

Memorandum

Date: January 23, 2003

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

From: David Zippin, Jones & Stokes

Subject: **Preliminary Impact Analysis**

This memorandum summarizes the methods and results of the preliminary impact analysis conducted to develop the draft conservation strategy and alternatives. This impact analysis will be refined and incorporated into chapter 5 of the administrative draft HCP/NCCP.

Background

The impact analysis of an HCP or NCCP has two primary purposes: 1) to clearly identify the impacts to covered species and natural communities from covered activities and projects, and 2) to define what impacts must be mitigated in the conservation strategy. Impact analyses are required components of HCPs and NCCPs, and the regulatory agencies will issue their permits based, in part, on the adequacy of the impact analysis.

A key component of the impact analysis is a clearly defined set of covered activities and covered projects. In the best case, the location, intensity, duration, and frequency of covered activities and projects would be well defined. This level of detail is typically not possible in a regional HCP with a relatively long permit duration (estimated to be 30 years for this HCP/NCCP) because of the uncertainty in future development patterns on such a large scale. The HCPA has not yet clearly defined the location or type of covered activities that will be included in this HCP/NCCP (see the memo dated August 8, 2002, for the latest list of proposed activities). We presented various options for addressing the uncertainty in covered activities in a May 6, 2002, memo. Some of these options have been incorporated into the impact analysis and conservation strategy.

In order to proceed with the impact analysis and conservation strategy, HCPA staff directed us to make some assumptions about where development might occur and what type of development might occur. The HCPA directed us to proceed with the preliminary impact analysis using 3 impact scenarios, each of which is described in the next section.

Methods

Given that the extent and location of future growth in East County cannot be precisely known, and since one purpose of developing the preliminary impact analysis and conservation strategy is to assist with subsequent identification of an HCP permit coverage area, three alternative impact

scenarios were developed and analyzed. Each of these three scenarios is based on the approved General Plans of HCPA Member Agencies with land use authority (i.e., the County and member Cities). A brief description of each scenario is provided below.

Scenario 1: Urban Land Use Designations Inside the Urban Limit Line (ULL). This scenario assumes that development will occur only those lands inside the ULL and with a development-type land use designation from the governing city or the County.

Scenario 2: All Non-Protected Lands Inside the ULL. This scenario assumes that, with the exception of existing parks, development will occur on all lands inside the ULL.

Scenario 3: City General Plans. This scenario assumes that, with the exception of existing parks, development will occur on all lands inside the ULL (same as Scenario 2). It further assumes that development will occur on lands meeting the following criteria:

- Outside the ULL, and
- Designated for development by approved City General Plans, and
- Not within lands already purchased for conservation.

In the few cases under this scenario where proposed development would surround proposed local open space areas and severely limit the regional resource value of the open space areas, both the proposed development and the open space it would surround were considered to be impacted.

Using GIS technology, the three impact scenarios were overlaid on the land cover map and on the species habitat model maps. This procedure allowed us to estimate the location of impacts to land cover types and suitable habitat and quantify the maximum impact that would occur under each scenario (i.e., assume all development lands in that scenario would be developed).

This method is inherently conservative and may overestimate the level of impacts. For instance, the land cover mapping identified areas of natural vegetation within existing built communities. Most such areas are within public parklands and were therefore excluded from the impact analysis. But small amounts of natural vegetation exist in other urban land use types such as along highway rights-of-way. These areas may never be directly affected by covered activities. In the revised impact analysis, we may refine our method to account for such fragments of natural vegetation. It should be noted, however, that limitations in the land cover mapping may have the opposite effect—an underestimation of impacts—as further explained below.

Types of Impacts

The impact analysis in the HCP/NCCP will focus on 3 primary types of impacts: 1) direct impacts, 2) indirect impacts, and 3) cumulative impacts.

Direct Impacts

Direct impacts are those that remove land cover types, habitat for covered species, or populations (or portions of populations) of covered species. Direct impacts can be either permanent or temporary. For the preliminary impact analysis, we assumed that all direct impacts would be permanent. The covered activities are not well-defined enough at this time to determine which impacts would be temporary. The impact scenarios described above estimated the amount of direct impacts to land cover types and covered species habitat. If some impacts can be identified later as having temporary impacts, the mitigation required for these impacts may be reduced slightly.

Indirect Impacts

The U.S. Fish and Wildlife Service (USFWS) defines indirect impacts as “those that are caused by the proposed action and are later in time, but are still reasonably certain to occur” (50CFR 402.02). Our definition of indirect impacts also includes those impacts that at the time of the proposed action but occur beyond the footprint of a project or activity (i.e., beyond the area of land disturbance). The HCP/NCCP must consider the indirect impacts in its impact analysis and mitigate these impacts to the maximum extent practicable.

Table 1 lists the major categories of indirect impacts that are expected to occur primarily from urban development and which covered species they are expected to affect. Expected indirect impacts include:

- Disturbance from lights in new urban development
- Harassment or disturbance from the larger human population
- Harassment of wildlife from additional pets
- Increased noise
- Increased runoff from urban development that may contain pollutants
- Increased recreation in HCP/NCCP Preserves (some informal use is assumed to occur in many areas that will be future Preserves)
- Increased chance of spread of exotic plants
- Increased vehicle-related disturbance or mortality to wildlife
- Increased chances of wildfire from larger human population and increased use of rural areas

Another important category of indirect effects comes from activities within the new Preserves that are required by the HCP/NCCP. Some habitat enhancement, restoration, and creation activities may temporarily and adversely affect covered species. For example, planting emergent vegetation in stock ponds could temporarily disturb California red-legged frogs that occupy the pond. Monitoring activities required by the HCP/NCCP may also disturb wildlife. For example, in order to determine the presence of some covered species, they must be handled by a qualified biologist (e.g., California red-legged frog, vernal pool invertebrates). This qualifies as harassment under the Endangered Species Act (ESA), and requires a permit. All monitors working under the HCP/NCCP, after approval by the USFWS, will be covered for their

monitoring activities in case they require take or in case take accidentally occurs. Some management activities may also disturb or inadvertently harm covered species. For example, fuel brakes must be created in key areas of the Preserves to minimize the risk of wildfire and to protect structures and adjacent lands. Creating and maintaining these fuel brakes may have minor adverse effects on grassland-dependent covered species such as Western Burrowing Owl and San Joaquin kit fox.

Table 1 lists preliminary indirect impacts of expected covered activities and projects. Because the list of covered activities and projects has not been finalized, the extent of indirect impacts from covered activities or projects have not been quantified or estimated. Because of this uncertainty, the conservation strategy does not address indirect impacts. When covered projects and activities have been defined, the impact analysis will be refined to include indirect impacts and the conservation strategy updated to address them.

Most of the indirect impacts will occur along or near the boundary between new urban development and new Preserves. Because of the geography of urban areas, this boundary zone will be a relatively small proportion of the total Preserve System. Therefore, it is expected that mitigation in the conservation strategy would have to be increased by between 1% and 10% to offset the indirect impacts of covered activities and projects.

Cumulative Impacts

Cumulative impacts result from the proposed action's incremental impacts when these impacts are added to the impacts of other past, present, and reasonably foreseeable future actions, regardless of the agency or person who undertakes them. Cumulative effects can result from individually minor but collectively significant actions that take place over time. The HCP/NCCP will consider the cumulative effects of covered projects and activities because of the requirement to address this issue under the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), and Section 7 of the Endangered Species Act (ESA). Cumulative effects were not considered in this impact analysis or in the conservation strategy at this time because the covered activities and projects have not yet been finalized. Cumulative impacts will be added to the impact analysis for the administrative draft HCP/NCCP.

Preliminary Impacts

Impact Scenario Locations

Figure 1 shows the land use designations in the inventory area. Figure 2 shows the location of maximum impacts under impact scenario 1 (pink color). All impacts under this scenario are restricted to within the ULL and to land use designations that already permit development. Figure 3 shows the location of maximum impacts under scenario 2 (magenta color). Impacts under this scenario are also restricted to within the ULL but assume development will occur on all non-protected lands. Figure 4 shows impacts under scenario 4 (maroon color), in which

development would extend beyond the ULL to the boundaries of current city General Plans. Figure 5 shows the differences between the 3 scenarios. Development would occur under all scenarios in the pink areas; under scenario 2 and 3 in the magenta areas; and in the maroon areas in scenario 3 only.

Impact scenario 2 includes up to 5,394 acres (41%) more new development than scenario 1 (Table 2), while impact scenario 3 includes up to 3,083 acres (16%) more new development than scenario 2 and 8,477 acres (64%) more new development than scenario 1.

Impacts to Land Cover Types

The numerical results of the preliminary impact analysis are presented in Tables 3, 4, and 5. Table 3 shows the estimated impacts of each of the 3 impact scenarios on land cover types. Table 3 also demonstrates that some land cover types are already mostly protected in public lands within the inventory area. For example, 92% of aquatic land cover (open water) is within public lands, mostly due to the Los Vaqueros Reservoir. 70% of all chaparral in the inventory area is also protected, mostly within Mount Diablo State Park. Similarly, almost half of all oak savanna and oak woodland is protected in public lands. There are major gaps in protection for other land cover types: 78% of alkali grassland, 85% of seasonal wetlands, and over 98% of agricultural land cover types are unprotected in the inventory area.

The land cover types with the most acreage removed by covered activities under all 3 scenarios are annual grassland (3,645 acres, 5,501 acres, or 8,002 acres for each scenario), ruderal (3,663 to 3,861 acres), and cropland (3,057 to 5,032 acres). Pasture and orchard would also be removed in substantial amounts under all 3 scenarios.

The data in Table 3 should be interpreted with caution for some land cover types. Because of the limitations in mapping and the uncertainty in the location and types of covered activities, impacts to some land cover types are either over- or underestimated. Some of these problems will be addressed if additional funding is found to improve the land cover mapping. The HCP/NCCP conservation strategy can be structured in certain ways to address other problems. Table 4 lists the land cover types that are subject to these problems and the potential solutions to address them in the next draft of the impact analysis. The draft conservation strategy already includes the potential solutions listed in Table 4.

Impacts to Covered Vegetation Communities and Streams

Table 5 lists the preliminary maximum impacts to each covered vegetation community and to wetlands and ponds. Impacts would be greatest to the agriculture vegetation community under all 3 impact scenarios, both in terms of proportion and absolute impact.

Streams in the inventory area have been mapped by Contra Costa County during the HCP/NCCP process. According to this new dataset, there are over 1,200 miles of streams in the inventory area (Table 5), 40% of which are in public lands. Estimated impacts to streams range between 26% and 34% of unprotected streams. However, this is an overestimate of the amount of

streams that would be filled or otherwise disturbed by covered activities (see Table 4).

Impacts to Covered Wildlife

Table 6 lists the maximum impacts to modeled habitat for 18 covered species¹ under each impact scenario. Species with significant gaps in the current protection of their modeled suitable habitat include San Joaquin kit fox (65%), Tricolored Blackbird (73%), Western Burrowing Owl (73%), and Swainson's Hawk (96%). Impacts to covered wildlife are similar among the 3 scenarios except for San Joaquin kit fox and Western Burrowing Owl. Approximately 12% of suitable core habitat for kit fox would be removed in scenario 1, while over twice this amount (25%) would be removed in scenario 3. Almost 8,000 acres of suitable habitat for Burrowing Owls would be removed in impact scenario 1 while over 12,000 acres would be removed in scenario 3.

According to this analysis, there would be direct impacts to only 8 acres of suitable core habitat for Alameda whipsnake in all 3 scenarios. This may be a slight underestimate of the actual maximum impact (see Table 4 under "chaparral") but the actual impact will be very low relative to the available core habitat in the inventory area.

Figures 6a, b, and c show the location of impacts that would occur to suitable kit fox habitat (either suitable core habitat or suitable low use habitat) under each impact scenario. There is an important geographical difference between impacts on kit fox in scenarios 1 and 2 and impacts in scenario 3. In impact scenario 3, development would occur along the western boundary of Brentwood and extend south into Deer Valley and the Briones Valley. These valleys have been identified in the conservation strategy as critical to the successful movement of San Joaquin kit fox between Cowell Ranch State Park/Los Vaqueros Watershed and Black Diamond Mines Regional Park.

Figures 7a, b, and c show the location of impacts on California red-legged frog from each scenario. Impacts to this species would be similar under all 3 scenarios. The majority of potential breeding ponds would be avoided from all 3 scenarios, although more potential migration and aestivation habitat would be removed in more intensive development scenarios.

Figure 8 shows the modeled habitat for Alameda whipsnake over impact scenario 3. This figure simply demonstrates the lack of overlap between this scenario and modeled suitable core habitat for the species. Figure 9 shows the overlap between Swainson's Hawk modeled habitat and impact scenario 3. This figure shows that the majority of modeled foraging habitat for Swainson's Hawk would be outside of the even the most intensive development scenario. However, foraging habitat closest to the only known breeding location of Swainson's Hawk in the inventory area (in Brentwood) would be lost.

¹ Previous models were presented for 19 covered species. The San Joaquin spearscale model was discarded because it did not accurately predict suitable habitat for this species.

Impacts to Covered Plants

One cannot interpret the modeled habitat data for plants (Table 6) in the same way as wildlife. Models for plants indicate the potential range of the species in which suitable habitat may occur. Plants, especially rare plants, tend to occur in distinctive microhabitats that cannot be mapped at a regional scale. Because of our lack of understanding of the habitat requirements of the covered plants and because of the issue of scale, the models for plants should be interpreted as quantifying the maximum amount of the *range* of the species that would be affected by covered activities, not the amount of *habitat* for the species that could be removed. The amount of habitat that could be removed would be a small fraction of the modeled range. The two exceptions to this caveat are Mount Diablo manzanita and brittlescale. Models for both species may be much closer to estimating actual suitable habitat in the inventory area than for other covered plants.

Because of the difficulty in interpreting the models for plants, impacts to and conservation for covered plants will be tracked in terms of actual populations rather than suitable habitat. See the draft conservation strategy for our proposed approach to mitigating impacts to covered plants and to contributing to the prevention of listing of these species.

Relationship of Impact Analysis to the Conservation Strategy

In the best site-specific projects, mitigation is developed simultaneously with the project itself so that the project proponent can change the project design to reduce mitigation costs and simplify regulatory compliance. The HCPA is going through the same process with the East Contra Costa County HCP/NCCP. The impact analysis is currently a set of impact scenarios that describe the maximum impacts within 3 regional footprints. The exact location and type of these impacts has not yet been determined.

The impact scenarios were developed before the conservation strategy to provide a general basis for the conservation strategy. Because of the uncertainty in the impacts covered under the HCP/NCCP, we developed the draft conservation strategy using the level and type of impact of each impact scenario as a guide (i.e., acres of impact to covered species habitat and land cover types), but not necessarily the location of these impacts. The location of the proposed HCP/NCCP Preserve System was designed independently of the impact scenarios so that the permit area could be refined to minimize impacts to covered species and natural communities. As a result, the proposed HCP/NCCP Preserves overlap with the impact scenarios in some locations. In other words, the conservation strategy proposes to establish Preserves in areas that could be developed under current General Plans or other planning documents. These overlap areas were identified because of their high conservation value and because the cost of the HCP/NCCP can be substantially reduced by preserving these overlap areas instead of developing them.

The current impact scenarios do not take into account the conservation priorities within the inventory area described in the conservation strategy. The allowed locations of covered activities and projects, however, will have to take this into account. The administrative draft HCP/NCCP must contain a single impact analysis of the proposed covered activities and covered projects within the proposed permit area. The selected impact scenario will essentially become the permit area for the HCP/NCCP when the scenario is “adjusted” to account for the conservation priorities identified in the conservation strategy (i.e., to eliminate the overlap between the two). We can make this adjustment, however, only after we receive direction from the HCPA regarding several key issues.

Remaining Issues

As work proceeds on the impact analysis and the components of the HCP/NCCP that will be linked to the impact analysis, a number of key policy decisions will need to be made. A list of these important next steps is provided below to close this report.

- The HCPA will need to choose an impact scenario or form a new or combined impact scenario to serve as the core of the permit area for the HCP/NCCP. For instance, we have already received comments from some members of the Coordination Group that none of the impact scenarios, in their view, adequately forecasts their goals for the Byron area because such goals are not reflected in existing, approved land use policy. In addition, there may also be instances where one or more of the impact scenarios is not consistent with one or more of the alternative conservation strategies. Crafting a permit area that reflects existing land use policies, reconciles the sometimes competing land-use goals of HCPA member agencies, recognizes the 30-year planning horizon of the HCP/NCCP, and integrates the conservation strategy will be an important milestone in completing the plan.
- Should the HCP/NCCP cover potential impacts from rural residential development and/or infrastructure projects outside the core impact area?
- Should the HCP/NCCP cover activities such as quarry or wind farm expansion or agricultural activities?
- Should the HCP/NCCP cover recreational uses in existing parks and open space?
- How should the HCP/NCCP be adjusted if the City of Antioch decides to join the HCPA or if the HCPA determines that Antioch will never join the HCPA?

Table 1. Preliminary Indirect Impacts Expected from Covered Activities and their Effects on Covered Species, East Contra Costa County HCP/NCCP

	Lights in New Urban Areas	Harassment, Disturbance from More People	Harassment or Injury from Additional Pets	More Noise	Increased Vehicle-Related Disturbance and Mortality	Spread of Invasive Exotic Plants	Increased Risk of Wildfire ¹	Increased Runoff of Urban Pollutants	Increased Recreation in Preserves	HCP/NCCP Preserve Management	HCP/NCCP Restoration Activities ²	HCP/NCCP Monitoring
Approx. Location of Impact												
Outside Preserves	✓	✓	✓	✓	✓	✓	✓	✓ ³				
Within HCP/NCCP Preserves					✓	✓	✓		✓		✓	✓
Within existing parks/open space					✓	✓	✓		✓		✓	
Covered Species Potentially Affected												
Townsend's western big-eared bat	✓	✓			✓				✓			✓
San Joaquin kit fox	✓	✓	✓	✓	✓		✓		✓		✓	✓
Tricolored blackbird		✓							✓		✓	✓
Golden eagle		✓			✓		✓		✓			✓
Western burrowing owl		✓	✓		✓		✓		✓		✓	✓
Swainson's hawk		✓			✓				✓			✓
Silvery legless lizard		✓	✓		✓	✓	✓		✓		✓	✓
Alameda whipsnake		✓	✓		✓		✓	✓	✓		✓	✓
Giant garter snake		✓	✓		✓	✓			✓			✓
California tiger salamander		✓	✓		✓	✓	✓	✓	✓		✓	✓
California red-legged frog	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Foothill yellow-legged frog	✓	✓	✓		✓	✓		✓	✓		✓	✓
Shrimp species			✓			✓	✓	✓	✓		✓	✓
Mount Diablo manzanita		✓				✓	✓		✓ ⁴			✓
Brittlescale		✓				✓	✓	✓	✓ ⁴			✓
San Joaquin spearscale		✓				✓	✓	✓	✓ ⁴			✓
Big tarplant		✓				✓	✓		✓ ⁴			✓
Mount Diablo fairy lantern		✓				✓			✓ ⁴			✓
Recurved larkspur		✓				✓		✓	✓ ⁴			✓
Diablo helianthella		✓				✓	✓		✓ ⁴			✓
Brewer's dwarf flax		✓				✓	✓		✓ ⁴			✓
Showy madia		✓				✓	✓		✓ ⁴			✓
Adobe navarretia		✓				✓	✓		✓ ⁴			✓

Notes:

- 1: Includes grading, clearing, disking, mowing, irrigation and other fire suppression activities, plus the temporary damage done by the wildfire itself
- 2: Restoration would occur within existing public land only if opportunities were not available within HCP/NCCP Preserves. Adverse impacts from restoration activities on covered species are expected to be temporary; long-term effects of restoration will be beneficial.
- 3: Impacts from increased runoff of urban development downstream of urban development would be confined to streams and channels and would not affect terrestrial covered species.
- 4: Potential impacts if recreational users go off-trail

Table 2. Maximum Area of Existing and New Development in Each Impact Scenario (acres)

Impact Scenario	Total Area	Area Mapped as Developed*	Difference (max. new development)
1: Urban land use designations inside ULL	39,606	26,314	13,292
2: All non-protected lands inside ULL	46,756	28,070	18,686
3: City General Plans	49,885	28,116	21,769

*Mapped as urban, aqueduct, or landfill land cover types in HCP/NCCP; turf is excluded because it is assumed to occur only with urban parks, which are excluded from all 3 impact scenarios. Because of development that has occurred after the 2000 air photos, these numbers underestimate the actual existing development within each impact scenario. If funding becomes available, we will update the existing urban areas through additional field work.

TABLE 3: SUMMARY OF IMPACTS TO LANDCOVER TYPES

Land Cover Types	Total in Inventory Area (acres)	In Public Land/OS (acres)	In Public Land/OS (%)	Impact Scenario 1: Development Designation in ULL			Impact Scenario 2: All Nonprotected Areas Within ULL			Impact Scenario 3: City General Plans		
				Impact (acres)	Impact Outside Public Land/OS	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact Outside Public Land/OS	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact Outside Public Land/OS	Remain Outside Public Land/OS (acres)
alkali grassland	1,988.8	435.4	21.9%	2	0.2%	1,551	229	14.8%	1,324	229		
alkali wetland	43.6	18.5	42.4%	0	0.0%	25	3	11.9%	22	3	11.9%	22
annual grassland	57,190.7	24,171.7	42.3%	3,645	11.0%	29,374	5,501	16.7%	27,518	8,002	24.2%	25,017
aquatic	1,730.6	1,593.8	92.1%	33	23.9%	104	40	29.2%	97	40	29.2%	97
aqueduct	383.7	14.8	3.9%	198	53.7%	171	209	56.7%	160	209	56.7%	160
chaparral/scrub	2,862.4	2,003.2	70.0%	1	0.1%	858	1	0.1%	858	1	0.1%	858
cropland	24,012.5	387.6	1.6%	3,057	12.9%	20,568	4,880	20.7%	18,744	5,032	21.3%	18,593
landfill	332.9	12.6	3.8%	0	0.0%	320	0	0.0%	320	0	0.0%	320
non-native woodland	47.8	11.2	23.4%	29	78.4%	8	34	94.1%	2	34	94.1%	2
oak savanna	5,835.4	2,627.3	45.0%	124	3.9%	3,084	202	6.3%	3,006	371	11.6%	2,837
oak woodland	24,189.7	11,561.8	47.8%	143	1.1%	12,485	220	1.7%	12,408	253	2.0%	12,375
orchard	4,767.5	17.7	0.4%	1,420	29.9%	3,330	1,632	34.4%	3,118	1,721	36.2%	3,028
pasture	3,533.2	71.0	2.0%	475	13.7%	2,987	1,442	41.6%	2,020	1,442	41.6%	2,020
pond	131.2	40.3	30.7%	14	15.2%	77	15	16.6%	76	16	17.5%	75
riparian woodland/scrub	219.2	62.7	28.6%	96	61.3%	61	99	63.1%	58	108	69.3%	48
rock outcrops	80.2	80.2	100.0%	0	0.0%	0	0	0.0%	0	0	0.0%	0
ruderal	7,292.7	499.7	6.9%	3,663	53.9%	3,130	3,739	55.0%	3,054	3,861	56.8%	2,932
seasonal wetland	18.9	2.9	15.3%	8	50.1%	8	8	50.1%	8	8	50.1%	8
slough/channel	157.1	50.9	32.4%	79	74.4%	27	88	83.0%	18	88	83.0%	18
turf	840.7	549.1	65.3%	107	36.7%	185	122	41.9%	169	122	41.9%	169
urban	32,297.2	500.8	1.6%	26,116	82.1%	5,680	27,861	87.6%	3,936	27,907	87.8%	3,889
vineyard	1,313.1	0.0	0.0%	371	28.3%	942	394	30.0%	919	394	30.0%	919
wetland (undetermined)	185.3	64.2	34.6%	26	21.8%	95	36	29.9%	85	42	34.8%	79
wind turbines	217.6	59.1	27.2%	0	0.0%	159	0	0.0%	159	0	0.0%	159
Total	169,672.0	44,836.5	26.4%	39,606	31.7%	85,229	46,756	37.5%	78,080	49,885	40.0%	74,950

Table 4 (continued)

Table 4. Land Cover Types with Inaccurate Impact Estimates.

Land Cover Type	Est. Max. Impact (acres)	Inaccuracy and Explanation	Potential Solutions
Alkali grassland	2-229	Underestimate. Alkali grassland was mapped based on the intersection of annual grassland with alkali soils mapped by the Soil Conservation Service (SCS). These soil maps likely missed small areas or inclusions of alkali soil.	<ul style="list-style-type: none"> • Set a cap on impacts to alkali grassland at 229 acres or less to ensure that the majority of this rare and important land cover type is protected in HCP/NCCP Preserves. • If additional funding becomes available, additional field work and mapping should improve our estimate of alkali grassland occurrence in the inventory area.
Alkali wetland	0-3	Underestimate. Alkali wetlands were mapped when wetlands occurred on alkali soils mapped by the SCS. Although the extent of alkali wetlands in the inventory is likely greater than that mapped, impacts to this land cover type would still be low (<10 acres?) because little development is planned south of Byron where these features occur.	<ul style="list-style-type: none"> ▪ To comply with the Clean Water Act, alkali wetlands must be delineated in impact areas and impacts must be mitigated at an accepted ratio. This program will ensure that actual impacts to alkali wetlands will be adequately mitigated. • Set a cap on impacts to alkali wetlands of 7 acres or less to ensure that the necessary 3:1 ratio of preservation can be met (there are 22 acres of unprotected alkali wetlands outside impact areas). If more alkali wetlands are found, the cap could be increased. • If additional funding becomes available, additional field work and mapping should improve our estimate of alkali wetland occurrence in the inventory area.
Chaparral	1	Slight underestimate. Coastal sage scrub patches below the minimum mapping unit of 10 acres may occur within the impact scenarios. However, because this land cover type typically occurs on steeper slopes, development potential in these areas is limited.	<ul style="list-style-type: none"> • Set a cap of allowable impacts to chaparral to 10-25 acres to account for small patches lost to development. There would be at least 834 acres of chaparral/scrub outside public lands available for protection to mitigate for these small impacts.
Riparian woodland/scrub	96-108	Substantial overestimate. Most of the riparian woodland/scrub mapped for the HCP occurs within the ULL in urban streams that probably will not be disturbed further because of build-out along their banks. New development typically retains streams and most riparian vegetation as a project amenity.	<ul style="list-style-type: none"> • Set a cap of 25-50 acres of impacts to riparian woodland/scrub that will be allowed under the HCP/NCCP to ensure that conservation requirements for protection and restoration can be met (there are 33 acres of riparian woodland/scrub available for preservation but more likely occurs). • Mitigation and contribution to recovery will be ratio-based so that actual impacts are clearly mitigated as they occur.
Rock outcrops	0	Underestimate. The only rock outcrops mapped for the HCP/NCCP are within the Los Vaqueros Watershed. Rock outcrops smaller than the minimum mapping unit of 10 acres likely	<ul style="list-style-type: none"> • Encourage avoidance of rock outcrops by development. • Require surveys for rock outcrops in the impact area and protection of this feature within HCP/NCCP Preserves if they are lost to covered activities.

Table 4 (continued)

Land Cover Type	Est. Max. Impact (acres)	Inaccuracy and Explanation	Potential Solutions
		occur within the impact scenarios.	<ul style="list-style-type: none"> Require surveys for longhorn fairy shrimp (the only covered species that might occur in rock outcrops¹) and avoidance if it is found.
Seasonal wetlands	8	Underestimate. Some seasonal wetlands are included in the “wetland” land cover types (i.e., undetermined wetlands). Furthermore, many seasonal wetlands were likely missed by the air photo mapping.	<ul style="list-style-type: none"> To comply with the Clean Water Act, seasonal wetlands must be delineated in impact areas and impacts must be mitigated at an accepted ratio. This program will ensure that actual impacts to seasonal wetlands will be adequately mitigated. Seasonal wetlands that support vernal pool invertebrates (e.g., vernal pools) will be mitigated under a program with even higher mitigation ratios.
Streams	122-156	Overestimate. Approximately 10% of streams are within existing urban areas. Like riparian woodland, these streams would not likely be affected directly by future urban development. Streams outside existing urban areas would likely be incorporated into development projects as amenities and flood protection.	<ul style="list-style-type: none"> To comply with the Clean Water Act and Section 1601 of the Fish and Game Code, streams must be delineated in impact areas and impacts must be mitigated at an accepted ratio. This program will ensure that actual impacts to streams will be adequately mitigated. Set a cap of allowable direct impacts (e.g., filling, channelizing) to perennial, ephemeral, and intermittent streams in the inventory area.
All landcover types, but especially grassland and ruderal	N/a	Very small overestimate. Small fragments of natural landcover within existing urban areas were reflected in the landcover map and may been included in impact estimates even though they were actually impacted long ago when made into fragments (see Methods section for more details)	<ul style="list-style-type: none"> Refine impact analysis methodology to exclude such fragments.

Notes:

1: A new theory about suitable habitat for the Alameda whipsnake suggests that this species may occur in some rock outcrops outside of chaparral or coastal sage scrub. If our understanding of Alameda whipsnake habitat changes, this will be incorporated into the Adaptive Management Program of the HCP/NCCP and the impact cap on rock outcrops could be reevaluated in light of new data.

TABLE 5: SUMMARY OF IMPACTS TO COVERED VEGETATION COMMUNITIES

Category	Total in Inventory Area (acres)	In Public Land/OS (acres)	In Public Land/OS (%)	Impact Scenario 1: Development Designation in ULL			Impact Scenario 2: All Nonprotected Areas Within ULL			Impact Scenario 3: City General Plans		
				Impact (acres)	Impact Outside Public Land/OS	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact Outside Public Land/OS	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact Outside Public Land/OS	Remain Outside Public Land/OS (acres)
Covered Vegetation Communities												
Grassland	59,336	24,684	41.6%	3,659	10.6%	30,993	5,746	16.6%	28,906	8,248	23.8%	26,404
Oak Woodland	24,268	11,617	47.9%	143	1.1%	12,507	220	1.7%	12,430	253	2.0%	12,397
Chaparral/Scrub	2,862	2,003	70.0%	1	0.1%	858	1	0.1%	858	1	0.1%	858
Riparian Woodland/Scrub	219	63	28.6%	96	61.3%	61	99	63.3%	58	108	69.0%	49
Agriculture	33,788	528	1.6%	5,398	16.2%	27,862	8,433	25.4%	24,827	8,674	26.1%	24,586
Total	120,474	38,896	32.3%	9,297	89.4%	72,281	14,498	107.1%	67,079	17,284	121.0%	64,294
Wetlands and Ponds												
Wetlands (undetermined)	185	64	34.6%	26	21.8%	95	36	30.0%	85	42	34.8%	79
Seasonal wetlands	19	3	15.3%	8	50.0%	8	8	50.0%	8	8	50.0%	8
Alkali wetlands	44	19	42.4%	0	0.0%	25	3	12.0%	22	3	12.0%	22
Aquatic	1,731	1,594	92.1%	33	24.1%	104	40	29.2%	97	40	29.2%	97
Ponds	131	40	30.7%	14	15.4%	77	15	16.5%	76	16	17.6%	75
Total	2,109	1,720	81.5%	81	20.9%	308	102	26.2%	288	109	28.0%	281
Streams (miles)	1,227	465	37.9%	200	26.3%	562	227	29.8%	535	257	33.7%	505
Streams (acres)*	744	282	37.9%	122	26.3%	340	138	29.8%	324	156	33.7%	306

* Assumes an average stream width of 5 feet

TABLE 6: SUMMARY OF IMPACTS TO COVERED SPECIES

Category	Note				Impact Scenario 1: Development Designation in ULL			Impact Scenario 2: All Nonprotected Areas Within ULL			Impact Scenario 3: City General Plans		
		Total in Inventory Area (acres)	In Public Land/OS (acres)	In Public Land/OS (%)	Impact (acres)	Impact (%)*	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact (%)*	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact (%)*	Remain Outside Public Land/OS (acres)
San Joaquin Kit Fox	a												
suitable habitat		63,199	25,668	41%	4,566	12%	32,966	6,767	18%	30,764	9,563	25%	27,969
suitable low use habitat		19,689	3,057	16%	3,368	20%	13,264	3,973	24%	12,659	4,194	25%	12,438
Total		82,888	28,724	35%	7,934	15%	46,230	10,740	20%	43,424	13,757	25%	40,407
Tricolored Blackbird	b												
suitable core habitat		469	149	32%	156	49%	164	175	55%	145	181	57%	138
primary foraging		88,745	25,207	28%	8,350	13%	55,188	14,018	22%	49,520	16,675	26%	46,863
secondary foraging		6,257	18	0%	1,967	32%	4,272	2,202	35%	4,037	2,292	37%	3,948
Total		95,471	25,374	27%	10,472	15%	59,625	16,395	23%	53,702	19,148	27%	50,949
Alameda Whipsnake	c												
suitable core and perimeter habitat		5,804	3,869	67%	8	0%	1,927	8	0%	1,927	8	0%	1,927
movement habitat		46,152	21,998	48%	813	3%	23,341	813	3%	23,341	925	4%	23,229
Total		51,957	25,868	50%	821	3%	25,268	821	3%	25,268	933	4%	25,156
Big Tarplant	d												
suitable habitat		36,534	16,329	45%	1,424	7%	18,781	2,741	14%	17,463	4,127	20%	16,078
suitable low potential habitat		18,843	6,877	36%	1,427	12%	10,539	1,927	16%	10,039	2,857	24%	9,109
Total		55,377	23,206	42%	2,851	9%	29,320	4,668	15%	27,503	6,984	22%	25,187
Brewer's Dwarf Flax	e												
suitable habitat		27,052	13,565	50%	144	1%	13,343	222	2%	13,266	254	2%	13,233
suitable low potential habitat		14,079	6,952	49%	248	3%		365	5%	6,762	409	6%	6,719
Total		41,131	20,517	50%	393	2%	20,222	587	3%	20,028	663	3%	19,951
Brittlescale	f												
suitable habitat		1,370	369	27%	1	0%	1,001	147	15%	855	147	15%	855
Giant Garter Snake	g												
potential core habitat	1	54	8	15%	26	57%	20	31	67%	15	31	67%	15
movement and foraging		1,268	38	3%	519	42%	711	626	51%	603	626	51%	603
Total		1,322	46	3%	545	43%	730	657	52%	619	657	52%	619
California Red-Legged Frog	h												
breeding ponds		109	40	37%	6	9%	62	7	11%	61	8	12%	60
breeding streams	3	136	52	38%	23	28%	61	27	32%	57	31	36%	53
migration and aestivation		112,846	44,162	39%	9,085	13%	59,599	11,828	17%	56,857	14,771	22%	53,914
Total		113,091	44,254	39%	9,115	13%	59,722	11,862	17%	56,975	14,810	22%	54,027
California Tiger Salamander	in												
breeding ponds		81	34	43%	0	0%	46	1	1%	46	2	3%	45
migration and aestivation		89,822	41,281	46%	2,013	4%	46,529	3,309	7%	45,232	5,374	11%	43,167
Total		89,822	41,281	46%	2,013	4%	46,529	3,309	7%	45,232	5,374	11%	43,167

Category	Note				Impact Scenario 1: Development Designation in ULL			Impact Scenario 2: All Nonprotected Areas Within ULL			Impact Scenario 3: City General Plans		
		Total in Inventory Area (acres)	In Public Land/OS (acres)	In Public Land/OS (%)	Impact (acres)	Impact (%)*	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact (%)*	Remain Outside Public Land/OS (acres)	Impact (acres)	Impact (%)*	Remain Outside Public Land/OS (acres)
Diablo Helianthella	j												
suitable habitat		31,034	15,143	49%	38	0%	15,853	75	0%	15,816	128	1%	15,763
Foothill Yellow-Legged Frog	k												
suitable habitat (breeding and migration)	3	7	3	46%	0.10	3%	4	0.13	4%	4	0.13	4%	4
low use (migration)	3	285	119	42%	22	13%	144	27	16%	139	37	23%	128
Total		292	122	42%	22	13%	148	27	16%	142	38	22%	132
Golden Eagle	l												
potential foraging		130,599	42,312	32%	12,753	14%	75,534	18,685	21%	69,601	21,682	25%	66,605
Mount Diablo Fairy Lantern	m												
suitable habitat		49,155	23,513	48%	81	0%	25,561	315	1%	25,327	764	3%	24,878
Mount Diablo Manzanita	n												
suitable habitat	2	2,445	1,484	61%	0	0%	961	0	0%	961	0	0%	961
Recurved Larkspur	o												
suitable habitat		1,989	435	22%	2	0%	1,551	229	15%	1,324	229	15%	1,324
Silvery Legless Lizard	p												
suitable habitat		3,686	2,156	58%	744	49%	786	744	49%	786	830	54%	700
Swainson Hawk	q												
potential breeding		267	74	28%	125	65%	69	133	69%	60	143	74%	50
potential foraging		36,345	1,442	4%	4,934	14%	29,969	9,113	26%	25,790	9,265	27%	25,638
Total		36,612	1,515	4%	5,059	14%	30,038	9,247	26%	25,850	9,408	27%	25,689
Western Burrowing Owl	r												
suitable habitat		67,907	25,724	38%	7,764	18%	34,420	9,943	24%	32,241	12,570	30%	29,614
suitable habitat - low use		29,557	586	2%	4,612	16%	24,359	8,194	28%	20,777	8,346	29%	20,625
Total		97,465	26,309	27%	18,137	25%	53,018	18,137	25%	53,018	20,916	29%	50,240

Notes

*% of category outside public land/open space

1: Giant garter snake potential core habitat assumes an average width of suitable habitat along sloughs/channels of 20 feet on either side = 40 feet total

2: Although no direct impacts to species, impact areas are very close to species' habitat in all three scenarios

3: California red-legged frog and foothill yellow-legged frog suitable habitat in streams assumes an average streambed width of 5 feet

a. San Joaquin Kit Fox Habitat Model Assumptions

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

b. Tricolored Blackbird Habitat 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.

c. Alameda Whipsnake Habitat Model Assumptions

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

d. Big Tarplant Habitat 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

e. Brewer's Dwarf Flax Habitat Model Assumptions

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

f. Brittsescale Habitat Model Assumptions

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

g. California Giant Garter Snake Habitat Model Assumptions

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

h. California Red-Legged Frog Habitat Model Assumptions

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

i. California Tiger Salamander Habitat Model Assumptions

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

j. Diablo Helianthella Habitat Model Assumptions

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

k. Foothill Yellow-Legged Frog Habitat 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.

l. Golden Eagle Habitat 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)

m. Mount Diablo Fairy Lantern Habitat Model Assumptions

1. Suitable Habitat: Annual grassland, chaparral/scrub, oak woodland, and oak savannah between 650 feet and 2,600 feet in elevation

n. Mount Diablo Manzanita Habitat Model Assumptions

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

o. Recurved Larkspur Habitat Model Assumptions

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

p. Silvery Legless Lizard Habitat Model Assumptions

1. Core Habitat: Sandy to sandy loam soil areas (Soil Conservation Service 1977) in chaparral/scrub, oak woodland, ruderal, and riparian woodland/scrub land-cover types. Any soil type that mentioned "sand" or "sand and loam" was considered a sandy loam soil potentially suitable for silvery legless lizard

q. Swainson Hawk Habitat Model Assumptions

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

r. Western Burrowing Owl Habitat Model Assumptions

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