Ste University, Hayward, CA. 140 pp.

Swaim, K. E. 2000. Alameda whipsnake habitat assessment Carnigie
State vehicle recreation Area and Alameda/Telsa properties Alameda and San Joaquin counties, California. California Department of Parks and Recreation, Livermore, CA.

U. S. Fish and Wildlife Service (USFWS). 2000a. Endangered and threatened wildlife and plants: final determination of critical habitat for the Alameda whipsnake (*Masticophis lateralis euryxanthus*). Federal Register 65(192)58933-58962.

U. S. Fish and Wildlife Service (USFWS). 2000b. Draft recovery plan for the California red-legged frog (*Rana aurora draytonii*). U. S. fish and Wildlife Service, Portland, Oregon. 258 pp.

Woodbridge, B. 1998. California Partners in Flight Riparian Bird Conservation Plan for the Swainson's Hawk. Point Reyes Bird Observatory website.
http://www.prbo.org/calpif/htmldocs/species/riparian/swhaacct.html 16 pp.

Personal Communications

Glover, Steve. 2002. Contra Costa County Breeding Bird Atlas.

Sterling, John. 2002. Jones & Stokes ornithologist.

Jones & Stokes

Memorandum

Date: August 9, 2002 (updated September 3, 2002)

To: East Contra Costa County HCP Stakeholders Group (updated for SAP)

cc:

From: Ed West and David Zippin, Jones & Stokes

Subject: **ECCC HCP/NCCP Covered Species Distribution Models (#2)**

This memorandum presents preliminary results for the second set of four covered species distribution models for the ECCC HCP/NCCP. The background, purpose, model structure and development methodology for all covered species models was presented in the previous memo.

Models for the San Joaquin kit fox, California tiger salamander, giant garter snake and recurved larkspur are presented here. Each model is based on a set of assumptions that define the mapping parameters used to identify the land cover areas important to each species. Rationales for the assumptions are also provided. The model results are presented in Figures 5-8 and described below.

San Joaquin Kit Fox

Model Assumptions:

1. The following land cover types were considered core habitat for the San Joaquin kit fox:
   - Annual grassland suitable for all kit fox activities including foraging, denning, shelter and movement corridors that is connected to known kit fox movement routes;
   - Oak savanna contiguous with annual grassland;
   - Alkali grassland within annual grassland or connected to annual grassland by agricultural lands;
   - Seasonal wetland within annual grassland or oak savanna;
   - Ruderal areas within annual grassland or oak savanna or contiguous with adjacent annual grassland;
   - All wind turbine areas within annual grassland
2. Cropland, pasture, and orchard land cover types within 1 mile of core habitat as defined above was considered low use habitat in which kit foxes may occur.
3. Grassland and oak savanna patches isolated from large contiguous tracts of annual grassland by oak woodland or chapparal/scrub were considered non-habitat.

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Rationale

Core Habitat: In the northern part of its range (including Contra Costa County), where most habitat on the valley floor has been eliminated, kit foxes now occur primarily in foothill grasslands (Swick 1973, Hall 1983, Williams et al. 1998), valley oak savanna and alkali grasslands (Bell 1994). They prefer habitats with loose-textured soils (Grinnell et al 1937, Hall 1946, Egoscue 1962, Morrell 1972), suitable for digging, but occur on virtually every soil type. Dens are generally located in open areas with grass or grass and scattered brush, and seldom occur in areas with thick brush (Morrell 1972). Preferred sites are relatively flat, well-drained terrain (Williams et al. 1998, Roderick and Mathews 1999). They are seldom found in areas with shallow soils due to high water tables (McCue et al. 1981) or impenetrable bedrock or hardpan layers (Morrell 1975, O'Farrell and Gilbertson 1979, O'Farrell et al. 1980). However, kit foxes may occupy soils with a high clay content where they can modify burrow dug by other animals such as ground squirrels (*Spermophilus beeychii)* (Orloff et al. 1986).

The geographical separation of suitable and unsuitable habitat of annual grassland and oak savanna was based on the location of large tracts of oak woodland separating large contiguous tracts of these land cover types from smaller isolated patches at higher elevations to the west. While kit foxes may occasionally use oak woodland habitat, at least along the margins adjacent to core grassland habitat (Orloff, pers. com.), they are not likely to frequently pass through these areas due to higher predation potential from other canids (coyotes, gray foxes, red foxes) and reduced prey availability. Isolated patches of grassland and oak savanna beyond these oak woodland tracts were therefore considered not suitable habitat for this species.

Low Use Habitat: San Joaquin kit foxes also less frequently occur adjacent to and forage in tilled and fallow fields and irrigated row crops (Bell 1994, Williams et al. 1997). These foxes will den within small parcels of native habitat that is surrounded by intensively maintained agricultural lands (Knapp 1978) and adjacent to dryland farms (Jensen 1972, Orloff et al. 1986, Williams et al. 1998). Kit foxes are known to use agricultural areas within the inventory area in these ways.

Results:

Figure 5 shows the modeled potential habitat of the San Joaquin kit fox within the ECCC HCP/NCCP inventory area. The habitat includes approximately two-thirds of the inventory area and is primarily located within the low elevation grassland areas between the agricultural/urban areas in the east and north and the higher elevation foothill areas around Mt. Diablo to the west. The documented occurrences of San Joaquin kit foxes in this area correspond well to locations within the modeled core area habitat.

California Tiger Salamander

Model Assumptions:

1. All ponds, wetlands, seasonal wetlands, and alkali wetlands within annual grassland, oak savanna, and oak woodland were considered potential breeding habitat for California tiger salamander.
2. All non-urban, non-aquatic land cover types within 1 mile of potential breeding sites were considered potential migration and aestivation habitat for this species.

Rationale:

California tiger salamanders require 2 major habitat components: aquatic breeding sites and terrestrial aestivation or refuge sites. California tiger salamanders inhabit valley and foothill grasslands and the grassy understory of open woodlands, usually within 1 mile of water (Jennings and Hayes 1994). The California tiger salamander is terrestrial as an adult and spends most of its time underground in subterranean refugia. Underground retreats usually consist of ground-squirrel burrows and occasionally human-made structures. Adults emerge from underground to breed, but only for brief periods during the year. Tiger salamanders breed and lay their eggs primarily in vernal pools and other ephemeral ponds that fill in winter and often dry out by summer (Loredo et al. 1996); they sometimes use permanent human-made ponds (e.g., stock ponds), reservoirs, and small lakes that do not support predatory fish or bullfrogs (see "Ecological Relationships" discussion below) (Stebbins 1972, Zeiner et al. 1988). Streams are rarely used for reproduction.

Adult salamanders migrate from upland habitats to aquatic breeding sites during the first major rainfall events of fall and early winter and return to upland habitats after breeding. This species requires small-mammal (e.g., California ground squirrel) burrows for cover during the non-breeding season and during migration to and from aquatic breeding sites (Zeiner et al. 1988). California tiger salamanders also use logs, piles of lumber, and shrink-swell cracks in the ground for cover (Holland et al. 1990) California tiger salamanders can overwinter in burrows up to 1 mile from their breeding sites (Jennings and Hayes 1994).

The proximity of refuge sites to aquatic breeding sites also affects the suitability of salamander habitat. Although the variation in distances between breeding and refuge sites is poorly studied (Jennings and Hayes 1994) juvenile salamanders are known to migrate distances up to 1 mile (1.6 km) from breeding sites (Austin and Shaffer 1992, Mullen *in* U.S. Fish and Wildlife Service 2000. Research has shown that dispersing juveniles can roam up to 1 mile from their breeding ponds.

Results:

Figure 6 shows the modeled potential habitat of the California tiger salamander. The habitat

includes approximately two-thirds of the inventory area and is largely located in the hilly portions of the western side of this area. All documented occurrences of this species fit well within the boundaries of the model.

The large proportion of the modeled habitat within non-urban areas is due to the large number of ponds that provide potential breeding habitat and the potential dispersal distance of this species. Loredo et al. (1996) found that tiger salamanders may use burrows that are first encountered during movements from breeding to upland sites. In their study area, where the density of California ground squirrel burrows was high, the average migration distances between breeding and refuge sites for adults and juveniles was 118 feet (35.9 m) and 85 feet (26.0 m), respectively. Therefore, although salamanders may migrate up to 1 mile, migration distances are likely to be less in areas supporting refugia closer to breeding sites. However, because the actual movement patterns of the salamanders away from breeding sites is not known within the inventory area, we used a conservative estimate of 1 mile to define the potential movement/dispersal habitat requirements for this species. Also, due to the 10 acre minimum resolution function of the model, vernal pools and seasonal wetlands could not be delineated within the modeled distribution areaand their abundance is likely to have been underestimated.

Giant Garter Snake

Model Assumptions:

1. The slough/channel, pond, and stream land-cover type within or adjacent to pasture and cropland were considered core habitat for the giant garter snake.
2. Pasture, cropland, and ruderal land-cover types within 900 feet of streams, sloughs and irrigation channels were considered potential movement and foraging habitat for the giant garter snake.

Rationale:

Core Habitat: The giant garter snake inhabits agricultural wetlands and associated waterways, including sloughs, irrigation and drainage canals, ponds, low-gradient streams, and adjacent uplands (U.S. Fish and Wildlife Service 1999).

Movement Habitat: During the active season, giant garter snakes generally remain in close proximity to wetland habitats but can move over 800 feet from the water during the day (G. Hansen 1988, Wylie et al. 1997). Because the actual movement patterns of garter snakes are not known, we used a conservative estimate of 900 feet to define the potential movement habitat

requirements for this species.

Results:

Figure 7 shows the modeled potential habitat of the giant garter snake within the inventory area. No occurrence records for this species were found within the inventory area. The only known records in the vicinity of the inventory area are to the north in the Sacramento/San Joaquin Delta. However, few surveys have been conducted for this species within the inventory area, but suitable habitat is known to occur there.. The habitat is largely restricted to the sloughs and surrounding agricultural areas in the northeast portion of the inventory area.

Recurved Larkspur

Model Assumptions:

1. All alkali grassland within the inventory area was considered suitable habitat for recurved larkspur.

Rationale:

Recurved larkspur occurs on sandy or clay alkaline soils, generally in annual grasslands or in association with saltbush scrub or valley sink scrub habitats, ranging in elevation from 100 to 2,000 feet above sea level (California Natural Diversity Data Base 2001).

Results:

Figure 8 shows the modeled potential habitat of the recurved larkspur within the inventory area. The habitat is restricted to the alkali grassland in the southeast portion of the area. Three of the four known occurrences fit well within the boundaries of the model. The record outside the model occurs in a patch of alkali grassland that was below the 10-acre minimum resolution of the land cover mapping (R. Preston, pers. comm.)

Literature Cited

Barry, S. J., and H. B. Shaffer. 1994. The status of the California Tiger Salamander (*Ambystoma californiense*) at Lagunita: a 50-year update. Journal of Herpetology 28:159–164.

Bell, H. 1994. Analysis of habitat characteristics of San Joaquin kit fox in its northern range.

Master's Thesis, California State University, Hayward.

Brode, J. and G. Hansen. 1992. Status and future management of the giant garter snake (*Thamnophis gigas*) within the southern American Basin, Sacramento and Sutter counties, California. California Department of Fish and Game, Inland Fisheries Division.

Brode, J. 1988. Natural history of the giant garter snake (*Thamnophis couchi gigas*). Pages 25–28, *in* Proceedings of the conference on California herpetology, H.F. DeListe, P. R. Brown, B. Kaufman, and B. M. McGurty (eds). Southwestern Herpetologists Society, Special Publication No. 4.

California Natural Diversity Database. 2001. RareFind 2, Version 2.1.2 (September 5, 2001 update). California Department of Fish and Game, Sacramento, CA.

Feaver, P. E. 1971. Breeding pool selection and larval mortality of three California amphibians: *Ambystoma tigrinum californiense* Gray, Hyla regilla Baird and Girard, and Scaphiopus hammondii Girard. MA Thesis, Fresno State College, Fresno, CA.

Grinnell, J., J. S. Dixon, and J. M. Linsdale. 1937. Fur-bearing mammals of California. Univ. California Press, Berkeley. Vol. 2, xiv + 377-777.

Hall, Jr., F. A. 1983. Status of the San Joaquin kit fox, *Vulpes macrotis mutica*, at the Bethany Wind Turbine Generating Project site, Alameda County, California. California Department of Fish and Game. 36pp.

Hansen, G. E. 1988. Review of the status of the giant garter snake (*Thamnophis couchi gigas*) and its supporting habitat during 1986–1987. Final report for California Department of Fish and Game, Contract C-2060. Unpublished. 31 pp.

Hansen, G. E. and J. M. Brode. 1993. Results of relocating canal habitat of the giant garter snake (*Thamnophis gigas*) during widening of State Route 99/70 in Sacramento and Sutter counties, California. Final report for Caltrans Interagency Agreement 03E325 (FG7550)(FY87/88-91-92). Unpublished. 36 pp.

Holland, D. C., M. P. Hayes, and E. McMillan. 1990. Late summer movement and mass mortality in the California tiger salamander (*Ambystoma californiense*). Southwestern Naturalist 35:217–220.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. Final Report to the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA. 225 pp.

Jensen, C. C. 1972. San Joaquin kit fox distribution. Bureau of Sport Fish and Wildlife, Div. Wildlife Serv., Sacramento, Ca. 22 pp.

Knapp, D. K. 1978. Effects of agricultural development in Kern County, California, on the San Joaquin kit fox in 1977. Final Report, Project E-1-1, Job V-1.21, Non-Game Wildlife Investigations, California Department of Fish and Game, Sacramento, California.

Loredo, I., D. Van Vuren, and M. L. Morrison. 1996. Habitat use and migration behavior of the California tiger salamander. Journal of Herpetology 30:282–285.

McCue, P., T. Kato, M. L. Sauls, T. P. O'Farrell. 1981. Inventory of San Joaquin kit fox on land proposed as Phase II, Kesterson Reservoir, Merced County, California. Topical Report EGG 1183-2426, EG&G, Santa Barbara Operations, U.S. Department of Energy, Goleta, California.

Morrell, S. 1972. Life history of the San Joaquin kit fox. California Fish and Game 58:162-174.

O'Farrell, T. P., T. Kato, P. McCue, and M. S. Sauls. 1980. Inventory of the San Joaquin kit fox on BLM lands in southern and southwestern San Joaquin Valley. Final Report, ECC 1183-2400, EG&C, Santa Barbara Operations, U.S. Department of Energy, Goleta, California.

O'Farrell, T. P. and L. Gilbertson 1979. Ecological life history of the desert kit fox in the Mojave desert of southern California. Final Report. U.s. Bureau of Land Management, Desert Plan Staff, Riverside, California.

Orloff, S., F. Hall, and L. Spiegel. 1986. Distribution and habitat requirements of the San Joaquin kit fox in the norther extreme of their range. Trans. West. Sect. Wildl. Soc. 22: 60-70.

Roderick, P. J. and N. E. Mathews. 1999. Characteristics of natal and non-natal kit fox dens in the northern Chihuahuan Desert. Great Basin Naturalist 59(3):252-258.

Rossman, D. and G. Stewart. 1987. Taxonomic reevaluation of *Thamnophis couchi* (*Serpentes:Colubridae*). Occasional Papers of the Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana. No. 63. 25 pp.

Shaffer, H. B., R. N. Fisher, and S. E. Stanley. 1993. Status report: The California tiger salamander (*Ambystoma californiense*). Final report to the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, California, under Contracts (FG 9422 and FG 1383).

Stebbins, R. C. 1972. California amphibians and reptiles. Univ. California Press, Berkeley. 152 pp.

Swick, C. D. 1973. Determination of San Joaquin kit fox in Contra Costa, Alameda, San Joaquin, and Tulare Counties. Special Wildlife Investigations Program Report W-54-R4, California Department of Fish and Game, Sacramento, California. 14 pp.

U. S. Fish and Wildlife Service. 1999. Draft Recovery Plan for the giant garter snake (*Thamnopsis gigas*). U. S. Fish and Wildlife Service, Portland, Oregon. ix + 129 pp.

Williams, D. F., E. A. Cypher, P. A. Kelly, N. Norvell, C. D. Johnson, G. W. Colliver, and K. J. Miller. 1998. Draft Recovery Plan for Upland Species of the San Joaquin Valley, California. U. S. Fish and Wildlife Service, Portland Oregon 295 pp.

Wylie, G. D., M. Cassaza, and J. K. Daugherty. 1997. 1996 progress report for the giant garter snake study. Preliminary report, U.S. Geological Survey, Biological Resources Division.

Zeiner, D. C., W. F. Laudenslayer, Jr., and K. E. Meyer. 1988. California's wildlife. Volume I: amphibians and reptiles. May 2, 1988. California Department of Fish and Game. Sacramento, CA.

Jones & Stokes

Memorandum

Date: September 10, 2002

To: East Contra Costa County HCP Association c/o John Kopchik

cc:

From: Ed West and David Zippin, Jones & Stokes

Subject: **ECCC HCP/NCCP Covered Species Distribution Models (#3)**

This memorandum presents preliminary results for the last 11[1] covered species distribution models for the East Contra Costa County habitat conservation plan/natural community conservation plan (HCP/NCCP). Models are presented for the foothill yellow-legged frog, silvery legless lizard, golden eagle, tricolored blackbird, Mt. Diablo manzanita, brittlescale, San Joaquin spearscale, big tarplant, Mt. Diablo fairy lantern, Diablo Helianthella, and Brewer's dwarf flax. Each model is based on a set of assumptions that define the mapping parameters used to identify the land cover areas important to each species. Rationales for the assumptions are also provided.

Foothill yellow-legged frog

Model Assumptions:

1. Core Habitat: Perennial streams in riparian woodland/scrub, grassland, oak savanna, and oak woodland land cover types.
2. Low-use habitat: Other streams in riparian woodland/scrub, grassland, oak savanna, and oak woodland land cover types.

Rationale

Foothill yellow-legged frogs are stream-dwelling amphibians that require shallow, flowing water in small to moderate-sized perennial streams with at least some cobble-sized substrate (Hayes and Jennings 1988, Jennings 1988). This species has also been found in perennial streams without cobble (Fitch 1938, Zweifel 1955), but it is not clear whether these habitats are regularly used (Hayes and Jennings 1988, Jennings and Hayes 1994). See the profile on this species in the preliminary draft of the HCP/NCCP for more details on its ecology.

Three stream reaches in the inventory area are perennial and flow through suitable land-cover

[1] As discussed in the memo on the first 4 covered species, species distribution models could be developed for 19 of the 27 covered species.

types: 1) along upper Marsh Creek, 2) lower Marsh Creek (below the reservoir and agricultural return flows and above urban areas), and 3) Kellogg Creek (below Los Vaqueros Reservoir and above cropland and orchard areas). Kellogg Creek has become perennial below the Los Vaqueros Dam since the construction of Los Vaqueros Reservoir. Future releases below the dam are uncertain. Upper Marsh Creek, south of Marsh Creek Road and upstream of the sandy creek bed which follows Marsh Creek Road, may also be perennial. Since comprehensive data on flow are not available for streams in Contra Costa County, the model also identifies all remaining stream reaches within suitable land cover types as potential low use habitat.

Results
Map 9 shows the modeled potential habitat of the foothill yellow-legged frog within the inventory area. The habitat includes the three stream reaches within the inventory area that maintain perennial stream flows and pass through suitable land-cover types. Most other stream reaches above the urban and agricultural lowlands are shown as potential low use habitat. There are no documented occurrences of foothill yellow-legged frogs in the databases for this area.

Silvery legless lizard

Model Assumptions:

1. Core Habitat: Sandy to sandy loam soil areas[2] (Soil Conservation Service 1977) in chaparral/scrub, oak woodland, ruderal, and riparian woodland/scrub land-cover types.

Rationale
Silvery legless lizards occur primarily in areas with sandy or loose loamy soils such as under sparse vegetation of beaches, chaparral, or oak woodland; or near sycamores, cottonwoods, or oaks that grow on stream terraces (Gorman 1957, Cunnignham 1959, Banta and Morafka 1968, Stebbins 1985, Jennings and Hayes 1994). The sandy loam soils of stabilized dunes seem to be especially favorable habitat (Grinnel and Camp 1917, Miller 1944, Smith 1946, Bury 1985). See the profile on this species in the preliminary draft of the HCP/NCCP for more details on its ecology.

Results
Map 10 shows the modeled potential habitat of the silvery legless lizard within the inventory area. The habitat is largely defined by the presence of suitable soils within chaparral/scrub, oak woodland, riparian woodland land cover areas. The only documented occurrence of this species in the inventory area is at the East Bay Regional Park District Legless Lizard Preserve east of the intersection of Highway 4 and Big Break Road in Oakley. This record is included in modelled habitat.

2 Any soil type that mentioned "sand" or "sand and loam" was considered a sandy loam soil potentially suitable for silvery legless lizard

Golden eagle

Model Assumptions:

1. Foraging habitat: All land cover areas except urban, aqueduct, aquatic, turf, orchards and vineyards.
2. Nesting habitat: Traditional nesting sites identified by researchers. Secluded cliffs with overhanging ledges and large trees adjacent to suitable foraging habitat. (not mapped)

Note: Terry Hunt is providing us with maps of known territories and nesting locations for the Mt. Diablo/Los Vaqueros area. Once we receive these data we will evaluate it and consider adding the occurrence data to the model.

Rationale
In the interior central Coast Ranges of California, Golden eagles use nearly all terrestrial habitats except urban, aquatic, turf, orchards, vineyards, and densely forested areas. Golden Eagles favor open grasslands and oak savanna, with lesser numbers in oak woodland and open shrublands (Hunt et al. 1998). In Contra Costa County, there are numerous traditional and stable nesting sites and territories of Golden eagles (T. Hunt, pers. comm.).

Results
Map 10 shows the modeled potential habitat of the golden within the inventory area. The habitat is very large, encompassing most of the inventory area. The documented occurrences of golden eagle include both verified nesting sites and estimated territory areas. Foraging ranges greatly exceed these areas. The known occurrences of golden eagles in east Contra Costa County fall within the modelled habitat.

Tricolored blackbird

Model Assumptions:

1. Core Breeding Habitat: Wetland, pond, and sloughs/channels in grassland, alkali grassland, cropland, pastures, ruderal, urban, and oak savanna land-cover types.
2. Primary Foraging Habitat: Pastures, grassland, seasonal wetlands, cropland.
3. Secondary Foraging Habitat: Orchards, vineyards.

Rationale
Tricolored blackbirds historically occurred within the Central Valley associated with emergent freshwater marshes dominated by cattails or bulrushes, with some colonies occurring in willows, blackberries, thistles, and nettles associated with sloughs and natural channels (Neff 1937).

More recent colonies have been observed in a diversity of upland and agricultural areas (Collier 1968, Cook 1996), riparian scrublands and woodlands Orians 1961a; DeHaven et al 1975a; Beedy et al. 1991; Hamilton et al. 1995; Beedy and Hamilton 1999).

Small breeding colonies have been documented at public and private lakes, reservoirs, and parks surrounded by shopping centers, subdivisions, and other urban development. Adults from these colonies generally forage in nearby undeveloped upland areas. Beedy and Hamilton (1999) predict that these small, urban wetlands and upland foraging habitats may continue to accommodate tricolored blackbirds in the future unless they are eliminated entirely by development. High-quality foraging areas include irrigated pastures, lightly grazed grasslands, dry seasonal pools, mowed alfalfa fields feedlots, and dairies (Beedy and Hamilton 1999). Lower quality foraging habitats include cultivated row crops, orchards, vineyards, and heavily grazed rangelands.

Results
Map 6 shows the modeled potential habitat of the tricolored blackbird within the inventory area. The modelled habitat is extensive because it includes a wide range of land-cover types. The documented occurrences of tricolored blackbirds in east Contra Costa County clearly are limited, in part due to the nomadic behavior of the species, but are consistent with the modelled habitat. The model may overestimate suitable core habitat in urban areas. It is likely that a small subset of ponds within urban areas actually provide suitable habitat due to requirements of suitable foraging habitat nearby. We conservatively assumed that all urban ponds are potentially suitable because of the lack of data on pond conditions. The model may overestimate suitable core habitat outside urban area because the condition of ponds (e.g, vegetation, ponding duration, etc.) is unknown. The model does not include reservoirs as suitable habitat, although tricolored blackbird may use emergent vegetation around the margins of some reservoirs (e.g., Contra Loma, Antioch, Marsh Creek, but not Los Vaqueros) for breeding. We did not map emergent vegetation around the margins of reservoirs because it fell below our minimum mapping unit.

Mount Diablo Manzanita

Model Assumptions:

1. Suitable Habitat: Chaparral/scrub between 700 and 1,860 feet in elevation.

Rationale
Mount Diablo manzanita is endemic to Contra Costa County, where it occurs only on Mount Diablo and in the adjacent foothills. It is found in chaparral/scrub land cover areas between 700 and 1,860 feet above sea level. See the profile on this species in the preliminary draft of the HCP/NCCP for more details on its ecology.

Results
Map 13 shows the modeled Mount Diablo manzanita habitat within the ECCC HCP/NCCP inventory area. The habitat is restricted to the eastern and northern flanks of Mt. Diablo. Most of the 11 documented occurrences of this species are consistent with the predicted suitable habitat in the model. One occurrence in northern Antioch is historical and may have been a misidentification. Four occurrences occur outside of the modeled suitable habitat. Two occurrences fall within patches of chaparral or scrub smaller than the minimum mapping unit of 10 acres (one was mapped as oak woodland, the other as grassland). The other two occurrences are within grassland with no shrubs or trees visible on the aerial photos. These records may be imprecisely located; the actual site may be within up to a mile of the record location.

Brittlescale

Model Assumptions:

1. Suitable Habitat: All alkali grasslands and alkali wetlands on soils of the Pescadero or Solano soil series (Soil Conservation Service 1977).

Rationale
Brittlescale occurs on alkali soils of the Pescadero and Solano series. Brittlescale typically occurs in barren areas within alkali grassland, alkali meadow, and alkali scrub. It is occasionally found on the margins of alkali vernal pools. It occurs in the broad flood basins of the Central Valley floor and on alluvial fans associated with the major streams draining from the inner Coast Range foothills. It is generally found at low elevations but has been collected up to 1,055 feet above sea level.

Results
Map 14-15 shows the modeled Brittlescale habitat within the ECCC HCP/NCCP inventory area (suitable habitat is the same as San Joaquin spearscale). The habitat is restricted to alkali soils in the southeastern region of the inventory area. The documented occurrences of this species are mostly consistent with the predicted suitable habitat in the model. Two occurrences fall outside modelled habitat and may occur on patches of alkaline soil not mapped by the Soil Conservation Service.

San Joaquin Spearscale

Model Assumptions:

1. Suitable Habitat: All alkali grasslands and alkali wetlands on soils of the Pescadero or Solano soil series (Soil Conservation Service 1977).

Rationale
San Joaquin spearscale typically occurs in alkali grassland and alkali meadow, or on the margins of alkali scrub. It occurs on clay soils, often in areas of high alkalinity. See the profile on this species in the preliminary draft of the HCP/NCCP for more details on its ecology.

Results
Map 14-15 shows the modeled San Joaquin spearscale habitat within the ECCC HCP/NCCP inventory area (suitable habitat is the same as brittlescale). Although not mapped, the documented occurrences of this species are on private lands in the eastern portion of the inventory area, including within Lone Tree Valley, Briones Valley, and the Brushy Creek watershed south of Byron. There are many known occurrences of this species north and east of Los Vaqueros Dam in the Los Vaqueros watershed lands.

Note: This model does not accurately predict the distribution of this species in the inventory and will likely be revised based on further analysis and review of known occurrences.

Big Tarplant

Model Assumptions:

1. Primary habitat: Annual grassland below 1,500 feet on the Altamont soil series (Soil Conservation Service 1977).
2. Secondary habitat: all other annual grassland below 1,500 feet

Rationale
Big tarplant occurs in annual grassland on clay to clay-loam soils, usually on slopes and often in burned areas, below 1,500 feet (California Natural Diversity Database 2001). In Contra Costa County, the occurrences are primarily on soils of the Altamont series (Soil Conservation Service 1977). See the profile on this species in the preliminary draft of the HCP/NCCP for more details on its ecology.

Results
Map 16 shows the modeled big tarplant habitat within the ECCC HCP/NCCP inventory area. Big tarplant is known from 4 occurrences on Cowell Ranch, west of Brentwood, and 7 occurrences on Roddy Ranch, south of Antioch. The record in Pittsburg is historic. The distribution of known occurrences is consistent with the predicted suitable habitat of the model.

Mount Diablo Fairy Lantern

Model Assumptions:

1. Suitable Habitat: Annual grassland, chaparral/scrub, oak woodland, and oak savannah

between 650 feet and 2,600 feet in elevation

Rationale
Mount Diablo fairy-lantern is endemic to the Diablo Range in Contra Costa County, ranging in elevation between 650 and 2,600 feet (Hickman 1993). Mount Diablo fairy-lantern grows on grassy slopes and in openings in chaparral and oak woodland communities (California Natural Diversity Database 2001). See the profile on this species in the preliminary draft of the HCP/NCCP for more details on its ecology.

Results
Map 17 shows the modeled Mount Diablo fairy-lantern habitat within the ECCC HCP/NCCP inventory area. Twelve occurrences of Mount Diablo fairy-lantern occur in the inventory area, most on public lands. All known occurrences are within modelled suitable habitat.

Diablo Helianthella

Model Assumptions:

1. Suitable Habitat: Oak savannah, oak woodland, chaparral/scrub above 650 feet.

Rationale
Diablo helianthella is endemic to the San Francisco Bay Area, occurring in the Diablo Range, Berkeley Hills, and San Bruno Mountain (California Natural Diversity Database 2001). Diablo helianthella is associated with thin, rocky, well-drained soils on east-facing slopes. It is found in grassy openings in woodlands, chaparral, and coastal scrub, often at the transition zone between woodland and chaparral (California Natural Diversity Database 2001). See the profile on this species in the preliminary draft of the HCP/NCCP for more details on its ecology.

Results
Map 18 shows the modeled Diablo helianthella habitat within the ECCC HCP/NCCP inventory area. All records fall within modelled suitable habitat. This model likely overestimates the extent of suitable habitat for this species because the model does not limit suitable habitat to east-facing slopes.

Brewer's Dwarf Flax

Model Assumptions:

1. Suitable Habitat: Oak woodland and chaparral/scrub + 500 feet buffer into annual grasslands

Rationale
Brewer's dwarf flax is endemic to California, where it is restricted to the Mount Diablo and adjacent foothills in the east San Francisco Bay Area and to the Vaca Mountains of the southern interior North Coast Ranges (Hickman 1993, California Natural Diversity Database 2001). It occurs below 2,900 feet above sea level. Brewer's dwarf flax grows on rocky soils on serpentine, sandstone, or volcanic substrates. It is associated with grassland, oak woodland, and chaparral communities. It typically appears in areas with low vegetative cover, such as the transition zone between grassland and chaparral or open areas in chaparral.

Results
Map 19 shows the modeled Brewer's dwarf flax habitat within the inventory area. Thirteen occurrences of Brewer's dwarf flax occur within the inventory area. Two of the occurrences are in Mount Diablo State Park, 3 in East Bay Regional Park District lands, and 7 within the Los Vaqueros Watershed. One occurrence in Antioch is historic; this population has been extirpated. All but the historic occurrence fall within modeled suitable habitat for this species.

Literature Cited

Banta, B. H. and D. J. Morafka. 1968. An annotated checklist of the recent amphibians and reptiles of the Pinnacles National Monument and Bear Valley, San Benito and Monterey Counties, California, with some ecological observations. The Wasmann Journal of Biology 26(2):161–183.

Beedy, E. C. and W. J. Hamilton III. 1999. Tricolored Blackbird (*Agelaius tricolor*). In *The Birds of North America*, No. 423 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Beedy, E. C., S. D. Sanders, and D. Bloom. 1991. Breeding status, distribution, and habitat associations of the tricolored blackbird (*Agelaius tricolor*), 1850–1989. Jones & Stokes Associates, Inc. (JSA 88-197.) Prepared for U.S. Fish and Wildlife Service, Sacramento, CA.

Bury, R. B. 1985. Status report: Anniella pulchra nigra Fischer, black legless lizard (Anniellidae: Sauria) in central California. Final report of the U.S. Fish and Wildlife Service, Office of Endangered Species, Portland, OR.

California Natural Diversity Database. 2001. RareFind 2, Version 2.1.2 (September 5, 2001 update). California Department of Fish and Game, Sacramento, CA.

Cook, L. 1996. Nesting adaptations of tricolored blackbirds (*Agelaius tricolor*). Master's thesis. University of California, Davis.

Cunningham, J. D. 1959. *Notes on Anniella*. Herpetologica 15(1):19–20.

DeHaven R. W., F. T. Crase, and P. P. Woronecki. 1975a. Breeding status of the tricolored blackbird, 1969–1972. California Department of Fish and Game 61:166-180.

Fitch, H. S. 1938. Rana boylii *in Oregon*. Copeia 1938(3):148.

Gorman, J. 1957. *Recent collections of the California limbless lizard,* Anniella pulchra. Copeia 1957(2):148–150.

Grinnell, J. and C. L. Camp. 1917. A distributional list of the amphibians and reptiles of California. University of California Publications in Zoology 17(10):127–208.

Hamilton, W. J., III, L. Cook, and R. Grey. 1995. Tricolored blackbird project 1994. Unpublished report. Prepared for U.S. Fish and Wildlife Service,

Hayes, M. P. and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): Implications for management. Pp. 144–158 in: R. C. Szaro, K. E. Severson, and D. R. Patton (technical coordinators), Proceedings of the symposium on the management of amphibians, reptiles, and small mammals in North America. U.S. Department of Agriculture, Forest Service, General Technical Report RM-166.

Hickman, J. C. (ed.). 1993. *The Jepson Manual*. University of California Press, Berkeley, CA.

Hunt, W. G., R. E. Jackman, T. L. Brown, D. E. Driscoll, and L. Culp. 1998. A population study of golden eagles in the Altamont Pass Wind Resource Area: population trend analysis 1997. Report to National Renewable Energy laboratory, Subcontract XAT-6-16459-01. Predatory Bird Research Group,

Jennings, M. R. 1988. Natural history and decline of native ranids in California. Pp. 61–72 in: H. F. DeLisle, P. R. Brown, B. Kaufman, and B. M. McGurty (editors), Proceedings of the conference on California herpetology. Southwestern Herpetologists Society, Special Publication (4).

Jennings, M. R. and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. Final report submitted to the California Department of Fish and Game, Rancho Cordova, CA. Contract 8023.

Miller, M. R. 1944. *Ecologic relations and adaptations of the limbless lizards of the genus Anniella*. Ecological Monographs 14(3):271–289.

Neff, J. A. 1937. *Nesting distribution of the tricolored red-wing*. Condor 39:61–81.

Orians, G. H. 1961. *The ecology of blackbird (*Agelaius*) social systems*. Ecol. Monogr. 31:285–312.

Smith, H. M. 1946. *Handbood of Lizards: Lizards of the United States and of Canada*. Comstock Publishing Company, Ithaca, NY.

Soil Conservation Service. 1977. Soil survey of Contra Costa County, California. Concord, CA.

Stebbins, R. C. 1985. *A Field Guide to Western Reptiles and Amphibians*. Second edition, revised. Houghton Mifflin Company, Boston, MS.

Zweifel, R. G. 1955. *Ecology, distribution, and systematics of frogs of the* Rana boylei *group*. University of California Publications in Zoology 54(4):207–292.Personal Communication
Weston, Malcolm, Hydrologist, Contra Costa County Flood Control and Water Conservation District. September 5, 2002.

Chapter 1
Introduction

Note to Reader: This is a preliminary draft of the biological goals and objectives of the HCP/NCCP. This material will become part of Chapter 1 of the HCP/NCCP, so it is formatted as a section of this chapter. The introductory material is meant as background for your review and may or may not be included in the final chapter of the HCP/NCCP.

These goals and objectives are tentative until the conservation strategy is developed. Goals and objectives will be "tested" against the conservation strategy and refined according to what is feasible. Qualitative goals and objectives have been developed as a first step. Final goals and objectives may be more quantitative (e.g., have acreage targets, mitigation ratios, etc.) to provide a measurable target for HCP implementation. Qualitative goals and objectives are presented as a starting point for discussion.

Rationales are presented for selected goals and objectives. Rationales will eventually be written for all biological goals and objectives.

1.X Biological Goals and Objectives

This section describes the goals and objectives for each covered natural communities and covered species. Goals are broad, guiding principles based on the conservation needs of the resource. Goal statements describe the desired future condition for each covered natural community and species with full implementation of the HCP/NCCP. Objective statements are expressed as conservation targets or actions, or as studies to collect information necessary to implement adaptive management. Objectives are measurable and achievable within a given time frame; they clearly state a desired result and will collectively achieve goals.

Biological goals are required in HCPs for covered species by the U.S. Fish and Wildlife Service's "5-Point Policy" (65 FR 35242, June 1, 2000). Biological goals for natural communities are not required for HCPs or NCCPs but they are included in this plan for consistency and because this HCP/NCCP takes a habitat-based approach to conserving covered species. Some of the goals and objectives overlap among species and between species and natural communities. This overlap illustrates that many conservation measures will achieve multiple objectives to conserve covered species and natural communities.

Biological goals and objectives were developed using several sources, including:

- Recovery plans for covered species
- Species distribution models developed for 19 covered species

- State and federal resource planning documents
- Input from resource specialists
- Documentation of on-going resource management in the inventory area (e.g., Los Vaqueros Watershed management and monitoring)

Goals and objectives for covered natural communities are described first. Goals and objectives for covered species are listed in the order in which they are found in chapter 3.

1.X.2 Biological Goals and Objectives for Natural Communities, Wetlands, and Streams

A Natural Community Conservation Plan (NCCP) is required to "identify and provide for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible and appropriate economic development, growth, and other human uses" (Dept. of Fish and Game Code Sect. 2805(g)). This is done, in part, through measures designed to conserve covered species. However, biological diversity includes many more species than those covered by this HCP/NCCP. Another important component of natural systems is the community, which is composed of multiple species and the interactions among them. At the highest level, ecosystems integrate communities and the physical environment and include all interactions between the biological and physical worlds. NCCPs are required to address conservation at all of these levels.

The NCCP Act does not require developing goals or objectives for covered natural communities. However, this approach is consistent with existing guidelines for HCPs relating to covered species. Because the primary purpose of NCCPs is to conserve communities and biological diversity as a whole, it is appropriate to develop goals for the natural communities in this plan. Having clear goals for natural communities allows anyone to evaluate the HCP/NCCP against these goals to ensure that the broader purpose of the NCCP is met.

This HCP/NCCP includes 5 natural communities, called vegetation communities because they are defined in terms of their vegetation composition (as opposed to wildlife or other composition). The term natural community is also avoided because agricultural lands are not "natural" but they provide important habitat for some covered species. See chapter 3 of the HCP/NCCP for descriptions and definitions of the 5 vegetation communities in this plan:

- Grassland
- Chaparral/scrub
- Oak woodland (including oak savanna)
- Riparian woodland/scrub
- Irrigated agriculture

Wetlands and streams are aquatic features that occur in most of the vegetation communities in the inventory area. We have developed biological goals separately for wetlands and streams to ensure that the regulatory requirements of state and federal laws relating to these features are met. Goals for wetlands and streams apply to any vegetation community in which these features are found.

Each vegetation community, except irrigated agriculture, has a single, similar goal: to establish and maintain a reserve system that maintains and enhances the processes and functions of that community and the biological diversity is supports. Objectives are designed to meet this goal within the framework of the HCP/NCCP.

Grassland

Goal 1: Establish and maintain a reserve system that maintains and enhances the processes and functions of grassland and the biological diversity it supports.

Rationale: The grassland vegetation community is the most abundant natural community in the inventory area, supports most of the covered species, and has relatively high biological diversity of birds, amphibians, mammals, and plants. Opportunities exist to enhance this community in preserves through changes in grazing, fire, and invasive species management. Restoring native grassland and expanding the grassland community is not feasible on a regional scale. However, expanding the grassland community through restoration is possible in limited areas of ruderal land cover.

Objective 1a: Avoid or minimize impacts to native grassland; enhance native grassland within preserves.

Rationale: Remnant stands of native grassland are rare within the inventory area and in California. These stands provide the only examples of what the grassland community may have looked like prior to the invasion by European and other exotic grasses and herbs. Impacts to stands of this grassland type should be avoided and they should be incorporated into preserves to ensure proper management. Native grassland within preserves should be enhanced through changes in grazing practices and other disturbances such as fire.

Objective 1b: Avoid or minimize impacts to alkali grassland; enhance alkali grassland within preserves.

Rationale: Alkali grassland is relatively rare in the inventory area and in California. Alkali grassland supports a unique suite of grassland plants. Impacts to this grassland type should be avoided where practicable and minimized where unavoidable.

Objective 1c: Enhance the grassland community for grassland plants and wildlife within preserves through changes in grazing and fire management and a program for control of invasive plants.

Objective 1d: Convert ruderal land-cover types in protected areas to grassland communities with a large component of native plants through restoration.

Rationale: Small areas of ruderal land-cover in the inventory area are surrounded by grassland. If incorporated into preserves, these sites should be converted to grassland with a similar component (biomass and species) of native plants as intact grassland. Sites would be restored to grassland through restoration using active methods such as soil/topographic modification, herbicides, seeding, planting, or management changes in grazing or fire. The amount of active restoration needed will depend on the site conditions. The type of grassland created (e.g., annual grassland, perennial bunchgrass grassland, or alkali grassland) will depend on site conditions including soil type and the species composition of nearby grassland stands.

Objective 1e: Compensate for the loss of grassland by preserving large blocks of high-quality grassland capable of supporting covered species and representative grassland biological diversity. Emphasize preserving large blocks of grassland known to support covered species.

Objective 1f: Promote populations of key species in grassland to enhance the prey base for raptors and mammals and to increase habitat for various species.

Objective 1g: Minimize impacts of covered activities on the transition zones (edges) between grassland and other vegetation communities.

Rationale: The transition zone between grassland and oak woodland or between grassland and chaparral are important areas of high biological diversity. Natural changes in these zones will occur (e.g., shrubs invading grassland, or grasslands replacing chaparral after frequent fires). However, impacts from covered activities to these important transition zones should be minimized.

Objective 1h: Minimize the indirect effects of the urban edge on grasslands by preserving grassland at this edge to serve as a buffer zone.

All Wetland and Stream objectives are incorporated into this grassland goal because these aquatic features are common within grassland and they play an important role in the functioning of this community.

Oak Woodland

Goal 1: Establish and maintain a reserve system that preserves and enhances the processes and functions of the oak woodland community and the biological diversity it supports.

Rationale: Opportunities exist to enhance this community in preserves through changes in grazing, fire, and invasive species management. Expansion of the oak woodland community is not feasible on a regional scale because it would be at the expense of other vegetation communities. The historic extent of oak woodlands in undeveloped areas of the inventory area is unknown, so its current distribution is assumed to be “natural”.

Note to Science Panel: Jones & Stokes requests advice from the Science Advisory Panel on the possible historic extent of oak woodlands in the inventory area and whether an objective should be added to expand this community at the expense of grassland.

Objective 1a: Avoid or minimize adverse effects on oak woodlands and individual oak trees.

Rationale: Adverse effects on oak woodland and individual oak trees should be minimized to minimize the effects on the species, including covered species, supported by this community. Even isolated oak trees within urban development provide habitat for some resident wildlife.

Objective 1b: Compensate for the loss of oak woodlands by preserving stands with a similar species overstory and understory composition.

Rationale: The loss of the oak woodland community should be mitigated through preservation of existing oak woodlands. Preservation is necessary to ensure that presently unprotected oak woodlands are permanently protected.

Objective 1c: Enhance ecosystem functions of oak woodlands within protected areas through changes in management practices.

Rationale: Enhancement of ecosystem functions in existing oak woodlands serves to compensate for some of the functions lost in removed woodlands. Oak woodland can be managed to improve community functions and enhance populations of native plants and wildlife. Changes in livestock grazing practices may improve the condition of the woodland understory (e.g., decrease cover of exotic grasses and forbs) and allow for greater recruitment of oak seedlings into saplings and ultimately into the canopy as mature trees. In addition, changes in the fire frequency may also increase the chances of oak seedlings reaching maturity.

Objective 1d: Preserve a range of oak woodland types including blue oak woodland, coast live oak woodland, valley oak woodland, oak savannah, and mixed evergreen forest.

Objective 1e: Minimize impacts to transition zones (edges) between oak woodland and other vegetation communities.

All Wetland and Stream objectives are incorporated into this oak woodland goal because these aquatic features are common within oak woodlands and they play an important role in the functioning of this community.

Chaparral/Scrub

Goal 1: Establish and maintain a reserve system that maintains and enhances the processes and functions of chaparral/scrub and the biological diversity it supports.

Rationale: The chaparral/scrub community contains many unique plants and wildlife, and several covered species. Impacts on this community should be mitigated. This community can be enhanced through changes in land management. The historic extent of this community in the inventory area is unknown, so its current distribution is assumed to be "natural". Any creation of this community would come at the expense of other natural communities (e.g., grassland, oak woodland) so is not a goal.

Objective 1a: Minimize adverse effects on stands of the chaparral/scrub community.

Rationale: Effects on the chaparral/scrub community should be minimized because this community is relatively uncommon in the inventory area, especially at lower elevations. Stands of chaparral/scrub within grassland or oak woodland/savanna often provide the best cover for many wildlife species. Chaparral/scrub also provides habitat for several covered species.

Objective 1b: Mitigate loss of chaparral/scrub by preserving large stands of this community, particularly at lower elevations.

Rationale: Impacts on this community should be minimized when possible. Mitigation for the loss of this community is only feasible through protection of existing stands. Restoration of chaparral/scrub communities is unproven in northern California and would result in the loss of other natural communities, so it is not a viable mitigation strategy. Priority should be given to preserving stands at lower elevation because of these stands will be most similar in species composition and structure to stands affected by covered activities. Chaparral/scrub stands at lower elevation tend to have a different species composition than stands at higher elevation so these unique types should be preserved.

Objective 1c: Maintain or improve the quality of the chaparral/scrub community within protected areas through changes in management practices.

Rationale: Changes in management practices such as grazing or controlled fire may enhance some stands of chaparral/scrub in protected areas by increasing native plant diversity and wildlife habitat. Periodic prescribed burning may be desirable to maintain some stands in a mid-seral condition to provide habitat for species such as the Alameda whipsnake, maintain large-scale variation in successional types and stand structure, and reduce long-term risks of catastrophic fire.

Objective 1d: Minimize impacts to transition zones (edges) between chaparral/scrub and other vegetation communities.

All stream objectives are incorporated into this chaparral/scrub goal because streams occur within some chaparral stands. In these chaparral/scrub stands, streams play an important role in the functioning of this community.

Riparian Woodland/Scrub

Goal 1: Establish and maintain a reserve system that maintains and enhances the processes and functions of riparian woodland/scrub and the biological diversity it supports.

Rationale: This community is naturally rare in the landscape but supports disproportionately high biological diversity, particularly birds and amphibians. This community is also an important movement corridor for larger mammals. Impacts on this community should be fully mitigated through restoration, enhancement, and protection because of its rarity and biological importance. There are substantial opportunities in the inventory area for both enhancement of existing stands and restoration of stands that have been eliminated.

Objective 1a: Avoid and minimize adverse effects to riparian woodland/scrub to the maximum extent practicable.

Objective 1b: Compensate for any adverse effects on this community by enhancing degraded stands or restoring stream corridors to their historic vegetated condition within preserves to replace all ecological functions lost as a result of covered activities.

Objective 1c: Create buffers of natural communities within preserves of at least 200-foot width between development and the edge of riparian corridors.

Objective 1d: Maintain riparian corridors within preserves free of noxious weeds such as giant reed and tamarisk.

All stream objectives are incorporated into this riparian woodland/scrub goal because all riparian woodland/scrub communities occur in streams.

Irrigated Agriculture

Goal 1: Establish conservation easements in agricultural areas suitable for covered species and enhance the habitat for covered species and biological diversity in ways compatible with economically-viable agricultural uses.

Rationale: Irrigated agriculture in the inventory area supports habitat for several covered species. Impacts on this community should be mitigated. Because this community is a working landscape, habitat enhancement opportunities must be limited to what is compatible with maintaining the agricultural operation.

Objective 1a: Mitigate lost irrigated agriculture that provides habitat for covered species through preservation of agricultural land with equal or greater habitat value for these species.

Rationale: Effects on irrigated agriculture from covered activities cannot be avoided. Mitigation for lost agricultural land through preservation of agricultural

land of similar value is necessary to ensure preservation of this vegetation community for the benefit of certain covered species.

Objective 1b: Increase habitat value for wildlife on agricultural lands by encouraging voluntary agricultural practices that benefit wildlife and that are compatible with agricultural operations.

Rationale: Enhancing agricultural areas for wildlife will offset the expected net loss in agricultural areas in the inventory area that result from covered activities. Measures to enhance wildlife habitat on agricultural lands must be compatible with an active agricultural operation in order to be feasible.

Wetlands and Streams

Goal 1: Establish and maintain a reserve system that maintains and enhances the processes, functions, and values of wetlands, ponds, and streams and the biological diversity they support.

Objective 1a: Avoid impacts on wetlands from covered activities to the maximum extent practicable. Minimize adverse effects on wetlands from covered activities to the maximum extent practicable.

Objective 1b: Achieve no-net-loss in wetland functions and values by restoring or creating wetlands of equal or greater function and value than those that are lost.

Objective 1c: Stock ponds lost to covered activities will be compensated through preservation, restoration, and creation of ponds of equal or greater extent and function than those ponds lost.

Objective 1d: Increase the extent and function of wetlands within the inventory area through restoration and creation of wetlands along streams or in historical seasonal wetland soils (e.g., alkali soils on abandoned agricultural lands), if practicable.

Objective 1e: Enhance natural wetlands within preserves by limiting or eliminating livestock access.

Objective 1f: Within preserves, improve the functioning of stock ponds for covered species by draining them annually to remove exotic species and by limiting access by livestock.

Objective 1g: Ensure wetlands within preserves maintain or improve their hydrologic functions by preserving upland habitat up-gradient of wetlands and maintaining surface hydrologic connections to streams or other water bodies. For wetlands that form complexes, emphasize preservation of the entire complex to maintain the hydrology of the wetland system.

Objective 1h: Preserve intact watersheds to the maximum extent practicable.

Objective 1i: Avoid or minimize the loss of streams to covered activities. Limit the total loss of streams to less the 5% of remaining streams in the inventory area.

Objective 1j: Compensate for any loss of streams by preserving a larger and longer extent of stream and enhancing degraded streams.

Objective 1k: Increase riparian woodland/scrub canopy coverage over streams to reduce and mediate stream water temperatures and improve aquatic habitat through active and passive restoration and changes in grazing practices.

Objective 1l: Reduce stream bank erosion within preserves through active and passive means such as bank stabilization, planting riparian and upland vegetation, and changes in grazing practices.

1.X.3 Biological Goals for Covered Species

This section establishes the biological goals and objectives for each covered species. For each covered species, the first goal addresses avoidance, minimization, and mitigation of impacts of covered activities on the species. Achieving this goal would meet the requirements of the federal ESA for covered species to avoid, minimize, and mitigate adverse effects to the maximum extent practicable. Each species also has a second goal to enhance population viability and contribute to recovery of the species within the inventory area. This goal exceeds the federal regulatory standard and is designed to meet the standards of the NCCP Act of 2002. The first goal applies to all covered species; the second goal applies to those covered species for which there is the opportunity in the inventory area to benefit to the species' recovery or, in the case of non-listed species, to reduce the likelihood of future listing under CESA and the federal ESA.

To achieve the goal of contributing to recovery, HCP/NCCP participants will implement conservation measures to the maximum extent practicable. The magnitude of contribution to species recovery is based on several factors, including the proportion of the species' range that occurs in the inventory area, the sensitivity of the species to covered activities, existing draft and final recovery plans, and the practicability of actions under control of the HCP/NCCP participants. For plants, the proportion of population occurrences found in the inventory area was also considered.

The HCP/NCCP presents a habitat-based approach for conserving covered species. Consequently, goals and objectives for covered species are primarily expressed in terms of avoiding, minimizing, and compensating impacts of covered activities on covered species habitat, and contributing to recovery of covered species by protecting, enhancing, and/or restoring covered species habitat. For some covered species additional species-specific objectives (e.g., population augmentation, predator control, and focused research) are required to achieve goals.

Townsend's Western Big-eared Bat

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on Townsend's western big-eared bat and its habitat.

Objective 1a. Avoid direct mortality, and minimize adverse effects on Townsend's western big-eared bat habitat.

Objective 1b. Minimize or avoid disturbance to active roosts, particularly winter hibernacula and summer maternity roosts.

Objective 1c. Compensate for the loss of foraging and roosting habitat as a result of covered activities by protecting areas of equal or greater function.

Goal 2. Establish and maintain a habitat reserve system capable of sustaining a Townsend's western big-eared bat population in the inventory area.

Objective 2a. To the maximum extent practicable, protect key areas of foraging and roosting habitat including caves and abandoned mines.

Objective 2b. Enhance foraging habitat by restoring streams, wetlands, and associated riparian habitat in habitat preserves, and prohibiting the use of insecticides in preserves.

San Joaquin Kit Fox

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on San Joaquin kit fox and its habitat.

Objective 1a. Avoid direct mortality, and minimize adverse effects on San Joaquin kit fox habitat.

Objective 1b. Compensate for suitable habitat lost as a result of covered activities by protecting areas of equal or better quality habitat.

Goal 2. Establish and maintain a habitat reserve system capable of supporting a portion of the northwest extension of the San Joaquin kit fox population (i.e., San Joaquin Kit fox in the inventory area).

Objective 2a. Protect key areas of core habitat sufficiently large and connected to sustain a portion of the San Joaquin kit fox population.

Objective 2b. Emphasize the protection of suitable habitat within the inventory area where breeding San Joaquin kit foxes have been documented in the last 10 years

Objective 2c. Establish and maintain buffers around protected habitats sufficient to minimize human disturbances to kit foxes, suitable habitat, and prey populations.

Rationale for Objectives 2a-2c: The San Joaquin kit fox Recovery Plan identifies the protection of existing kit fox habitat in the northern portion of its range as a primary recovery action. Protecting and buffering habitats that currently support, or have the highest potential to support, San Joaquin kit foxes is the most cost-effective approach to preventing a population decline as a result of covered activities, and expanding these populations in the inventory area.

Objective 2d. Link occupied or suitable kit fox habitat in a configuration that ensures successful movement within the reserve system and from the reserve system to the southern boundary of the inventory area, to promote connectivity between the inventory area and the core San Joaquin Valley population.

Rationale: The recovery plan identifies the protection of existing connections between habitat in Contra Costa County and habitat farther south as primary recovery actions. This objective would facilitate colonization of the inventory area from adjacent areas, as well as dispersal from within to outside the inventory area.

Objective 2e. Protect suitable low-use habitat near Byron in agricultural easements to provide a buffer between core habitat and any future development to the north and east.

Objective 2f. Convert ruderal land-cover types to higher-quality grassland in protected areas where there is opportunity.

Objective 2g. Manage habitat reserves to promote kit fox prey and commensal species populations where appropriate.

Tricolored Blackbird

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on tricolored blackbird and its habitat.

Objective 1a. Minimize adverse effects on tricolored blackbird nesting and foraging habitat.

Objective 1b. Avoid or minimize disturbances to active tricolored blackbird colonies by establishing adequate buffer zones and limiting activities within and adjacent to these buffers.

Objective 1c. Compensate for suitable foraging and nesting habitat lost as a result of covered activities by protecting existing areas of equal or better quality habitat, and/or restoring or creating suitable habitat in protected areas.

Goal 2. Establish and maintain a habitat reserve system capable of enhancing the abundance and productivity of tricolored blackbird colonies in the inventory area.

Objective 2a. Protect key areas of suitable nesting and foraging habitat sufficiently large, abundant, and configured to sustain multiple, large nesting colonies in the inventory area. Emphasize maintaining suitable nesting habitat within or adjacent

to suitable foraging areas. At a minimum, ensure that suitable nesting habitat is within 3 miles of suitable foraging areas.

Objective 2b. To the maximum extent practicable, protect recently-active colony sites and nearby foraging habitats to provide sites for future colonization.

Objective 2c. Achieve a no-net-loss of nesting habitat in the inventory area through habitat restoration or creation on protected lands in appropriate locations (i.e., near foraging areas). Emphasize expanding the size of existing suitable or occupied nesting habitats.

Objective 2d. Enhance reproductive success of colonies in preserves by minimizing predation at colony sites, and controlling the use of pesticides and other toxic contaminants in preserves.

Objective 2e. To the extent feasible and where appropriate, provide incentives for land owners to improve foraging opportunities and minimize mortality on irrigated agricultural lands that provide foraging habitat (e.g., delaying harvest until after a colony has fledged young).

Golden Eagle

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on golden eagle and its habitat.

Objective 1a. Avoid direct mortality, and minimize adverse effects on golden eagle foraging and nesting habitat.

Objective 1b. Avoid or minimize disturbances to nesting golden eagles.

Objective 1c. Compensate for suitable foraging and nesting habitat lost as a result of covered activities by protecting areas of equal or better quality habitat.

Goal 2. Establish and maintain a habitat reserve system capable of supporting a resident golden eagle population and foraging opportunities for migrant golden eagles.

Objective 2a. Protect key areas of foraging and nesting habitat sufficiently large to, at a minimum, sustain the existing resident golden eagle population.

Objective 2b. Emphasize protecting known territories (i.e., nest sites and associated foraging habitats).

Objective 2c. Emphasize protecting large expanses of open foraging habitat adjacent to or near suitable or occupied nesting habitat (e.g., near the Los Vaqueros watershed), and where the risk of collision with wind turbines is low.

Objective 2d. Enhance foraging habitat by converting ruderal land-cover types to higher-quality grassland in habitat reserves where there is opportunity, and managing protected foraging habitat to promote golden eagle prey populations.

Objective 2e. Manage preserves to minimize or avoid wind turbine strikes and electrocution.

Objective 2f. Minimize the risk of contamination to golden eagles by controlling the use of poisons in preserves.

Western Burrowing Owl

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on Western burrowing owl and its habitat.

Objective 1a. Minimize adverse effects on burrowing owl breeding, wintering, and foraging habitat.

Objective 1b. Avoid or minimize disturbance to nesting burrowing owls.

Objective 1c. Where loss of occupied breeding or wintering burrowing owl habitat cannot be avoided, avoid injury and direct mortality of individual owls by implementing passive displacement and relocation techniques during the non-nesting period if necessary.

Rationale: Implementing passive displacement and relocation measures, such as installing one-way doors over occupied burrows during the non-nesting period and creating artificial nesting habitat nearby, would reduce the likelihood of mortality and injury of individuals and provide an opportunity for displaced birds to colonize other suitable areas.

Objective 1d. Achieve no-net-loss of habitat function by protecting areas of equal or greater habitat function as those lost, and restoring and enhancing habitat in habitat reserves.

Goal 2. Establish and maintain a habitat reserve system capable of enhancing and sustaining the burrowing owl population in the inventory area.

Objective 2a. Protect key areas of foraging and nesting habitat sufficient to increase and sustain the burrowing owl population in the inventory area. Emphasize protecting occupied habitat and adjacent or nearby suitable breeding/foraging habitat. To minimize adverse effects of habitat fragmentation on breeding and foraging owls, emphasize protecting large contiguous blocks of nesting and foraging habitat.

Objective 2b. Where necessary, provide opportunity for individuals to colonize unoccupied suitable habitat in habitat preserves by protecting undeveloped lands sufficiently large and configured to function as movement corridors for burrowing owls.

Objective 2c. Where feasible, protect a series of temporary "stepping stone" or transition habitats to attract owls out of occupied habitat to be lost to covered activities and into preserved habitats.

Rationale for Objectives 2a-2c: For western burrowing owl, what constitutes an isolated habitat patch and the minimum size of a viable patch of habitat is not well documented. These parameters are affected by habitat quality, the juxtaposition of the site relative to other suitable habitat, surrounding land uses, and prey availability. Although the spatial requirements of burrowing owls are not well understood, it is assumed that small and isolated patches of habitat are not likely to sustain robust prey populations, or high reproductive success and long-term persistence of burrowing owls. It is assumed that movement corridors between small habitats and other suitable areas would partly offset the insular effects of small or isolated habitats on owl populations, by increasing foraging potential and facilitating dispersal or colonization. The size and dimensions of corridors that would be adequate to facilitate movements of burrowing owls between suitable habitats has not been studied. However, in some locations, burrowing owls are known to occur within railroad corridors as narrow as 100 meters.

Objective 2d. Enhance foraging habitat by converting ruderal land-cover types to higher-quality grassland in habitat reserves where possible, and managing protected foraging habitat to promote burrowing owl prey populations.

Objective 2e. Enhance breeding habitat in preserves by creating artificial burrows where the availability of natural burrows is limiting, promoting fossorial rodent populations, and managing grazing to maintain suitable vegetation structure (e.g., short sparse vegetation).

Rationale: Burrowing owls require habitat with three basic attributes: open, well-drained terrain; short, sparse vegetation; and underground burrows or burrow facsimiles. Managing protected lands to ensure that they support these attributes would enhance habitat for burrowing owls

Objective 2f. Establish and maintain buffers around protected habitats to minimize intrusion from humans and domestic animals (including predators).

Swainson's Hawk

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on Swainson's hawk and its habitat.

Objective 1a. Avoid direct mortality, and minimize adverse effects on Swainson's hawk foraging and nesting habitat.

Objective 1b. Avoid or minimize disturbances to nesting Swainson's hawks.

Objective 2c. Compensate for suitable foraging and nesting habitat lost as a result of covered activities by protecting areas of equal or higher function.

Goal 2. Establish and maintain a habitat reserve system capable of enhancing the Swainson's hawk breeding population in the inventory area.

Objective 2a. Protect key areas of high-quality foraging and nesting habitat sufficiently large and abundant to enhance the Swainson's hawk breeding population in the inventory area. Emphasize maintaining nesting habitat adjacent to or near large blocks of high-quality foraging areas.

Objective 2b. To the maximum extent practicable, protect suitable nest sites that have been active within the last 10 years and nearby foraging habitats.

Objective 2c. Achieve a no-net-loss of high-quality foraging habitat in the inventory area through habitat restoration or creation, and/or agricultural conversion, on protected lands.

Objective 2d. Enhance foraging habitat by converting ruderal land-cover types to higher-quality grassland in habitat reserves where there is opportunity, and managing protected foraging habitat to promote Swainson's hawk prey populations.

Objective 2e. Manage protected foraging and nesting habitats to minimize or avoid wind turbine strikes and electrocution.

Objective 2f. To the extent feasible and where appropriate, provide incentives for agricultural land owners to maintain or enhance foraging habitat. Emphasize maintaining crops that provide high-quality foraging habitat (e.g., alfalfa).

Silvery Legless Lizard

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on silvery legless lizard and its habitat.

Objective 1a. Minimize adverse effects of covered activities on silvery legless lizard core habitat.

Objective 1b. Compensate for suitable habitat lost as a result of covered activities by protecting habitat areas of equal or higher function.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable silvery legless lizard populations in the inventory area at the northern extent of its range.

Objective 2a. Protect key areas of core habitat sufficiently large and connected to sustain silvery legless lizard populations in the inventory area.

Objective 2b. Maintain or promote suitable soil types (e.g., sandy or loose loamy soils) in protected core habitats. Limit activities that could substantially compact suitable soils within protected core habitat.

Alameda Whipsnake

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on Alameda whipsnake and its habitat.

Objective 1a. Avoid adverse effects of covered activities on Alameda whipsnake core habitat. Minimize adverse effects of covered activities on movement habitat.

Rationale: Because most of the Alameda whipsnake core habitat in the inventory area occurs outside of the urban limit line, there is good potential to avoid impacts to core habitat. Effects on the chaparral/scrub community should be minimized because this community is relatively uncommon in the inventory area, especially at lower elevations. Stands of chaparral/scrub within grassland or oak woodland/savanna often provide the best cover for many wildlife species. Chaparral/scrub also provides habitat for several covered species.

Objective 1b. Compensate for the loss of suitable movement habitat by protecting areas of equal or higher quality habitat.

Goal 2. Contribute significantly to the recovery of the Alameda whipsnake by protecting and managing a network of reserves that contain core habitat and are connected by movement habitat.

Objective 2a. To the maximum extent practicable, protect all Alameda whipsnake core habitat in the inventory area.

Objective 2b. Maintain dispersal/movement of whipsnakes among core habitat areas by protecting key movement corridors between core habitat areas.

Objective 2c. Establish and maintain buffers around protected habitats sufficient to minimize intrusion by humans and domestic animals.

Objective 2d. Where appropriate, implement fire and grazing management practices that enhance the long-term persistence of the Mount Diablo-Black Hills population of the Alameda whipsnake.

Rationale for Objectives 2a-2d. A large portion of the Mount Diablo-Black Hills population of the Alameda whipsnake occurs in the inventory area. The USFWS lists this population as having a high potential for recovery if threats from urban development, catastrophic wildfire, and grazing practices can be managed well. There is high potential for the HCP/NCCP to contribute to recovery of this species because nearly all Alameda whipsnake core and movement habitat inventory area occurs outside the urban limit line.

Giant Garter Snake

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on giant garter snake and its habitat.

Objective 1a. Avoid or minimize adverse effects on giant garter snake core habitat. Minimize adverse effects on giant garter snake movement habitat.

Objective 1b. Compensate for suitable habitat lost as a result of covered activities by protecting areas of equal or greater function.

Goal 2. Establish and maintain a habitat reserve system capable of sustaining the portion of the giant garter snake population that occurs in the inventory area.

Objective 2a. Protect key areas of core and movement habitat in agricultural areas sufficiently large to sustain a portion of the giant garter snake population that occurs in the inventory area.

Objective 2b. Increase habitat function for giant garter snake on agricultural lands by encouraging voluntary agricultural practices that benefit this species and that are compatible with economically-viable agricultural uses.

California Tiger Salamander

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on California tiger salamander and its habitat.

Objective 1a. Avoid or minimize adverse effects of covered activities on California tiger salamander individuals, suitable breeding habitat, and key movement routes.

Objective 1b. Compensate for loss of suitable breeding habitat by protecting existing areas of equal or greater function habitat, and restoring or creating breeding habitat of equal or greater function in habitat reserves.

Objective 1c. Compensate for loss of suitable aestivation/movement habitat by protecting areas of equal or greater function habitat.

Goal 2. Establish and maintain a habitat reserve system capable of sustaining an increased population of California tiger salamander in the inventory area.

Objective 2a. Protect complexes of suitable breeding and aestivation/movement habitat sufficiently large and connected to sustain California tiger salamander populations. Complexes should include multiple breeding sites surrounded by abundant suitable aestivation/movement habitat.

Rationale: Reserves of multiple breeding ponds surrounded by abundant upland habitat have been recommended to ensure the persistence of California tiger salamander. Preserving wetland-upland complexes is more likely to maintain "core" breeding - refuge site ensembles than more isolated sites. This approach will increase the area of contiguous suitable habitat and decrease fragmentation. In this HCP/NCCP, the suitability of upland habitat is assumed to increase with the number of available refuge sites and decrease with the distance from a breeding site Although probability of upland use by tiger salamanders is likely to decrease with distance to a breeding site, the strength of this relationship in an area probably

depends on the abundance and distribution of available refuge sites. Juvenile salamanders are known to migrate distances up to 1 mile from breeding sites. However, DFG suggests that upland habitats greater than 0.62 mile (1 km) from a breeding site are probably not suitable for California tiger salamanders (California Department of Fish and Game 1997).

Objective 2b. Emphasize the protection of breeding sites that have been productive (i.e., source populations) during the last 10 years.

Objective 2c. Support dispersal of tiger salamanders among protected habitat complexes; protect key areas of aestivation/movement habitat sufficiently large and configured to function as movement corridors among complexes.

Objective 2d. In areas targeted to function as primary tiger salamander movement corridors, maintain or create appropriately-distributed "stepping-stone" aquatic breeding sites and upland refugia (e.g., ground squirrel burrows).

Objective 2e. Enhance protected areas by restoring or creating suitable aquatic habitat and increasing the abundance of upland refugia. Design created or restored aquatic habitat to meet the specific breeding habitat requirements of California tiger salamander (e.g., sufficient ponding depth and duration).

Rationale: California tiger salamanders require two major habitat components: aquatic breeding sites and terrestrial aestivation or refuge sites. Increasing the availability and function of these features where they may be limiting factors are expected to enhance tiger salamander populations.

Objective 2f. To the extent feasible, prohibit habitat modifications that result in movement barriers or hazards between breeding and upland habitat (e.g., berms, fences, roads, and some pipelines). Where roads or other structures must traverse a known or possible movement route, establish safe movement routes for tiger salamanders. Remove structures or close roads within reserves where possible to reduce risks to dispersing tiger salamanders.

Objective 2g. Establish and maintain adequate buffers around protected habitats to minimize intrusion from humans and domestic animals.

Rationale: Intrusion by humans can harm California tiger salamanders, and predation or disturbance by domestic animals such as cats and dogs can affect local populations.

Objective 2h. Manage protected movement/aestivation habitat to promote ground squirrel populations.

Objective 2i. Control tiger salamander predators (e.g., bullfrogs and fish) in protected breeding habitat.

Rationale: Predation by bullfrogs, non-native fish, and other species has contributed to declines in tiger salamander populations. Monitoring and controlling predation by non-native species will enhance tiger salamander populations and productivity.

Objective 2j. To the maximum extent practicable, prohibit activities that may threaten water quality in habitat reserves and their watersheds.

California Red-legged Frog

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on California red-legged frog and its habitat.

Objective 1a. Avoid or minimize adverse effects of covered activities on California red-legged frog individuals, suitable breeding habitat, and key migration/aestivation habitat.

Objective 1b. To the extent feasible, relocate California red-legged frogs from areas where impacts cannot be avoided to suitable but unoccupied breeding sites in preserves.

Objective 1c. Compensate for loss of suitable breeding habitat, and achieve a no-net-loss of breeding habitat function, by protecting areas of equal or greater function, and restoring or creating breeding habitat of equal or greater function in preserves. Stock ponds lost to covered activities will be compensated through preservation, restoration, and creation of ponds of equal or greater extent and function than those ponds lost.

Objective 1d. Compensate for loss of migration/aestivation habitat by protecting upland areas of equal or greater function.

Objective 1e. To the extent feasible, prohibit habitat modifications that result in movement barriers or hazards between breeding and upland habitat (e.g., berms, fences, roads, and some pipelines). Where roads or other structures must traverse a known or possible movement route, establish safe movement routes for red-legged frogs.

Goal 2. Establish and maintain a habitat reserve system capable of sustaining larger populations of California red-legged frog in the inventory area, and contribute to the recovery of this species in the Mount Diablo vicinity core area in the South and East San Francisco Bay Recovery Unit.

Objective 2a. Protect complexes of suitable breeding and migration/aestivation habitat sufficiently large and connected to sustain several large California red-legged frog populations. Complexes should include multiple breeding sites surrounded and connected by abundant suitable aestivation/migration habitat.

Objective 2b. Emphasize the protection of larger populations that are well-connected by upland habitat, and that are likely to serve as source populations. To the extent feasible, link potential source populations to other suitable or occupied breeding habitat by protecting key areas of aestivation/migration habitat sufficiently large and configured to function as movement corridors.

Objective 2c. Identify areas to function as key red-legged frog movement corridors, and maintain or create appropriately-distributed “stepping-stone” aquatic

breeding sites and abundant suitable upland refugia (e.g., ground squirrel burrows) within these areas.

Objective 2d. Enhance habitat function in reserves by restoring or creating aquatic breeding sites and increasing the abundance of suitable upland refugia in habitat reserves. Design created or restored aquatic habitat to meet the specific breeding habitat requirements of California red-legged frog (e.g., sufficient ponding depth).

Objective 2e. Attempt to establish red-legged frog populations in restored or created breeding habitat that is unlikely to be naturally colonized by red-legged frogs from existing populations.

Objective 2f. Remove structures or close roads within reserves where possible to reduce barriers and risks to dispersing frogs.

Objective 2g. Establish and maintain adequate buffers around protected habitats to minimize intrusion from humans, domestic animals, and contaminants.

Objective 2h. Manage protected movement/aestivation habitat to promote ground squirrel populations.

Objective 2i. Control red-legged frog predators (e.g., bullfrogs and non-native predatory fish) in protected breeding habitat.

Objective 2j. To the maximum extent practicable, prohibit activities that may threaten water quality in habitat reserves and their watersheds.

Objective 2k. To the extent practicable, minimize the spread of disease and parasites among breeding sites.

Foothill Yellow-legged Frog

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on foothill yellow-legged frog and its habitat.

Objective 1a. Avoid or minimize adverse effects of covered activities on suitable foothill yellow-legged frog habitat. Limit the total loss of perennial streams to less the 5% of remaining perennial streams in the planning area.

Objective 1b. Compensate for loss of suitable habitat by protecting existing areas of equal or greater function habitat, and restoring breeding habitat of equal or greater function in habitat reserves.

Goal 2. Establish and maintain a habitat reserve system capable of enhancing foothill yellow-legged frog populations in the inventory area.

Objective 2a. Protect key areas of core habitat sufficient to expand yellow-legged frog populations. To the extent feasible, emphasize the protection of core habitat that has been occupied during the last 10 years, and nearby suitable habitat.

Objective 2b. Achieve no-net-loss in habitat function through stream and riparian habitat enhancement and restoration in preserves. Design and manage yellow-legged frog habitat to meet the specific breeding habitat requirements of the species by improving streamflow and substrate conditions.

Objective 2c. Preserve intact watersheds to the maximum extent practicable to maintain streamflow patterns and ensure perennial streams remain perennial.

Objective 2d. Ensure streams within preserves maintain or improve their hydrologic functions by preserving upland habitat adjacent to streams.

Objective 2e. Enhance habitat quality within preserves by limiting or eliminating livestock access to riparian areas and adjacent uplands.

Objective 2f. Increase riparian woodland/scrub canopy coverage over streams to reduce and mediate stream water temperatures.

Objective 2g. Reduce stream bank erosion within preserves through means such as bank stabilization, planting riparian and upland vegetation, and changes in grazing practices.

Objective 2h. Establish and maintain adequate buffers around protected habitats to minimize intrusion from humans, domestic animals, and contaminants.

Objective 2i. Control non-native yellow-legged frog predators (e.g., bullfrogs) in protected breeding habitat.

Objective 2j. To the maximum extent practicable, prohibit activities that may threaten water quality in habitat reserves and their watersheds.

Longhorn Fairy Shrimp, Vernal Pool Fairy Shrimp, Midvalley Fairy Shrimp, and Vernal Pool Tadpole Shrimp

Goals and objectives for the four covered fairy shrimp are included together because of their similar ecology, habitat requirements, range, and conservation needs.

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects of covered activities on covered shrimp and their habitat.

Objective 1a. Avoid impacts to vernal pools from covered activities when practicable. Minimize adverse effects to vernal pools from covered activities to the extent practicable.

Objective 1b. Compensate for the loss of suitable habitat lost as a result of covered activities by preserving 2 acres and restoring or creating 1 acre of suitable habitat in habitat reserves for each acre removed.

Goal 2. Establish and maintain a habitat reserve system capable of enhancing vernal pool fairy shrimp, midvalley fairy shrimp, longhorn fairy shrimp, and vernal pool tadpole shrimp populations.

Rationale: Protecting occupied habitat, particularly habitat complexes, is important to maintaining and enhancing shrimp populations in the inventory area (also see below). However, little is presently known about the occurrence and distribution of these species in the inventory area.

Objective 2b. Achieve a net increase in habitat function for covered shrimp through vernal pool restoration or creation. Restore or create suitable pools in a quantity that exceeds Objective 1b.

Rationale: Increasing the amount of suitable habitat for covered shrimp provides opportunity for population enhancement and expansion in the inventory area.

Objective 2c. Emphasize protecting vernal pool complexes, including the upland habitat surrounding pools, rather than isolated pools.

Rationale: Achieving this objective maintains or enhances habitat function and the likelihood of long-term persistence by minimizing habitat fragmentation and the potential for local extirpation, and maintains or improves hydrologic function of vernal pools.

Objective 2d. Establish and maintain buffers around protected vernal pools and surrounding uplands to minimize intrusion from humans and equipment and maintain the local hydrologic regime that supports the pools.

Objective 2e. Enhance vernal pools and control exotic plants within and around pools in preserves by appropriate control and management of livestock.

Objective 2f. Maintain or improve the hydrologic functions of vernal pools in habitat preserves by preserving adjacent upland habitat; maintain surface hydrologic connections to swales or other water features; preserve vernal pools that form complexes; and prohibit activities that could adversely affect vernal pool hydrology.

Objective 2g. To the maximum extent practicable, prohibit or limit activities that may threaten water quality in habitat reserves and their watersheds.

Mount Diablo Manzanita

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on Mt. Diablo manzanita and its habitat.

Objective 1a. Avoid or minimize adverse effects on Mt. Diablo manzanita populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage cuttings and seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable Mt. Diablo manzanita populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of Mt. Diablo manzanita in the inventory area not affected by covered activities.

Rationale: This species is endemic to the Diablo Range in Contra Costa County. The inventory area includes a majority of the range of this species and 77% of known occurrences thought to be extant. Suitable habitat for the species is relatively uncommon in the inventory area. Protection of all remaining populations in the inventory area is necessary to prevent listing of this species or to recover the species if it becomes listed in the future. Impacts to this species or its suitable habitat are expected to be low from covered activities. Therefore, protection of known populations and suitable habitat should be to the maximum extent practicable within this plan.

Objective 2b. Protect stands of suitable chaparral habitat to allow expansion of Mt. Diablo manzanita populations or colonization of new areas.

Objective 2c. Study the ecology of this species to learn what factors may be limiting its distribution and populations size, and to determine what management techniques could be used to increase the size of known populations. Implement these management techniques on an experimental basis.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species.

Brittlescale

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on brittlescale and its habitat.

Objective 1a. Avoid or minimize adverse effects on brittlescale populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable brittlescale populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of brittlescale in the inventory area not affected by covered activities. Protect multiple populations in the reserve system to maximize long-term viability of the species in the inventory area.

Rationale: The inventory area includes a small portion of the range of this species and 20% of the known occurrences. To make a substantial contribution to recovery, all remaining populations in the inventory area should be preserved. However, this should be done to the maximum extent practicable because this action may not be required to prevent listing of this species.

Objective 2b. Protect suitable habitat in alkali soils to allow expansion of brittlescale populations.

Objective 2c. Conduct experimental management within preserves to determine what techniques can increase the population size of brittlescale. Enhance populations of brittlescale using successful techniques.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species.

San Joaquin Spearscale

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on San Joaquin spearscale and its habitat.

Objective 1a. Avoid or minimize adverse effects on San Joaquin spearscale populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable San Joaquin spearscale populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of San Joaquin spearscale in the inventory area not affected by covered activities. Protect multiple populations in the reserve system to maximize long-term viability of the species in the inventory area.

Rationale: The inventory area includes a small portion of the range of this species but over 40% of known occurrences. To make a substantial contribution to recovery, all remaining populations in the inventory area should be preserved in order to prevent listing or if the species is listed, to recover it.

Objective 2b. Protect suitable habitat in alkali soils to allow expansion of San Joaquin spearscale populations.

Objective 2c. Increase the population size of San Joaquin spearscale within preserves by applying techniques learned from monitoring and managing San Joaquin spearscale populations in the Los Vaqueros watershed.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species. Such an approach has been underway since 1999 in the Los Vaqueros Watershed as mitigation for impacts to this species from construction of the reservoir. Results from this study should be available by the time the HCP/NCCP is implemented to inform management within preserves.

Big Tarplant

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on big tarplant and its habitat.

Objective 1a. Avoid or minimize adverse effects on big tarplant populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable big tarplant populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of big tarplant in the inventory area not affected by covered activities.

Rationale: This species is found largely in the foothills of Mt. Diablo in Contra Costa, Alameda, and San Joaquin Counties. The inventory area contains a significant portion of the species' range and approximately 40% of the occurrences thought to be extant. Protection of all remaining populations in the inventory area is necessary to prevent listing of this species or if it becomes listed, to recover the species.

Objective 2b. Protect suitable habitat in soils of the Altamont series to allow expansion of big tarplant populations.

Objective 2c. Study the ecology of this species to learn what factors may be limiting its distribution and populations size, and to determine what management techniques could be used to increase the size of known populations. Implement these management techniques on an experimental basis.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species. Other agencies such as the Lawrence Livermore National Laboratories are studying the ecology of this species. Data from their studies could inform management in the preserves.

Mt. Diablo Fairy Lantern

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on Mt. Diablo fairy lantern and its habitat.

Objective 1a. Avoid or minimize adverse effects on Mt. Diablo fairy lantern populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable Mt. Diablo fairy lantern populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of Mt. Diablo fairy lantern in the inventory area not affected by covered activities.

Rationale: This species is endemic to the Diablo Range in Contra Costa County. The inventory area accounts for a substantial portion of the species range and approximately 20% of occurrence records. Protection of all remaining populations in the inventory area is necessary to prevent listing of this species or if it becomes listed, to recover the species.

Objective 2b. Protect suitable habitat to allow expansion of Mt. Diablo fairy lantern populations.

Objective 2c. Study the ecology of this species to learn what factors may be limiting its distribution and populations size, and to determine what management

techniques could be used to increase the size of known populations. Implement these management techniques on an experimental basis.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species.

Recurved Larkspur

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on recurved larkspur and its habitat.

Objective 1a. Avoid or minimize adverse effects on recurved larkspur populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable recurved larkspur populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of recurved larkspur in the inventory area not affected by covered activities. Protect multiple populations in the reserve system to maximize long-term viability of the species in the inventory area.

Rationale: The inventory area includes a small portion of the range of this species and approximately 5% of known occurrences. To make a substantial contribution to recovery (or prevention of listing), all remaining populations in the inventory area should be preserved. However, this should be done to the maximum extent practicable because this action is likely not required to prevent listing of this species.

Objective 2b. Protect suitable habitat in alkali soils to allow expansion of recurved larkspur populations.

Objective 2c. Conduct experimental management within preserves to determine what techniques can increase the population size of recurved larkspur. Enhance populations of recurved larkspur using successful techniques.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing

populations in preserves in order to determine which approaches are most effective for this species.

Diablo Helianthella

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on Diablo helianthella and its habitat.

Objective 1a. Avoid or minimize adverse effects on Diablo helianthella populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable Diablo helianthella populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of Diablo helianthella plant in the inventory area not affected by covered activities.

Rationale: This species is found only in Contra Costa, Alameda, and San Mateo Counties. The inventory area contains a majority of the species' range and approximately 20% of known occurrences. Protection of all remaining populations in the inventory area is necessary to prevent listing of this species or if it becomes listed, to recover the species.

Objective 2b. Protect suitable habitat to allow expansion of Diablo helianthella populations.

Objective 2c. Study the ecology of this species to learn what factors may be limiting its distribution and populations size, and to determine what management techniques could be used to increase the size of known populations. Implement these management techniques on an experimental basis.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species.

Brewer's Dwarf Flax

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on Brewer's dwarf flax and its habitat.

Objective 1a. Avoid or minimize adverse effects on Brewer's dwarf flax populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable Brewer's dwarf flax populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of Brewer's dwarf flax in the inventory area not affected by covered activities.

Rationale: This species is found in the foothills of Mt. Diablo in Contra Costa County and in the Vaca Mountains of Solano and Napa Counties. The inventory area contains a significant portion of the species' range and 48% of the known occurrences. Protection of all remaining populations in the inventory area is necessary to prevent listing of this species or if it becomes listed, to recover the species.

Objective 2b. Protect suitable habitat in oak woodland and chaparral to allow expansion of Brewer's dwarf flax populations.

Objective 2c. Study the ecology of this species to learn what factors may be limiting its distribution and populations size, and to determine what management techniques could be used to increase the size of known populations. Implement these management techniques on an experimental basis.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species.

Showy Madia

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on showy madia and its habitat.

Objective 1a. Avoid or minimize adverse effects on showy madia populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable showy madia populations in the inventory area at the northern extent of its range, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of showy madia in the inventory area not affected by covered activities. Protect multiple populations in the reserve system to maximize long-term viability of the species in the inventory area.

Rationale: The inventory area includes a small but important portion of the range of this species because it represents the northern extent of its range. The species is known to occur in the inventory only near Sand Creek in Antioch. Suitable habitat exists elsewhere. To make a substantial contribution to recovery, any populations found in the inventory area should be preserved.

Objective 2b. Protect suitable habitat to allow expansion of showy madia populations.

Objective 2c. Study the ecology of this species to learn what factors may be limiting its distribution and populations size, and to determine what management techniques could be used to increase the size of known populations. Implement these management techniques on an experimental basis.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species.

Adobe Navarretia

Goal 1. To the maximum extent practicable, avoid, minimize, and mitigate adverse effects on adobe navarretia and its habitat.

Objective 1a. Avoid or minimize adverse effects on adobe navarretia populations; minimize adverse effects on suitable habitat.

Objective 1b. Compensate for individuals lost as a result of covered activities by protecting an area of habitat of equal or higher function occupied by the species.

Objective 1c. Salvage seeds from individuals lost to covered activities and plant in suitable habitat within preserves.

Goal 2. Establish and maintain a habitat reserve system capable of supporting sustainable adobe navarretia populations in the inventory area, and increase the size of these populations in this system through improved habitat management.

Objective 2a. To the maximum extent practicable, protect all remaining populations of adobe navarretia in the inventory area not affected by covered activities. Protect multiple populations in the reserve system to maximize long-term viability of the species in the inventory area.

Rationale: The inventory area includes a small portion of the range of this species. At least 2 populations are found in the inventory area. To make a substantial contribution to recovery, all remaining populations in the inventory area should be preserved.

Objective 2b. Protect suitable habitat to allow expansion of adobe navarretia populations.

Objective 2c. Study the ecology of this species to learn what factors may be limiting its distribution and populations size, and to determine what management techniques could be used to increase the size of known populations. Implement these management techniques on an experimental basis.

Rationale: Little is known of the ecology of this species and what management techniques may enhance its populations. Because of the uncertainty in management needs, a scientifically-valid experimental approach should be taken to managing populations in preserves in order to determine which approaches are most effective for this species.

Jones & Stokes

Memorandum

Date: September 6, 2002

To: East Contra Costa County HCP Association
C/o John Kopchik

cc:

From: David Zippin

Subject: **Options to Address New Scientific Requirements of NCCP Act of 2002**

The Natural Community Conservation Planning Act (NCCPA) of 2002, signed by the Governor in February 2002, substantially alters the requirements of Natural Community Conservation Plans (NCCPs). The scope of work for Jones & Stokes or the East Contra Costa Habitat Conservation Plan (HCP)/NCCP, dated July 17, 2001, and adopted by the East Contra Costa County Habitat Conservation Plan Association (HCPA) was developed to address the requirements of the NCCPA of 1991 and did not contain all the provisions necessary for the NCCP to comply with the NCCPA of 2002. This memo outlines potential approaches to address the new scientific findings required for NCCPs.

Background
The NCCPA of 2002 had substantial changes to the NCCPA of 1991 in the following areas, all of which affect (or already affected) our scope of work:

- Planning Agreement
- Process for interim project review
- Wider public review of draft material
- More extensive scientific input
- Findings

Planning Agreement
The NCCPA requires applicants to sign a Planning Agreement with the California Department of Fish and Game (DFG) that outlines key features of the NCCP and the planning process. This binding agreement must specify many of the components of the NCCP that have already been developed (e.g., geographic scope, potential covered species, process for independent scientific input, public involvement process). However, some required elements have not yet been determined such as a process for interim project review.

Interim Project Review
Planning Agreements are required to contain a process to allow the DFG to review projects proposed in the NCCP planning area while the NCCP is being developed. The goal of this process is to ensure that projects approved are consistent with the overall conservation goals of the NCCP and do not preclude conservation options necessary for NCCP approval. Interim projects (i.e., projects approved after the Planning Agreement is signed and before the NCCP is complete) must also be included in the analysis of impacts within the planning area.

Increased Public Review
NCCP proponents are required to establish a process for public involvement and review under the new NCCPA. This public participation plan must adhere to the following guidelines and/or include the following components:

- Draft documents considered for adoption by the plan lead agency must be available for public review and comment at least 60 days prior to the adoption of the draft document.
- Preliminary public review documents must be made available at least 10 working days (2 weeks) prior to any public hearing addressing these documents.
- All "draft plans, memoranda of understanding, maps, conservation guidelines, species coverage lists, and other planning documents associated with an NCCP that are subject to public review" must be made available in a reasonable and timely manner
- An outreach program to provide access to information for persons interested in the plan, including landowners, with an emphasis on obtaining input from a balanced variety of affected public and private interests.

Scientific Input
The NCCPA of 2002 requires independent scientific input to the NCCP process. The project has already been modified to address this new requirement.

Findings
DFG is now required to make specific and detailed findings to support approval of NCCPs, based on substantial evidence in the record; DFG findings that must be made related to species, habitats, and the reserve system are:

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

- That the development of reserve systems and conservation measures in the plan area provides, as needed for the conservation of species, all of the following: (Sect. 2820 (a)(4))

  -Conserving, restoring, and managing representative natural and seminatural landscapes to maintain the ecological integrity of large habitat blocks, ecosystem function, and biological diversity

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

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

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

  -Sustaining the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the habitat areas within the plan area

Our original scope of work did not include explicit evaluation of ecosystem function, biological diversity, shifting species distributions, or environmental gradients. The remainder of this memo decribes our suggestions for the additional work on these topics we believe is necessary to support the required findings. Panel feedback on these ideas is most welcome.

Suggestions for Augmenting Baseline Data Inventory
Additional work is suggested to describe the ecosystem function, biological diversity and environmental gradients of the inventory area. These terms are not defined in the NCCPA of 2002, so definitions will have to be developed for use in the HCP/NCCP.

Ecosystem Function

We suggest defining ecosystems as "a community of organisms and their physical environmental interacting as an ecological unit" (Lincoln et al. 1998). The boundaries between ecosystems are somewhat arbitrary at the scale of the inventory area. In fact, some would argue that the entire inventory area is part of a single ecosystem of the interior coast range of California, or in the Mediterranean climate region of California. Ecosystem function is defined as the "sum total of processes operating at the ecosystem level, such as the cycling of matter, energy, and nutrients" (Mooney et al. 1995). Ecosystem processes also include processes at lower levels such as species interactions, and the transfer of genetic material.

We believe it is beyond the scope of this project (and likely beyond the intent of the NCCPA) to analyze the full range of ecosystem functions in the HCP/NCCP inventory area. For example, we cannot estimate nitrogen cycling within the inventory area and the impacts on this ecosystem function on covered activities without empirical data and complex computer modeling. Similarly, we cannot quantify other important ecosystem functions such as soil erosion rates or water quality within the inventory area without extensive field sampling and modeling. As a surrogate for these ecosystem functions, we suggest describing and evaluating the major watersheds of the inventory area. This is a useful unit and a reasonable surrogate for many ecosystem functions for several reasons:

- the inventory area was defined, in part, by watershed boundaries,
- many of the proposed covered species depend wholly or in part on freshwater habitats that are supplied and maintained by the watershed, and
- maintaining an intact watershed should, all else being equal, maintain important ecosystem functions such as minimizing soil erosion, maintaining water quality, maintaining the local hydrologic cycle, ensuring adequate cycling of key nutrients, and ensuring species interactions between aquatic and terrestrial ecosystems.

This approach has been recommended recently to conserve freshwater species and habitats on a regional scale (Saunders, Meeuwig, and Vincent 2002). We suggest describing the watersheds of the inventory area in terms of their:

- size (acres),
- proportion in natural land-cover types,
- proportion in land-cover types subject to grazing (we would assume all grassland and oak savanna/woodland land-cover types are grazed)
- streams within each watershed (length) and the proportion adjacent to natural land-cover types or urban development (to address the importance of vegetation buffers along streams to maintain hydrologic functions)
- headwater streams (e.g., whether headwaters are intact)

An important ecosystem-level effect of human disturbance that it is not encompassed by a watershed analysis is the introduction or spread of invasive species. To address this important issue, we propose describing the major invasive exotic species currently found in the inventory area and suites of species that may invade the inventory in the future. We also propose identifying other natural disturbances that occur on a large scale and affect ecosystem functions such as fire, stream flow changes (including flooding), and changes in climate (see the section on "shifting species distributions" below).

Biological Diversity

We suggest defining biological diversity as "the variety of organisms considered at all levels, from genetic variants of a single species through arrays of species to arrays of genera, families and still higher taxonomic levels; includes the variety of ecosystems" (Lincoln et al. 1998). For this HCP/NCCP, we suggest biological diversity include only species native to the inventory area (i.e., measure of biological diversity will not include exotic species). Biological diversity is difficult to evaluate without comprehensive inventories of species. There have been no such studies within the HCP/NCCP inventory area. However, the habitat relationships of two taxonomic groups, vertebrates and plants, are fairly well known in California. We recommend using these two groups as surrogates for overall biological diversity (i.e., diversity of all species).

We propose basing the biological diversity of vertebrates within the inventory area on the California Department of Fish and Game (DFG) Wildlife Habitat Relationship (WHR) System. The number of terrestrial vertebrates within each relevant WHR category (see Table 3-2 in the working draft of Chapter 3 of the HCP/NCCP) could be used as one measure of biological diversity within each natural community. This method was used in the Alameda/Contra Costa Biodiversity Study (Jones & Stokes Associates 1996). For plants, the CalFlora database at U.C. Berkeley could be used to determine the number of native plants found within Contra Costa County in each natural community (data limited to eastern Contra Costa County is not available). Data may be accessed from the CalFlora web site (http://www.calflora.org/calflora/).

Environmental Gradients

We propose defining environmental gradients as shifts in physical and ecological parameters. To describe environmental gradients in the inventory area, we suggest describing the transition zones between land cover types and natural communities. For example, oak savannah, as defined in our land cover types (<10% cover of oak trees) is a natural transition zone between annual grassland and oak woodland. We also suggest quantifying habitat gradients with the linear distance shared by mapped natural communities (i.e., the boundary between natural communities). The amount of habitat "edge" gives an indication of the amount of ecotonal variation in the inventory area. Environmental gradients could also be described by physical features such as topographic variation, slope, and aspect. These features should be described quantitatively when possible. In sum, we suggest determining:

- linear amount of ecotones between natural communities
- acreage of transitional communities or land cover types (e.g., oak savannah)
- acreage of land with steep or gentle slopes (using slope categories),
- acreage of land with north, south, west, or east aspects,
- acreage of land within categories of elevation

We propose using a digital elevation model (DEM) for the inventory area to quantify and analyze topographic and physical parameters. We would create a mosaic of 1:24,000 scale DEMs for the inventory area. All other analyses would be based on land-cover mapping already completed for the project.

Shifting Species Distributions

The NCCPA requires that NCCPs account for shifting species distribution due to "changed circumstances." The primary intent of this requirement is to account for changes in natural communities and species distributions that are expected to occur over time for a variety of reasons. An important cause of shifting species distributions that may occur during the term of this NCCP is global warming. To address this, we propose summarizing the most recent literature on the predicted effects of global warming (e.g., EPA 1997; National Assessment Synthesis Team 2000; IPCC 2001). Global warming predictions tend to be broad in geographic or taxonomic scope. However, when possible, we would cite predictions for natural communities, species groups, or areas within the inventory area so that the expected changes can be incorporated into the reserve design.

Suggestions for Augmenting the Conservation Strategies Task

Additional work is suggested to address impacts to and conservation of ecosystem function, biological diversity, shifting species distributions, and environmental gradients.

Impact Analysis

We propose evaluating the impacts of the covered activities and covered projects within the inventory area on ecosystem function, biological diversity, shifting species distributions, and environmental gradients. These analyses would be qualitative for some topics (shifting species distributions, biological diversity), and quantitative for others (ecosystem function, environmental gradients).

For ecosystem function, we propose quantifying the impact of covered activities on the watersheds in the inventory area, using all of the parameters described in the Baseline Data Inventory (above). In addition, we would qualitatively infer impacts on ecosystem processes themselves, such as soil erosion, nutrient cycles, and the hydrologic cycle. We would also evaluate the effects of covered activities on exotic and invasive species, fire frequency and intensity, stream flow patterns, and climate change, and how these factors might affect ecosystem function.

We suggest qualitatively evaluating the impacts of covered activities and projects on biological diversity by evaluating the effects on land-cover types and natural communities and how they relate to overall biodiversity.

For environmental gradients, we propose overlaying land use designations within the inventory area with each environmental gradient to determine the impact of future development on these features. For shifting species distributions, we would qualitatively analyze the proposed conservation strategies to determine how the covered activities and projects will affect the ability of covered species, natural communities, and overall biodiversity to shift.

Conservation Strategy

To synthesize the additional tasks described above, we propose adapting the proposed conservation strategies (or modifying working strategies, depending on the timing of this scope augmentation) to incorporate conservation of ecosystem function, biological diversity, shifting species distributions, and environmental gradients. The conservation strategy would be tested against the DFG findings required at the end of the NCCP process to ensure that regulatory requirements are being met.

Literature Cited

Environmental Protection Agency (EPA). 1997. Climate Change in California. Publication 230-F-97-008e. Washington, D.C. (available at: http://www.epa.gov/globalwarming/publications/impacts/state/ca_impct.pdf)

Intergovernmental Panel on Climate Change (IPCC). 2001. Climate Change and Biodiversity. April. United Nations Environment Programme, Nairobi, Kenya. (available at: http://www.ipcc.ch/pub/tpbiodiv.pdf)

Jones & Stokes Associates, Inc. 1996. Opportunities and constraints for conservation of biodiversity in eastern Alameda and Contra Costa Counties. Administrative draft. April 12 (JSA 95-122). Sacramento, CA. Prepared for Alameda-Contra Costa Biodiversity Working Group, Martinez, CA.

Lincoln, R., G. Boxshall, P. Clark. 1998. A Dictionary of Ecology, Evolution, and Systematics. Cambridge University Press, New York.

Mooney, H. A., J. Lubchenco, R. Dirzo, O.E. Sala. 1995. Biodiversity and ecosystem functioning: Basic principles. Pp. 275-325 in: V. H. Heywood, Ed. Global Biodiversity Assessment. Published for the United Nations Environment Programme. Cambridge University Press, Cambridge, UK.

National Assessment Synthesis Team. 2000. Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change. Cambridge University Press, New

York.

Saunders, D. L., J. J. Meeuwig, and A. C. J. Vincent. 2002. Freshwater protected areas: Strategies for conservation. Conservation Biology. 16:30-41.