East Contra Costa County Habitat Conservation Plan Association

HCPA Coordination Group Meeting

Thursday, September 19, 2002
1 p.m. to 3 p.m.

City of Pittsburg Council Chambers
65 Civic Drive in Pittsburg, 3rd Floor
(see map on reverse)

Agenda

1:00 Introductions. Review contents of meeting packet.

1:05 Review and approve Draft Meeting Record of the August 15, 2002 Coordination Group meeting.

1:10 Discuss Coordination Group Work Plan for the next several months (handout).

1:20 Consider draft chapter section on Biological Goals for the East Contra Costa HCP (draft chapter section attached).

1:40 Continue to review analysis methods that will be used to prepare the HCP: 11 new habitat models for covered species (memo attached).

2:05 Update on subcommittee assigned to discuss biological inventory issues in more detail (subcommittee to meet before October Coordination Group meeting).

2:06 Consider whether the Coordination Group wishes to pose any questions to the Science Advisory Panel ("SAP") for the September 20 meeting; plan for compiling questions for the subsequent SAP meeting.

2:20 Continue discussion on the topic of covered activities and consider recommending additional refinements to the list (memo attached). Begin discussion of permit area.

2:55 Confirm upcoming meeting dates and review upcoming topics. Upcoming meetings are scheduled as follows for the City of Pittsburg Council Chambers (3rd Thursdays):

Thursday, October 17, 1 p.m. to 3 p.m. (tentative)
Thursday, November 21, 1 p.m. to 3 p.m. (tentative)
(Science Advisory Panel scheduled to meet again at 1 on 9/20)

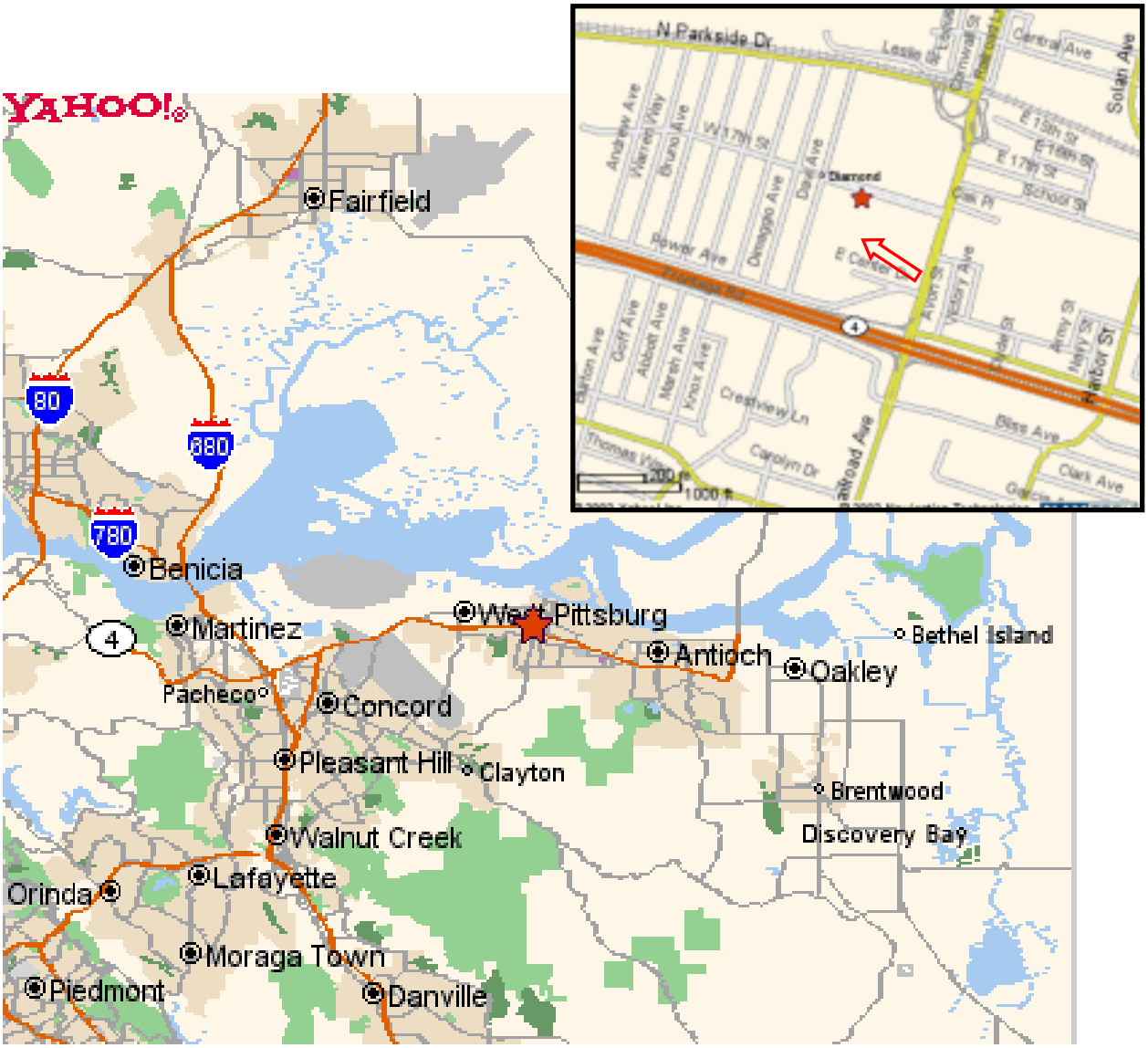
Upcoming topics include: initial work on economic analysis and development of alternative conservation strategies.

2:55 Public comment.

3:00 Adjourn.

Times are approximate. If you have questions about this agenda or desire additional meeting materials, you may contact John Kopchik of the Contra Costa County Community Development Department at 925-335-1227.

Map and Directions to Pittsburg City Hall
65 Civic Drive



Directions from I-680, Central County

1) Take Hwy 4 East toward Antioch/Stockton
2) Follow Hwy East over the hill (Willow Pass)
3) Exit Railroad Ave. (the 2nd exit after the hill)
4) At the end of the exit ramp, turn left on Railroad Ave.
5) Turn left at the second intersection, East Center Drive (signs for various city offices will also point you this way)
6) Immediately bear right into the large parking lot next to City Hall
7) Meeting is on the 3rd floor

Directions from Antioch and points east

1) Take Hwy 4 West toward Martinez/Richmond
2) Exit Railroad Ave.
3) At the end of the exit ramp, turn right on Railroad Ave.
4) Turn left at the next intersection, East Center Drive (signs for various city offices will also point you this way)
5) Immediately bear right into the large parking lot next to City Hall
6) Meeting is on the 3rd floor

DRAFT MEETING RECORD

East Contra Costa County Habitat Conservation Plan Association (HCPA) Coordination Group Meeting

Thursday, August 15, 2002
1 p.m. to 3 p.m.

City of Pittsburg Council Chambers

1:00 Welcome and introductions. Meeting attendees introduced themselves. Coordination Group members in attendance were:

Guy Bjerke, Home Builders Assoc. of N.CA
Bradley Brownlow, Contra Costa Council
Mike Daley, Sierra Club Bay Chapter
Dave Dolter, the Seeno Companies
Fran Garland, CCWD
Jim Gwerder, CCC Citizens' Land Alliance
Barry Hand, City of Oakley
Randy Jerome, City of Pittsburg
John Kopchik, CCC Community Dev. Dept.
Sheila Larsen, U.S. Fish & Wildlife Service
Kathy Leighton, Byron MAC
Jody Merriam, Byron MAC
Peter Rauch, CA Native Plant Society
John Slaymaker, Greenbelt Alliance
Jacqui Smalley, Golden Gate Audubon
Beth Stone, EBRPD
Nancy Thomas, CCRCD
Carl Wilcox, CA Dept of Fish & Game

Others in attendance included: John Hopkins, Institute for Ecological Hlth, Lisa Hokholt, USDA/NRCS, and Ann Dennis, Sierra Club. David Zippin, Project Manager for lead project consultants, Jones & Stokes, Inc. was also present.

1:05 Review and approve Draft Meeting Record of the July 18, 2002 Coordination Group meeting. Meeting record was approved.

1:10 Consider draft memo on Application of Conservation Biology Principles to the East Contra Costa HCP. David Zippin explained the memo. Individual members made a number of comments on the text, including suggestions that analysis look beyond the County boundary, that the buffer question be given serious attention because that could be a contentious and important issue, that the "consider watersheds" item be strengthened, and that perhaps "encouraged" wasn't the right word under the compatible uses bullet near the end. John Hopkins provided written comments and summarized these, including a comment under the "maximize size" item that the concept of reasonable proportion to impacts may not be consistent with the NCCP Act. Several members stressed the importance of continued outreach to willing sellers. John Kopchik thanked the group for the feedback and indicated that David Zippin would consider the comments received at the meeting from individual participants and produce an edited version of the document for the Science Advisory Panel.

1:30 Continue to review analysis methods that will be used to prepare the HCP: 4 new habitat models for covered species. John Kopchik reminded the group of the habitat modeling disclaimer included on the map, in the accompanying memo, and discussed last time. David Zippin reviewed four new habitat models and explained any revisions to the four models presented previously. Members asked a variety of questions. A specific suggestion was made regarding the model for Giant Garter Snake, namely, that model was constrained by

the lack of data on the location of irrigation channels. The group repeated its request that a few major highways and a larger version date be included in the models.

1:50 Biological Resources Inventory wrap-up (Chapter 3 of the HCP):

a) Geographic Information System (GIS) demo of landcover map and aerial photos. John Kopchik and David Zippin demonstrated the landcover map, showed the aerial photos from which the landcover map was largely derived, showed the location of the whipsnake "outliers" and the lack of shrub habitat nearby, and demonstrated an early draft of the more comprehensive creek data being developed by the County.

b) Revisit prior topics as needed

- **1st meeting report from Science Advisory Panel**
- **Jones and Stokes' recommendations for addressing these suggestions**
  - **Recommendation on "No-Take" Species**

c) Develop any consensus comments on Chapter 3, the Science Panel Report and the Jones and Stokes response (initial habitat modeling may be taken into consideration, but we won't attempt to develop consensus comments on those at this meeting)

Discussion of items b and c was combined. John Kopchik asked the group to name their major concerns with Chapter 3, including issues discussed in the Science Advisory Panel (SAP) meeting report and the Jones & Stokes response. John Kopchik recorded comments with a flip chart and started the discussion by listing small scale features on the flipchart as the biggest concern he had heard expressed. He asked for other concerns and individuals suggested the following: the definition of oak savannah as 10% cover or less, the request for a representative example of how the species accounts will be edited when inserted in the HCP, and the request for a map highlighting …(flip chart notes unclear! anyone remember?). The relation of windfarms to the HCP was also mentioned as a major concern, though not necessarily with Chapter 3.

The group returned to the topic of small scale features. David Zippin explained that small scale features cannot be seen with aerial photography. Given property access limitations and budget constraints, it was not possible to map such features systematically throughout the inventory area. John Kopchik asked the group to identify and consider some approaches to addressing this matter. The following suggestions were recorded:

a) delay resolution of the issue until permit time (i.e. individual applicants would need to survey for such features in order to quantify impacts; the body implementing the HCP would also need to survey lands prior to acquisition to verify the quality of the habitat at a finer scale)
b) conduct "statistically valid" survey and estimation (i.e. survey a small sub-area where access is not a problem and attempt to extrapolate these results across the inventory area to help with quantifying impacts)
c) survey impact area where possible to develop an estimate of impacts up-front
d) figure out if these is really an issue

The group agreed that d) was a prudent first step and didn't preclude recommending a,b, or c. A representative subcommittee was formed to explore this issue further. Volunteers were: Sheila Larsen and/or Carl Wilcox, Peter Rauch, David Dolter, Jim Gwerder, Nancy Thomas, and Beth Stone.

John Kopchik closed the discussion by requesting that any individual comments on the Biological Resources Inventory be submitted by August 31

2:35 Continue discussion on the topic of covered activities and consider removal of activities from the original all-encompassing list. David Zippin explained the revised memo in which he had consolidated items where possible, put notes next to some items indicating that they

should only be covered if that constituency requested it, and recommending eliminating some activities that were significantly different from the other activities and therefore not good fit for the planning process. The Coordination Group discussed some of the details and agreed on some suggested refinements. The agreed to refinements are presented in detail in the revised covered activities memo included in the 9/19/02 meeting packet.

2:55 Confirm upcoming meeting dates and review upcoming topics. Upcoming meetings are scheduled as follows for the City of Pittsburg Council Chambers (3rd Thursdays):

Thursday, September 19, 1 p.m. to 3 p.m.
Thursday, October 17, 1 p.m. to 3 p.m. (tentative)
(Science Advisory Panel tentatively scheduled to meet again at 1 on 9/20)

Upcoming topics include: initial work on economic analysis and development of alternative conservation strategies.

2:55 Public comment. None.

3:00 Adjourn.

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 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.

Jones & Stokes

Memorandum

Date: August 8, 2002 (updated September 14, 2002 by John Kopchik)

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

cc:

From: David Zippin, Jones & Stokes

Subject: **Covered Activities**

Jones & Stokes submitted a preliminary list of potential covered activities to the HCPA in a February 13 memorandum. This memo presents our recommendations of changes to the original list (Table 1) based on discussions with staff, the HCPA Coordination Group, and the Executive Governing Committee since February 13. Our recommendations include deletions, one addition, and several consolidations of the original 18 activities to a new list of from 9 to 12 activities (see summary list at the end of the memo). The HCPA Coordination Group discussed the revised covered activities list at their August 15 meeting and a record of that discussion is included at the end of this memo.

Table 1. Recommended Changes Regarding the 18 Covered Activities Under Consideration by the HCPA.

Proposed Activity from Feb. 13 list	Recommendation	Remaining Questions
1. Residential, commercial, and industrial development	Retain as core covered activity.	How much residential development is to be covered and where?
2. Road construction and maintenance	Refine activity to "road and highway construction and maintenance". Estimate final impacts based on combination of on-going and future maintenance, and new construction from foreseeable major projects.	What is the length of roads outside the ULL on which regular maintenance is conducted? Are major new highways, roads or highway/road expansions planned outside the ULL?
3. Water infrastructure projects	Refine activity to "water infrastructure construction and maintenance". Estimate impacts based on combination of on-going and future maintenance, and new construction from foreseeable major projects.	Where are major water infrastructure projects planned, besides the Los Vaqueros Reservoir expansion (excluded from HCP/NCCP)?
4. Flood control project construction and maintenance	Retain activity. Estimate final impacts based on combination of on-going and future maintenance, and new construction from foreseeable major projects.	Where are major flood control projects planned?
5. Wind energy	Drop from consideration as a covered	None

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www.jonesandstokes.com

Proposed Activity from Feb. 13 list	Recommendation	Remaining Questions
development	activity due to the lack of foreseeable projects and the unique nature of their impact on raptors.	
6. Sanitary system infrastructure	Refine activity to "sanitary system infrastructure construction and maintenance". Estimate final impacts based on combination of on-going, small-scale activities and new construction of foreseeable major projects.	Where are major wastewater projects planned?
7. Recreational facility construction, maintenance, and operation	Refine activity to "rural recreational facility…" (recreational facilities within the Urban Limit Line (ULL) can be subsumed within #1). Estimate impacts based on combination of on-going and future operation and maintenance activities, and construction of new facilities needed for the HCP/NCCP preserve system.	Does EBRPD need coverage under the HCP/NCCP for construction, maintenance, and operation of their existing or new facilities?
8. Mining facility construction, operation, and maintenance	Due to the limited mining occurring in the inventory area, drop this activity unless Unamin in interested in coverage under the HCP/NCCP.	Is Unamin interested in getting their operations or future expansions covered under the HCP/NCCP?
9. Creation of parks, trails, and campgrounds	Include these activities within the ULL in activity #1; include these activities outside the ULL in activity #7. Create new category "recreational use of rural parks and preserves" to cover recreational uses within HCP/NCCP preserve system.	Does EBRPD want to include existing recreational uses in their parks in the HCP/NCCP?
10. Funeral/ Interment Services	Include these activities within the ULL in activity #1. Create new activity "miscellaneous development outside the ULL". Estimate final impacts based on rough acreage ceiling.	None
11. Public Services (e.g., construction of fire stations, police stations, public administration centers, community centers, schools, airports (or airport expansion))	Include these activities within the ULL in activity #1; include these activities outside the ULL in revised activity #10; estimate activities outside the ULL based on rough ceiling	The Byron Airport is within the ULL; should we include development on current GP designations in the final analysis or another development footprint? Is there a formal proposal to expand the Byron Airport?
12. Construction of Churches	Include this activity within the ULL in activity #1. Include this activity outside the ULL in revised activity #10. Estimate activity outside the ULL based on rough ceiling.	None

Proposed Activity from Feb. 13 list	Recommendation	Remaining Questions
13. Utility services-electricity, solids, liquids or gas through pipes which are necessary to support principal development involving only minor structures	Include this activity within the ULL in activity #1. Include this activity outside the ULL in revised activity #10. Estimate activity outside the ULL based on rough ceiling.	None
14. Population surveys, management, and scientific research on Preserve lands or potential preserve lands	Refine this activity to include habitat restoration in preserves created by the HCP/NCCP.	None
15. Relocation of covered species or other mitigation required for direct impacts to covered species	Retain this activity but combine with #14.	None
16. New agricultural operations	Combine with #17 and redefine as "clearing, grading, or filling of grasslands, oak woodlands, chaparral, wetlands, or riparian woodland/scrub natural communities for new irrigated agriculture". Define new irrigated agriculture as "cropland, pasture, orchards, or vineyards that currently do not support these activities".	Does the agricultural community want this activity covered in the HCP/NCCP? How much is irrigated agriculture expected to expand into these natural communities during the permit term?
17. Agricultural intensification	Combine with #16; see above	None
18. On-going operations of existing agriculture	Drop activity unless agricultural community is interested in covered it in the HCP/NCCP. Define terms clearly with help of landowner representatives and based on new California Endangered Species Act revisions to agricultural exemption provision. Estimate impacts based on ceiling within current agriculture and grassland land cover types.	Does the agricultural community want this activity covered? If so, how much coverage is needed and for which on-going activities?

In summary, this new draft list of activities incorporates all of our recommendations:

1. Residential, commercial, and industrial development
2. Road and highway construction and maintenance
3. Water infrastructure construction and maintenance
4. Flood control project construction and maintenance
5. Sanitary system infrastructure construction and maintenance
6. Rural recreational facility construction, maintenance, and operation
7. Recreational use of rural parks and preserves
8. Mining facility construction, operation, and maintenance (if requested by mining companies)
9. Miscellaneous development outside the ULL (to be defined later)
10. Population surveys, species relocation, habitat restoration, management, and scientific research on preserve lands or potential preserve lands
11. Clearing, grading, or filling of natural communities for new irrigated agriculture (if requested by agricultural community)
12. On-going operations of existing agriculture (if requested by agricultural community)

(below please find a refined draft of the above list that received consensus approval of the Coordination Group at its August 15 meeting; the Coordination will review the accuracy of this summary and continue the discussion on September 19)

Discussion Draft of Covered Activities List[1]

1. Residential, commercial, and industrial development (and other development activities, such as described in items 2 thru 4, inside the Urban Limit Line)
2. Road and highway construction and maintenance outside the ULL
3. Water infrastructure construction and maintenance outside the ULL
4. Flood control project construction and maintenance outside the ULL
5. Sanitary system infrastructure construction and maintenance
6. Rural recreational facility construction, maintenance, and operation
7. Recreational use of rural parks and preserves
8. Mining facility construction, operation, and maintenance (if requested by mining companies)
9. Miscellaneous development outside the ULL (to be defined later)
10. Population surveys, species relocation, habitat restoration, management, and scientific research on preserve lands or potential preserve lands
11. Clearing, grading, or filling of natural communities for new irrigated agriculture (if requested by agricultural community)
12. On-going operations of existing agriculture (if requested by agricultural community)
13. Wind turbines to be discussed later

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1 The introductory text on this subject should explain the difference between Section 7 and Section 10 of the Federal Endangered Species Act and make clear that, while an HCP can only provide coverage under section 10, HCPs can be an instrument for identifying permit conditions under Section 7.

Jones & Stokes

Memorandum

Date: ~~August 8~~September 9, 2002

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

cc:

From: David Zippin, Jones & Stokes

Subject: **Application of Conservation Biology Principles to the ECCC HCP/NCCP**

Introduction

A fundamental component of the conservation strategy for the East Contra Costa County (ECCC) HCP/NCCP is a preserve system composed of land purchased through fee title or conservation easements. This land will then be managed for the benefit of the covered species and natural communities in the HCP/NCCP, as well as for overall biodiversity, ecosystem functions, and any other complimentary goals identified in the planning process such as recreation, grazing, or agriculture. In order to maximize the benefits to these resources and uses with limited funds, the protected areas must be selected carefully. Selection will be based on a variety of biological, economic, and other factors. A partial list of these factors is presented at the end of this memo for context (these factors will be discussed at a later meeting).

This memorandum summarizes how principles of conservation biology will be applied to the ECCC HCP/NCCP to help guide the creation of a high-quality preserve system. This memo is a revision of the August 8 memo based on comments from the HCPA Coordination Group.

Background and Purpose

One of the primary benefits of a regional HCP or an NCCP (by definition, NCCPs are regional) over a project-by-project approach is the ability to assemble multiple parcels of preserved land into a preserve system. If designed properly, this preserve system can function in a manner greater than the sum of its parts (individual preserves). Proper design of a preserve system depends on proper application of the scientific principles of conservation biology. In addition, to be successful a preserve system must be designed considering multiple spatial scales. For example, at a small scale, a preserve system must contain the microhabitats necessary for target species (e.g., covered species) to survive. At a medium scale, habitat patches must be large enough to support populations or important portions of populations of covered species and seasonal movement of species (e.g., aquatic habitat for winter breeding of amphibians and upland habitat for summer aestivation (hibernation)). At a larger scale, preserves must be linked

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to allow movement of wide-ranging species, for genetic exchange, and for recolonization following a local extinction. At the largest scale (landscape or regional scale), preserves must be able to support ecological functions (e.g., watershed functions) within a matrix of urban development, agricultural land, and other land use features. Small- and medium-scale considerations will be driven by the needs of covered species and natural communities. Larger-scale issues will be guided by the conservation principles for reserve design, large-scale ecological functions, biological goals for natural communities, and biological goals for wide-ranging covered species. Proposed biological goals for natural communities and covered species are presented in a separate memo.

Principles of Conservation Biology

We propose the following principles of conservation biology be used to guide the design and assembly of the preserve system for the ECCC HCP/NCCP. These principles are taken from major texts on conservation biology (Soule and Wilcox 1980; Soule 1986; Primack 1993; Meffe and Carroll 1997; Noss et al. 1997). They also incorporate important regulatory requirements that will affect the preserve design of this HCP/NCCP.

The principles of conservation biology on which the preserve system will be based will include but not be limited to the following.

- **Maximize Size.** The preserve system should be as large as possible within funding and management limits ~~and within reasonable proportion to the project impacts~~. The preserve system must be large enough to mitigate for impacts of covered activities and to contribute to the recovery of covered species. A large preserve system is important to ensure viable populations or portion of populations of covered species, to maximize protection of species sensitive to disturbances from adjacent land use, and to maximize the protection of biodiversity. Large preserves tend to support more species for longer periods of time than small preserves.

- **Minimize the Number of Preserve Units.** The preserve system should have as few units (individual preserve "islands" separated by non-preserve land) as possible to reduce management costs and increase habitat integrity and connectivity while balancing the need to link preserves (see below) and maximizinge preservation of covered species and natural communities. A single large preserve is generally better than several small preserves of equal area at maintaining viable populations of species. In some cases, however, small and isolated preserves are necessary to protect~~ion~~ isolated ~~occurrences~~ features or populations with~~of local areas of~~ high biological importance (e.g., covered plant species populations, unique or especially diverse land cover types such as alkali wetlands and serpentine grassland/scrub).

- **Link Preserves.** The system should link existing and proposed preserves inside and

outside the inventory area to maximize the ability of organisms to move between preserves; ensure the exchange of genetic material, species migrations, dispersal, colonization; and increase the integrity of the network of preserve systems (e.g., reduces preserve edge with adjacent land uses).

- **Include Urban Buffer.** The preserve system should include urban buffers: undeveloped lands at the urban edge to ensure a fixed and adequate buffer between urban development and natural communities. The ~~adequacy~~size of the buffer will depend on the intensity of urban development, the natural community being buffered from the development, and whether covered species may be present near this buffer.

- **Minimize Edge.** The preserve system should have the minimum amount of edge with non-preserve land, especially urban development (i.e., maximize the preserve area-perimeter ratio) to minimize the indirect effects of adjacent land uses on the preserve resources and to minimize management costs. For example, preserves should be more round or square in shape rather than long and narrow to minimize edge. In some cases, preserves with low area-perimeter ratios may be appropriate to preserve linear features with high biological value such as streams or riparian woodland.

- **Maximize Environmental Gradients.** The preserve system should include a range of environmental gradients (e.g., topography, soil types, slopes, and aspects) to allow for shifting species distributions in response to catastrophic events (e.g., fire, prolonged drought) or anthropogenic change such as global warming.

- **Consider Watersheds.** The preserve system should include, when possible, entire watersheds, subwatersheds, or headwater streams not already in public ownership in order to maintain ecosystem function and aquatic habitat diversity.

- **Consider Full Ecological Range of Communities.** The preserve system should include the full ecological range of natural communities in the inventory area in order to maintain sufficient habitat diversity, species and population interactions, and natural disturbance regimes such as fire.

I encourage the HCPA and the Science Advisory Panel to suggest ~~alternative~~ additional conservation biology principles on which to the base the preserve design.

Other Factors

As stated above, the final preserve design will be based on a variety of biological, economic, and other factors in selecting lands to purchase in fee title or through conservation easements. Below is a partial list of these factors to provide context for the principles of conservation biology. We will discuss these other factors in more detail later in the process. Sites will be chosen based on,

in part:

- whether the site supports covered species or can support these species (based on the species distribution models, records of species locations, and knowledge of the habitat quality of the area);
- whether the site supports covered natural communities (based on the land-cover mapping);
- the ability of the site to help achieve the biological goals and objectives for covered natural communities and covered species;
- the ability of the site and its resources to adequately mitigate for cumulative project impacts (i.e., impacts of multiple projects covered by the HCP/NCCP);
- land or easement cost and value;
- seller willingness to include land in preserve system; and
- whether compatible uses such as recreation, grazing, or agriculture occur on the site ~~(these uses will be encouraged, when compatible)~~. Other uses such as wind farms may be compatible with the preserve system.~~;~~

~~- whether the site supports covered species or can support these species (based on the species distribution models, records of species locations, and knowledge of the habitat quality of the area), and~~

- ~~whether the site supports covered natural communities (based on the land-cover mapping).~~

Literature Cited

Meffe, G. K., and C. R. Carroll. 1997. Principles of Conservation Biology, 2nd edition. Sinauer Associates, Sunderland, MA.

Noss, R. F., M. A. O'Connell, and D. D. Murphy. 1997. The Science of Conservation Planning: Habitat Conservation Planning Under the Endangered Species Act. Island Press, Covelo, CA.

Primack, R. B. 1993. Essentials of Conservation Biology. Sinauer Associates, Sunderland, MA.

Soule, M. E., ed. 1986. Conservation Biology: The Science of Scarcity and Diversity. Sinauer Associates, Sunderland, MA.

Soule, M. E., and B. A. Wilcox, eds. 1980. Conservation Biology: An Evolutionary-Ecological Perspective. Sinauer Associates, Sunderland, MA.