# UPPER SACRAMENTO RIVER

# RESOURCE PROTECTION PLAN

Cantara Trustee Council, March 18, 1999

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## I. INTRODUCTION

Established in 1995, the Cantara Trustee Council (Council) administers settlement funds received for natural resource damages due to the 1991 metam sodium spill into the upper Sacramento River. As outlined in the settlement terms, the Memorandum of Agreement (MOA), assigns responsibility for expenditures to the Council. The terms of the MOA allow funds from the Upper Sacramento River Account to be used for: *"resource protection; restoration; rehabilitation; enhancement; acquisition; study and research; and program and administrative support for these activities."* Required by the MOA, the Council's Expenditure Plan calls for the following types of projects to be funded: those that will "protect, restore and enhance natural resources, replace resource values that have been lost, and encourage public understanding and participation in the restoration and recovery process." Within the Expenditure Plan, habitat acquisition is identified as an increasingly important part of the Council's resource protection efforts. The Council wants to direct acquisition efforts toward certain protection goals. This Resource Protection plan has been prepared to coordinate these efforts and ensure that monies are best spent to maximize resource protection and recovery benefits.

This plan outlines the methods, criteria, and Geographic Information System (GIS) techniques that will be used to identify, rank, and select areas within the upper Sacramento River watershed for resource protection actions by the Council. The Council intends to achieve its conservation goals through a combination of acquisition, restoration, enforcement, and long-term planning. In addition, the Council will consider funding actions within other watersheds where it can be shown that such efforts will help replace resources lost because of the spill.

### Purpose

This plan has been prepared to implement the Council's resource protection and long-term planning goals identified in the MOA and the Council's Strategic Plan. Specifically, this document is an operational or implementation plan designed to guide the Council's conservation actions within the upper Sacramento River watershed.

The Council recognizes that a variety of resource protection and conservation actions are available within the

watershed, and that funds within the Upper Sacramento River Account are limited. A primary purpose of this plan is to develop a coordinated approach to ensure that Council funds are spent in a cost-effective manner. From a resource protection standpoint, this means maximizing the resource benefits of every expenditure by the Council. Actions that achieve multiple resource goals will be emphasized whenever possible. This plan is designed to assist the Council in evaluating the current distribution of resources in the watershed, identifying key areas for resource protection, and finally, to prioritize and select appropriate conservation actions on a site-specific basis.

## II. GOALS

Four general goals are identified by this plan, encompassing the resource protection and public use objectives of the Council. These goals include protecting and replacing resources damaged by the spill, improving public access to the river, protecting and improving water quality, and planning for the long-term health of the river ecosystem. The Council anticipates that all of its planned conservation actions can be accomplished under the following goals:

- **Protect and Replace Resources Damaged by the Spill**

Under the terms of the settlement Memorandum of Agreement, protection of resource types damaged by the spill is a basic Council directive. These include cold-water lotic aquatic habitats and montane riparian terrestrial habitats, as well as the species they support.

- **Enhance Opportunities for Stream-oriented Recreation**

Besides damaging natural resources, the spill caused a reduction in human use values associated with stream-oriented recreation. The Council believes that it is essential to maintain and enhance existing river access points and provide new opportunities for public access to replace these lost human use values.

- **Protect and Improve Water Quality**

Good water quality is fundamental to the recovery and future health of resources. The Council will seek to identify and correct water quality problems through monitoring, enforcement, and remediation work within the watershed.

- **Establish a Forum for Long-term Watershed Planning**

The Council realizes that ensuring the future health of the upper Sacramento River involves a long-term commitment by those who live, work, and recreate within the watershed. The Council believes that it is important to establish a framework for watershed planning that will involve all interested parties and extend beyond the Council's limited tenure.

## III. SCOPE

The Cantara Trustee Council's mandate is to protect, restore, rehabilitate, enhance, and acquire resource types damaged by the spill. These resources consist primarily of the montane riparian terrestrial and cold water lotic aquatic communities of the upper Sacramento River, and the species they support. In its Strategic Plan, the Council recognized the need for an ecosystem approach to protect these resource types. The river and its riparian zone are intimately connected to the larger watershed and cannot be effectively protected without considering activities that occur on the adjacent uplands and tributaries.

The geographic scope of this plan comprises the watershed of the upper Sacramento River above Lake Shasta (Figure 1). This 470-square mile area was selected as the minimum planning area to include the primary factors influencing long-term health of the river. Both private and public lands are included within the plan,

since resource protection actions may be warranted in both settings. From an ecosystem standpoint, the plan focuses on maintaining both system components (e.g., communities, species, and populations) and ecosystem processes (e.g., recruitment of coarse woody debris to the aquatic system, downstream drift of nutrients and aquatic organisms).

Because of the interdependency of the river and adjacent uplands, this plan takes a watershed-level approach to protecting resources in the upper Sacramento River canyon. As this plan applies a watershed-level approach, it is important to note that recommendations may be made for conservation activities away from the main stem of the upper Sacramento River. This watershed-level approach applies the criteria to all sites (parcels) in the watershed, prioritizing them with respect to each conservation objective.

Besides focusing on natural resources within the upper Sacramento River watershed, associated human use values are also considered. Substantial losses in human recreational use values occurred both immediately following the accident, and during the river's recovery. It is the Council's intent to protect the resources of the upper Sacramento River for their intrinsic values, and for the use and enjoyment of the public.

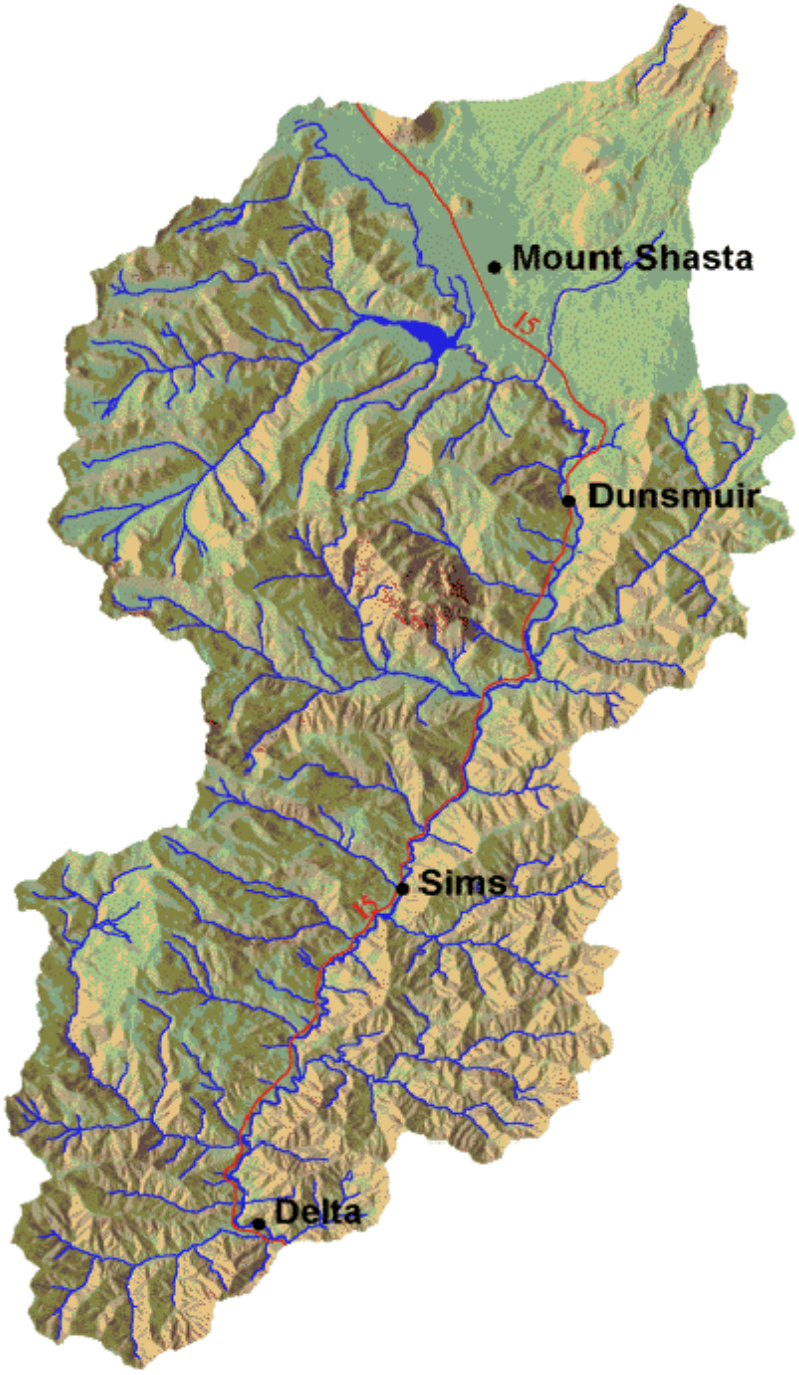



*Figure 1. Upper Sacramento River Watershed (GIS map)*

## IV. APPROACH

Like many recent efforts to identify sites to target for conservation actions, the current approach utilizes a series of criteria to evaluate the suitability of each potential site for a given conservation action. To this end, the Council has established 24 criteria designed to evaluate sites in terms of their natural resource values, human use values, and land management factors. These criteria include:

| | |
|---|---|
| Habitat for Species Affected by Spill | Listed Animals and Habitat |
| CEQA Animals and Habitat | General Wildlife Habitat |
| Bat Roosting Habitat | Deer Habitat |
| Mast Communities | Listed Plant Species |
| CEQA Plant Species | In-kind Terrestrial Communities |
| In-kind Aquatic Communities | Special Status Communities |
| Forest Seral Stage | Landscape Connectivity |
| Reserve Proximity | Parcel Size |
| Accessibility | Adjacent Land Use |
| Erosion Hazard | Recreational Value |
| Stream Frontage | Slope Adjacent to River |
| Watershed Quality | Bear Habitat |

In this effort, these 24 criteria are applied to all parcels in the upper Sacramento River watershed to develop a prioritized list of potential sites for each proposed conservation action.

This watershed-level approach requires the synthesis of an enormous amount of information. To identify and prioritize sites that conform to the established criteria, there must be detailed spatial information (i.e., maps) depicting each criterion, and this information must cover the entire 470 square-mile watershed. Because of the sheer volume of information involved, this approach is only possible through the use of a Geographic Information System(GIS).

In this approach, each criterion is modeled in the GIS as a layer. These layers consist of mapped features that pertain to the criterion. For example, the GIS layer that describes the criterion of "In-kind Terrestrial Communities" yields information about the size and nature of various in-kind community types (e.g., riparian forest, riparian scrub) found throughout the watershed. Layers also contain information about the relative value of the various features to the criteria at hand. For the "In-kind Terrestrial Communities" criteria, mature riparian forest is considered to be "more valuable" than other in-kind types (e.g., riparian scrub, springs, etc.), and the features within the layer are coded as such. See Appendix A for a detailed description of each criterion layer.

Using standard GIS techniques, the information contained within the criteria layers is transferred to the layer containing information about potential sites (i.e., the parcel map) in order to rank sites for the given criterion. Figure 2 illustrates this transfer process for the "In-kind Terrestrial Communities" criterion. In this figure it can be seen that parcels containing large areas of mature riparian forest score more highly than parcels containing other in-kind terrestrial community types. Even sites with small areas of in-kind community types score more highly than parcels with no in-kind terrestrial resources.

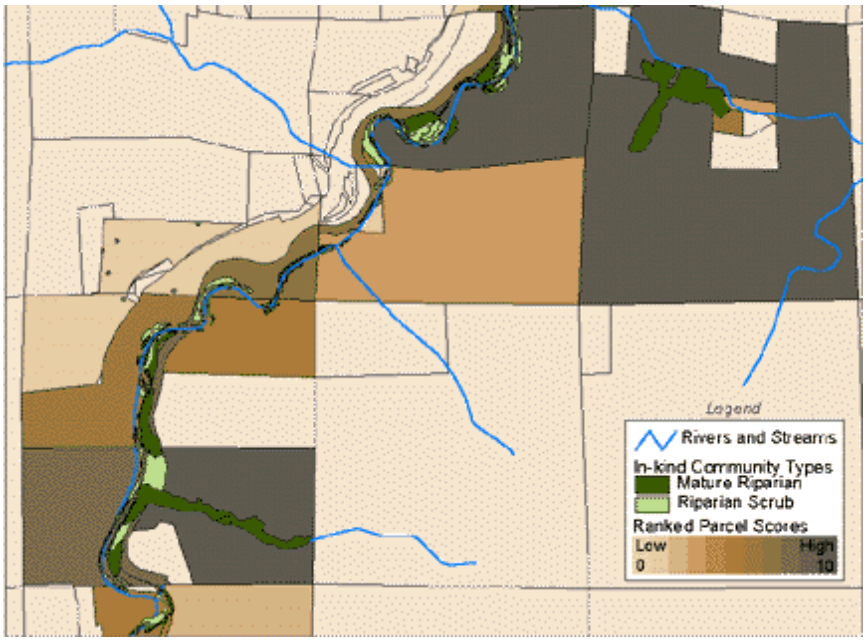



*Figure 2. Transferral of In-kind Terrestrial Communities Criterion to Parcel Layer*

Using similar transferral processes, information contained in each of the 24 criterion layers is transferred to the parcels layer (see figure 3). In this way, every parcel in the watershed receives a numeric value that describes its suitability for each criterion. Each criterion score for a given parcel ranges between 0 and 10, with 0 being of no value and 10 being the maximum value. For instance, sites that receive a score of 10 for the "In-kind terrestrial communities" criterion have large acreages of riparian vegetation.

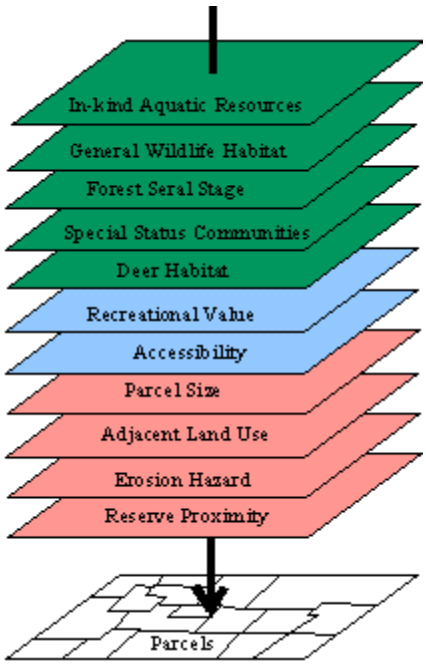



*Figure 3. Transferral of multiple criteria to site-selection layer using the GIS*

After information is transferred to the site selection layer for each criteria, it is possible to prioritize the sites. Since the criterion scores are numeric they can simply be added together to derive a score for each potential site. Sites yielding the greatest value for the most criteria receive the highest scores and should receive greater priority for a given conservation action.

Not all of the 24 criteria are likely to be relevant to the accomplishment of a given conservation objective. For example, the criteria of "Accessibility" and "Recreational Value" may be irrelevant or inappropriate if the conservation objective is to improve water quality. Additionally, it is unlikely that all of the relevant criteria are of equal importance to accomplishing the objective at hand. This differing relative importance among criteria is handled by numerically weighting the criteria with respect to one another (see Appendix B for discussion of the weighting process). By creating a weighted subset of the 24 criteria, it is possible to develop a "search image" for sites in the upper Sacramento River watershed that will accomplish specific conservation objectives.

To facilitate this process, the Cantara staff has developed a GIS model that automatically calculates summary scores for each parcel based on criterion weight factors input by the user. The ParcRank (Parcel Ranking) model calculates weighted scores for each parcel in the watershed and allows the user to interactively create and test scenarios for multiple objectives. Output from this model includes a prioritized list of sites for each specific objective, and a series of maps to assist in further site evaluations. Specific steps of the ParcRank model are detailed in Appendix B.

It should be noted that the ParcRank model is only a tool to help identify and prioritize potential sites for conservation activities. Following analysis, potential sites will require ground evaluation to ensure that the criteria were modeled accurately. In addition, some factors such as existing easements and "willing partner" cannot be adequately modeled using GIS. These considerations will need to be addressed subsequent to GIS analysis.

Because of the interdependency of the river and adjacent uplands, this plan takes a watershed-level approach to protecting resources in the upper Sacramento River canyon. Because of this, it is important to note that recommendations may be made for conservation activities away from the main stem of the upper Sacramento River. This watershed-level approach applies the criteria to all sites (parcels in the watershed, prioritizing them with respect to each conservation objective.

## V. CONSERVATION OBJECTIVES

### Theory

The resource protection goals developed by the Council encompass a diversity of purposes. These goals range from protecting and enhancing natural resources to replacing lost human use values (e.g., stream oriented recreational opportunities, fishing access, etc.). Individual conservation objectives have been developed to translate these broad and somewhat disparate goals into specific strategies that can be linked to actions on the ground. The Council has identified seven primary conservation objectives for the upper Sacramento River watershed:

- Protect and improve public access to the river
- Conserve species and habitats affected by the spill
- Provide buffers for key riparian zones
- Protect aquatic refugia
- Protect and improve water quality
- Expand existing reserves
- Improve recreational opportunities

While there are a variety of conservation actions the Council can undertake to accomplish these objectives, all of them ultimately involve site-specific efforts to protect or improve resources (refer to Implementation section). As such, the goal is to identify sites throughout the watershed that will provide the greatest value for each objective. The focus of each conservation objective, its relationship to the Cantara Trustee Council goals and guidance documents, and the primary evaluation criteria used to prioritize important sites within the

watershed are described below.

**Protect and improve public access to the river**

Providing improved public access to the river was initially identified in the Natural Resource Damage Assessment Plan (NRDA) as a means to compensate for losses in recreation use values. The Council's Strategic Plan also emphasizes the importance of enhancing opportunities for public access along the river. The Council believes it is essential to maintain and enhance existing river access points and provide new opportunities for public access.

This conservation objective focuses primarily on providing new access points for fishing and general river-oriented recreation. While many areas of the river have "informal" access, these sites commonly require trespass on Union Pacific right-of-way, and other private properties. Overall, public access to the river is constrained by Interstate-5 and the railroad right-of-way, for virtually the entire 30 river-miles between Dunsmuir and Lake Shasta. Formal access points are limited to a handful of sites.

Providing safe, legal access to sections of river where formal public access is lacking or inadequate, is the goal of this objective. Evaluation criteria receiving the highest weights included stream frontage, recreational value, and of course, road access. Factors that might influence site development, such as slope adjacent to the river and erosion hazard, received lower weights. Reserve proximity and parcel size also received low weights since these criteria indirectly affect the potential value of an access point by increasing the area available for public use.

**Conserve species and habitats affected by the spill**

Protecting species and habitats that were adversely affected by the spill is the Council's primary mandate. The settlement MOA requires the Council to give priority to "in-kind" resources. Further, restoration and replacement of resource types injured by the spill is a central theme articulated in the Council's Strategic Plan.

Through this conservation objective, the Council seeks to identify and protect cold-water lotic and montane riparian habitats within the watershed, both along the upper Sacramento River and its tributaries. In addition, this objective attempts to identify and maintain linkages between those in-kind habitats and upland habitat components essential to the support of species that were adversely affected by the spill.

Parcel evaluation criteria for this objective can be divided into two general categories: those relating to habitat quality or suitability, and those that address landscape level considerations such as patch size, distribution, and connectivity. When evaluating habitat-based criteria, in-kind aquatic and terrestrial communities received greatest weight since these habitats were directly injured by the spill. The total length of stream segments within each parcel was used to provide an independent estimate of in-kind aquatic habitats. In addition, WHR models for species affected by the spill were used to develop a composite map of upland habitat values. Forest seral stage was included as a primary evaluation criterion since trees near the river provide nesting sites for osprey, and large trees located upslope provide an ongoing source of coarse woody debris for the aquatic system. Data characterizing day roost habitat for bat species within the watershed were used to ensure that critical upland habitat components were included in the analysis.

High-quality habitats, present in blocks of sufficient size to meet minimum species requirements, are important. Additionally, distribution of habitat patches should be adequate to allow natural disturbance regimes to operate without causing local extirpation of populations. Primary evaluation criteria related to these factors include parcel size, connectivity, and proximity to existing reserves. Adjacent land use was also evaluated as incompatible activities may adversely affect habitat values or increase management costs. As focusing conservation efforts within areas that retain relatively intact habitats may be most efficient, a "watershed quality" criterion was applied to all parcels. This criterion reflects the biological and physical

integrity of each parcel located within the watershed.

**Provide buffers for key riparian zones**

The establishment of riparian buffer zones along the river and tributaries is identified as a potential Cantara Trustee Council action in the MOA, and is a component of the Council's Strategic Plan. Maintaining effective buffers against disruptive land use is critical to obtaining other Council objectives, such as conserving species, providing aquatic refugia, and maintaining water quality. The purpose of this objective is to maintain ecosystem processes in proximity to the river and key tributaries.

Evaluation criteria focus on the ability of the parcel to provide long-term, high-quality buffers against watershed degradation. The criterion receiving the greatest weight in this evaluation is slope adjacent to the river. Protecting those lands with the greatest potential to become degraded is vitally important. Forest seral stage and watershed quality were used as indicators of the parcel's ability to resist degrading forces, while erosion hazard rating suggested the parcel's vulnerability to existing problems. Primary consideration was also given to stream frontage, connectivity, and adjacent land use. These criteria indicate a parcel's ability to enhance the buffer effect in a sub-watershed. Reserve proximity and parcel size criteria provided additional measurements of this effect.

**Protect aquatic refugia**

Tributaries have played a crucial role in the river's recovery following the spill. The Council believes that protecting these "aquatic refugia" is essential to support current recovery processes, and to maintain the river's ability to recover from future spills or other catastrophic events. Because of the discontinuity caused by Lake Siskiyou, this objective focuses on tributaries downstream of Box Canyon Dam. The primary goal of this effort is to identify and protect key tributaries and their watersheds as sources of fish, benthic invertebrates, and other aquatic organisms for the river.

This analysis has been conducted at two scales: a sub-watershed scale and a site-specific, or parcel scale. At the larger scale, a watershed quality criterion was developed to evaluate the relative importance of individual tributary watersheds for recruiting organisms to the river. Tributary watersheds were scored for basin size, miles of fish-bearing streams, habitat for species affected by the spill, and in-kind terrestrial habitat to assess potential biological values. Erosion hazard, land use patterns, road density, and forest seral stages were used as indicators of disturbance that might reduce the value of a watershed as an aquatic refugium.

At the parcel scale, greatest weight was given to habitat-based criteria as a measure of a parcel's ability to support species affected by the spill. These included presence of in-kind terrestrial and aquatic communities, tributary frontage, and habitat for species affected by the spill based on models developed for the Wildlife Habitat Relationships program (WHR). The quality of the watershed in which the parcel is found also received high weight in this analysis. Erosion hazard, adjacent land use, connectivity, proximity to existing reserves, and parcel size received lower weights for this conservation objective.

**Protect and improve water quality**

Preserving and enhancing the water quality in the upper Sacramento River watershed is central to maintaining a healthy ecosystem. Actions to improve water quality through stabilizing disturbed soils and reducing sediment loading into the river and tributaries are among the projects recommended for consideration by the

Council in the settlement MOA. The Council has taken a twofold approach in addressing this conservation objective: identification and protection of tributary sub-basins providing high-quality inflows to the river, and conversely, identification of sites that may require remediation or erosion control measures to improve water quality.

The Council has already taken direct action to protect existing water quality by providing funding to the Regional Water Quality Control Board for increased monitoring and enforcement activities within the watershed. Other conservation objectives under consideration by the Council such as providing buffers for key riparian zones will also do much to maintain existing water quality. The focus of the current objective is therefore to identify sites in need of remediation to correct water quality problems.

Because there are very few sources of chemical contaminants in the watershed, identification and correction of erosion problems and other sediment sources is the main emphasis of this conservation objective. Primary parcel evaluation criteria include erosion hazard rating, road density, stream frontage, and slope adjacent to the river. Forest seral stage is factored into the evaluation with emphasis placed on earlier stages with low vegetation cover. Overall watershed quality is also considered as an indicator of general disturbance levels within a given tributary basin.

**Expand existing reserves**

Whenever possible, the Council wishes to expand and connect existing protected parcels to maximize long-term benefits to the resources, the landscape, and the public. This objective emphasizes the maintenance of habitat continuity for riparian dependent wildlife species.

The criteria used to evaluate land for this objective are straightforward, relating to proximity, habitat quality, and public benefits. Because a few large protected areas are more beneficial in the end than many small ones, the criteria receiving the highest weight were reserve proximity, connectivity, and adjacent land use. Parcels adjacent to existing protected lands, that connect two or more such lands, are of great value in achieving this conservation objective. High weight was given to watershed quality and parcel size, as large parcels relieve fragmentation effects. In addition, preserving existing good quality sub-watersheds is a more efficient use of funds for long-term protection. Public benefits of access and recreational value received additional consideration as primary evaluation criteria.

**Improve recreational opportunities**

This objective is intended to complement enhanced public access to the upper Sacramento River by identifying opportunities to improving stream-related recreation. Providing alternative angling opportunities at locations off the river is a restoration action identified in the NRDA Plan. Improving public access to stream resources is also a component of the Council's Strategic Plan for replacing recreational use values lost during the spill.

Road access, in-kind aquatic communities, and recreational value received the greatest weights under this objective. Other evaluation criteria receiving high weights included adjacent land use and stream frontage. Factors influencing wildlife viewing opportunities such as watershed quality, general wildlife habitat, in-kind terrestrial communities, and forest seral stage received intermediate weights, as did criteria reflecting management considerations such as parcel size, reserve proximity, erosion hazard, and slope adjacent to the stream.

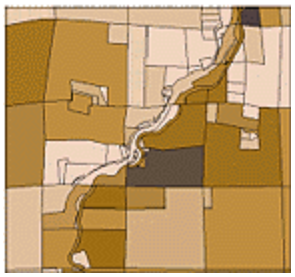
**Application of objectives**

Each of the seven objectives described above were run through the ParcRank model to develop a ranked list of potential sites. Sample results from this procedure can be seen in Figure 4. It can be seen that each resultant site ranking is different from the rankings of the other objectives. In some cases this difference is subtle. For example, the results of the objectives "Conserve Species and Habitats Affected by the Spill" and "Provide Buffers for Key Riparian Areas" are similar. This similarity comes about because these objectives are related, thus the criteria and the respective weights used are similar as well.

While the results of individual objective runs may be used to identify potential sites for conservation activities, the real power of this approach is that it can be used to identify sites that meet multiple objectives. The ranked scores of one objective may be further evaluated by examining how highly-ranked sites score with respect to the other objectives. For example, the site rankings for the "Protect and Improve Public Access to the River" objective may be further evaluated as to how they score for the objectives of "Conserve Species and Habitats Affected by the Spill" and "Provide Buffers for Key Riparian Zones", and "Protect Aquatic Refugia". By targeting sites that accomplish multiple objectives, the Council can truly maximize conservation efforts.

The ParcRank model is not designed to provide the Council with immediate answers as to which site to apply conservation action to; it is meant to be an additional tool to assist the Council in their decision-making process. The model is designed to provide a meaningful subset of all possible sites for the Council to examine. Additional factors that are not modeled in the GIS (e.g., willing seller, etc.) must be evaluated to further narrow the possible selections for a given objective.

Protect and Improve Public Access to the River

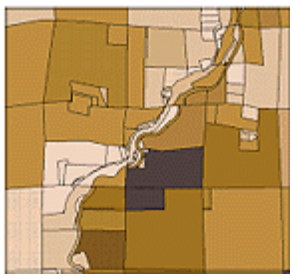


Conserve Species and Habitats Affected by the Spill

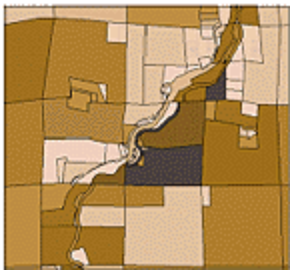
Provide Buffers for Key Riparian Areas

Protect Aquatic Refugia

Improve Water Quality



Expand Existing Reserves



Improve Recreational Opportunities

*Figure 4. Sample Results From Each of the Seven Objectives.*

## VI. IMPLEMENTATION

A number of different strategies are available to the Council to achieve the conservation objectives identified in this plan. Options include acquisition (both fee title and interest in land), direct actions such as improvements to existing access points and erosion control projects, enforcement of existing regulations, and finally, support and participation in long-term watershed planning efforts. Each of these potential strategies is applicable to one or more conservation objectives. Some of these strategies have already been implemented by the Council, such as funding a warden position dedicated to the upper Sacramento River watershed to enforce fishing, streambed alteration, and suction dredging regulations; funding a water quality monitoring and enforcement effort by the Central Valley Regional Water Quality Control Board; funding the collection of biological data used to support angling regulation recommendations; and staff review of permit applications to ensure minimal or no effects on recovering resources. Table 1 uses a matrix format to display the strategies expected to be most useful for each of the conservation objectives.

| **Table 1.** | **Trustee Council Strategies** | | | | | |
|---|---|---|---|---|---|---|
| CONSERVATION OBJECTIVES | Fee Title Acquisition | Acquire Easements | Fund Access Improvements | Watershed Improvements | Enforce Regulations | Watershed Planning |
| | | | | | | |
| Improve access to the river | X | X | X | | | |
| Conserve Species Affected by the Spill | X | X | | X | X | X |
| Provide Riparian Buffer Zones | | X | | | X | X |
| Protect Aquatic Refugia | | X | | X | X | X |
| Protect & Improve Water Quality | | X | X | X | X | X |
| Expand Existing Reserves | X | X | | | | X |
| Improve Recreational Opportunities | X | X | X | | | X |

### Acquisition and Conservation Easement

Each locale of interest will be evaluated to determine the best protection strategy once the GIS analysis is complete. Some areas may require direct fee acquisition to provide the most effective protection. For other parcels, a conservation easement may be the best option. In either case, the acquisition process and considerations for long-term success will be the same.

Parcels acquired by the Council will become the property of the California Department of Fish and Game (Department) **or other organization approved by unanimous vote of the Council**. Acquisition costs **could** include funds to cover the land cost, the title transfer process, payment of in-lieu fees, necessary enhancements and initial improvements, an endowment fund for maintenance of the parcel, preparation of a management plan, and formal designation of the land as a wildlife area or ecological reserve. Acquisition of conservation easements will require less funding for these purposes, but may need funds for such items as fencing or signing.

Once parcels for acquisition are identified, proposals will be made available to the Cantara Trustee Council for consideration. Upon approval of a proposal, a letter from the Council will be sent to the Department director, requesting assistance from the Wildlife Conservation Board (WCB) in identifying and negotiating with landowners. If approved, WCB will act as agent for the Council in negotiations. Table 2 lists the steps involved in this procedure (refer to Appendix C for detailed procedural information).

**Table 2**

**Cantara Trustee Council/WCB Acquisition Procedure**

| |
|---|
| 1. Site Selection Model. |
| 2. Field Review. |
| 3. Prepare Modified Land Acquisition Evaluation (LAE). |
| 4. Staff recommends to Council areas appropriate for acquisition, including the modified LAE. |
| 5. Council approves its priority parcels, and requests DFG Director to submit request for assistance to WCB. |
| 6. DFG Director submits recommendation/evaluation to WCB. |
| 7. WCB reviews LAE. |
| 8. LAE assigned to Land Agent for action. |
| 9. Land Agent field reviews project for purpose of initial dollar estimates, special problems, such as neighborhood trends, hazardous materials, likelihood the project purposes can be accomplished via acquisition, potential for alternative approaches (conservation easement, exchanges, etc.). |
| 10. Title Reports ordered. |
| 11. Agent makes initial owner contact regarding willingness to sell. |
| 12. Acquisition checked for CEQA compliance. |
| 13. Appraisal acquired, DGS (OREDS) appraisal review. (At this point, negotiations can legally be commenced.) |
| 14. If cost is over the amount CTC authorized, a revised authorization shall be obtained before offer is made. Last offer contingent upon CTC approval. |
| 15. Offer to purchase (completed 45 days prior to WCB meeting):<br><br>a) Deed<br><br>b) Property Acquisition Agreement<br><br>c) Statement of Just Compensation |
| 16. Agreement is submitted to WCB for consideration and funding (when WCB funds are included). |

| |
|---|
| 17. "Settlement Transmittal" to DGS (OREDS) for review and approval.<br><br>a) Deed<br><br>b) Property Acquisition Agreement<br><br>c) Statement of Just Compensation<br><br>d) Title explanations<br><br>e) Environmental<br><br>f) Escrow Instructions |
| 18. DGS approval; delivery of documents to escrow; schedule warrant for delivery to escrow. |
| 19. Escrow closing. |
| 20. "Closing Package"<br><br>a) Notify Director and Council of close of escrow<br><br>b) Notify DGS (Proprietary Lands Index).<br><br>c) Notify County Assessor (for action regarding local taxes). |

A report similar to a Land Acquisition Evaluation will be provided to the WCB, indicating the parcel characteristics of interest. During negotiations with interested parties, WCB will conduct necessary appraisals and determine the total purchase cost.

When the total costs are known, and an acceptable price is agreed upon, staff will prepare a funding request to the Council. This funding request will include provision for enhancement funds. The funding request will also include provision for an endowment fund, to be used for future improvements, maintenance, protection, or monitoring of the parcel. The funding request will further include costs for preparing a management plan, which is required for all department lands. The plan will direct future operations on the parcel, and serves as the documentation for designating the land as a wildlife area, ecological reserve, or fishing access. Finally, the funding request will include an amount sufficient to cover anticipated in-lieu fees to local government.

Grant agreements will be prepared by staff for proposals originating as part of the grant process. Upon securing the deed, funds will be deposited in interest-bearing accounts to provide for enhancements, improvements, a management plan, in-lieu fees, and formal designation.

As funds in the Sacramento River Account are limited, searching for ways to "stretch the dollar" are advisable. The Council will actively attempt to identify partnerships with other entities for purposes of cost sharing. Partners may help with direct acquisition costs, providing for the development and maintenance endowment, or even preparation of the management plan. Additionally, the Council will also pursue the use of volunteer organizations to provide labor for maintenance, development, or restoration. Outside proposals that include these cost sharing methods will be regarded more favorably during the review process.

Conservation easements are another means of extending the purchasing power of acquisition funds. An easement usually obtains a large measure of protection for existing resources at a cost less than that of direct acquisition. Easements may be useful in special situations, such as to provide increased protection of stream-side habitat on commercial timberlands. For example, current forest-practice rules provide for stream-side protection zones, but often allow some measure of harvest within those zones. A conservation easement could protect riparian corridors from all harvest activities.

## Enforcement of Existing Regulations

Most of the actions available under this strategy have already been undertaken by the Council, and will not be further addressed in this plan. However, the Council has an additional option of influencing timber harvest practices by using the regulatory authority of the California Department of Forestry and Fire Protection (CDF). Approximately 40% of the watershed is subject to CDF's Forest Practice Rules for timber harvesting. One of the most important aspects of these rules is the provision of streamside protection zones (SPZ). At least one Council-funded effort to determine the adequacy of SPZs to protect a species, the tailed frog, is ongoing. Further efforts to document the effectiveness of SPZs may be supported by the Council.

If the Council's efforts in this area show that expansion of SPZs may be warranted, a mechanism exists within the Forest Practice Rules to accomplish this. Section 916.8 of the rules provides for the creation of "sensitive watersheds." Areas so designated are provided with additional, case-specific protections over the normal rules. Documentation recommending sensitive-watershed designation status must be extensive, and thus is best pursued on a long-term basis.

Meanwhile, during the life of the Council, the most effective strategy to provide additional protection for stream buffers is to pursue conservation agreements or easements with the owners of key riparian parcels.

## Direct Management Actions

Maintaining and improving water quality is the conservation objective most amenable to direct management action by the Council. Among the most readily identifiable factors affecting water quality are erosion and sedimentation, which can adversely affect both terrestrial and aquatic resource values. However, the extent of these impacts within the watershed is currently unknown. Small, to relatively large, landslides are common in the upland areas and may date from logging and mining disturbance in the early years of this century. More recent features such as I-5, the railroad, and an ever-expanding network of logging and recreational access roads also combine to increase sediment loads in the river and tributaries. Tributaries such as the middle and north forks of the Sacramento River and Castle Creek, carry tremendous bed-loads that may be responsible for the channel instability evidenced in these locations.

The GIS models developed under this plan will be used to identify and prioritize erosion control needs. An overall assessment of erosion hazard will be developed for the watershed using existing ratings developed by the Shasta-Trinity National Forest. This work will be supplemented by an analysis of soil types and slopes on non-forest lands. Water quality monitoring by the RWQCB will help identify tributary watersheds that contribute excessive sediment loads to the river. Erosion control measures can then be evaluated, focusing on tributaries with identified problems. Other water quality problems will be identified by RWQCB monitoring. Council staff and the RWQCB will develop priorities and implement corrective actions to eliminate or reduce discharges or activities that exceed water quality standards or impair the recovery of aquatic resources.

In evaluating erosion control options on the tributaries, the Council can build upon the efforts of others. For example, the Shasta-Trinity National Forest has conducted Watershed Improvement Needs inventories for some portions of the forest. These studies frequently identify specific sites in need of remediation. Where information is lacking, the Council may choose to fund similar inventory efforts on non-forest lands. The product of these efforts would be a prioritized list of site-specific actions to eliminate or reduce sediment loads. Once these actions are identified, the Council can consider the most cost-effective means of implementing them. Options include direct Council funding, cooperative efforts with land management agencies or private landowners, volunteer efforts, and seeking funds from additional sources to maximize Council funds. Efforts are already underway with the U.S. Forest Service to accomplish this last item. Monitoring should be an integral component of the program to determine the effectiveness of erosion control measures.

## Long-term Planning

The Council can augment its funds, increase coordination, and improve resource protection effectiveness by participating in cooperative watershed protection planning. Given its short-term nature, the Council can act as a catalyst to bring concerned parties together for the purposes of communication, trust building, developing a plan for the future, and implementing protection strategies.

Sharing information is the first step in this process. All federal, state, and local agencies have been contacted and informed of the Council's interest in coordinated upper Sacramento River watershed planning. The following agencies were questioned about protection strategies they may already have in place or are planning to implement.

The Bureau of Land Management (BLM) owns two parcels in the watershed, but is planning to exchange them, probably with Sierra Pacific Industries. If these parcels rank well in the site-selection process, the Council will express their interest to BLM.

Watershed analyses have been conducted on four tributaries by the United States Forest Service (USFS), and at least two more are planned. Council staff are attempting to incorporate these analyses into the parcel evaluation plan. The USFS has also prepared planning maps in conjunction with the President's Forest Plan (Option 9), which will be obtained for our GIS analysis. Additionally, the USFS has conducted Watershed Improvement Needs analyses, and identified areas where culvert repair, road closures, and other erosion control measures are necessary. Working with the USFS to augment funds to accomplish these measures is an option for the Council.

At the state level, the CDF has not developed a plan specific to the upper Sacramento River watershed. However, that agency is a major player in watershed protection because of its role in enforcing the Forest Practices Act. Discussions have taken place between CDF and the City of Dunsmuir regarding developing a fire protection break for the city.

Carried out by the Regional Water Quality Control Board (RWQCB), the Basin Plan for the Central Valley Region identifies beneficial uses and water quality objectives for the upper Sacramento River. Specific quantitative objectives, are listed for chemicals, dissolved oxygen, pH, salinity, and temperature. In addition, the RWQCB is monitoring water quality in the watershed, under a multi-year grant from the Council.

The Department of Water Resources (DWR) has no ongoing resource protection efforts in the watershed besides maintaining a gauging station at Delta that collects water quality data.

Local agencies contacted included the Shasta County Planning Division, that reported the county has no specific plans or ordinances to protect resources in the upper Sacramento watershed, other than the General Plan, that regulates development density in timber or resource districts. Siskiyou County's General Plan has flood-zone setbacks and density criteria. The Siskiyou County Board of Supervisors has a Land Plan that encourages cooperation among entities involved in land-use planning in the county. The City of Dunsmuir has no plans or ordinances except general requirements for sewage disposal. The Nature Conservancy, a private organization often involved in resource protection planning, is not currently targeting any effort on the upper Sacramento.

All of the entities contacted expressed willingness to be involved in formal watershed planning efforts that may arise in the future.

Organizing a series of meetings to bring interested parties together is the next step. The purpose of these meetings is to develop a joint vision of where watershed planning will lead. As the Council will only be in existence for a limited time, another entity should act as the lead in this process. The Dunsmuir River Exchange could serve as facilitator for these meetings, and in fact, several such meetings have already

occurred. Restoration Roundtables have been hosted by the River Exchange and the Council in 1997 and 1998. At these meetings, participants showed considerable interest in forming a watershed conservancy or similar group to address issues of concern to all parties. Union Pacific Railroad Company held a meeting with interested parties regarding access to the river across their track. From this developed a more comprehensive Public Access Meeting which in turn led to the formation of a public access working group, which has been meeting since October 27, 1998 with the objective of defining public access needs and determining criteria for meeting those needs.

These meetings should result in commitments among the parties to share ideas and plans. Creating a list of opportunities for the parties to pursue in implementing resource protection should be a goal. These opportunities will include all of the conservation actions outlined in the previous sections.

The Council can approach multiparty planning as an opportunity to optimize its own resource protection goals, that have been prioritized in this plan. However, to take timely advantage of beneficial conservation opportunities, the Council may implement independent actions.

**Appendix A - Criterion Layer Descriptions**

Habitat for Species Affected by Spill

This layer was developed to represent terrestrial habitat quality for species affected by the spill. The layer was developed through a linkage of the GIC vegetation coverage to the CWHR Model (See Habitat Modeling section). Affected species were selected by Bruce Deuel from the list of species modeled in CWHR and through the CWHR-VEG linkage, overall habitat quality was modeled. The Habitat Value index (HV) for affected species ranged in magnitude from 0 to 25.15. The HV was then normalized to integer values between 0 and 10 and used as a feature rank for the Affected Species Habitat Criterion Layer. The species used in the development of this criterion layer include the following:

| Common Name | Scientific Name |
|---|---|
| ROUGH-SKINNED NEWT | Taricha granulosa |
| PACIFIC TREEFROG | Hyla regilla |
| GREEN HERON | Butorides virescens |
| BLACK-CHINNED HUMMINGBIRD | Archilochus alexandri |
| DOWNY WOODPECKER | Picoides pubescens |
| PAC.-SLOPE/CORDILLERAN FLYCATCHER | Empidonax difficilis/occidentalis |
| NORTHERN ROUGH-WINGED SWALLOW | Stelgidopteryx serripennis |
| CLIFF SWALLOW | Hirundo pyrrhonota |
| SONG SPARROW | Melospiza melodia |
| LESSER GOLDFINCH | Carduelis psaltria |
| LITTLE BROWN MYOTIS | Myotis lucifugus |
| YUMA MYOTIS | Myotis yumanensis |
| LONG-EARED MYOTIS | Myotis evotis |
| FRINGED MYOTIS | Myotis thysanodes |
| LONG-LEGGED MYOTIS | Myotis volans |
| CALIFORNIA MYOTIS | Myotis californicus |
| WESTERN SMALL-FOOTED MYOTIS | Myotis ciliolabrum |
| SILVER-HAIRED BAT | Lasionycteris noctivagans |

| | |
|---|---|
| BIG BROWN BAT | Eptesicus fuscus |
| WESTERN RED BAT | Lasiurus blossevillii |
| WESTERN TERRESTRIAL GARTER SNAKE | Thamnophis elegans |
| WESTERN AQUATIC/GIANT GARTER SNAKE | Thamnophis couchi/gigas |
| SWAINSON'S THRUSH | Catharus ustulatus |
| WARBLING VIREO | Vireo gilvus |
| WILSON'S WARBLER | Wilsonia pusilla |
| NORTHERN ORIOLE | Icterus galbula |
| BRUSH RABBIT | Sylvilagus bachmani |
| BEAVER | Castor canadensis |
| RACCOON | Procyon lotor |
| LONG-TAILED WEASEL | Mustela frenata |
| PACIFIC GIANT SALAMANDER | Dicamptodon tenebrosus |
| GREAT BLUE HERON | Ardea herodias |
| COMMON MERGANSER | Mergus merganser |
| SPOTTED SANDPIPER | Actitis macularia |
| VAUX'S SWIFT | Chaetura vauxi |
| BELTED KINGFISHER | Ceryle alcyon |
| AMERICAN DIPPER | Cinclus mexicanus |
| WATER SHREW | Sorex palustris |
| MINK | Mustela vison |
| RIVER OTTER | Lutra canadensis |

Listed Animals & Habitat

This layer was developed to represent both known locations (sightings, etc.) and habitat quality for species falling under the California Environmental Quality Act (CEQA). Known locations were obtained from the California Natural Diversity Data Base (CNDDB), and habitat quality was obtained through the linkage of the GIC vegetation coverage to the CWHR Model (See Habitat Modeling section). For the habitat modeling purposes, CEQA species were identified by Bruce Deuel from the list of species modeled in CWHR. The HV for CEQA species ranged in magnitude from 0 to 10.19. The HV was then normalized to integer values between 0 and 10 and used as a feature rank for the CEQA Species Habitat Criterion Layer. The species used in the development of this criterion layer include the following:

| **Common Name** | **Scientific Name** |
|---|---|
| SHASTA SALAMANDER | Hydromantes shastae |
| BALD EAGLE | Haliaeetus leucocephalus |
| PEREGRINE FALCON | Falco peregrinus |
| SPOTTED OWL | Strix occidentalis |
| WILLOW FLYCATCHER | Empidonax traillii |
| WOLVERINE | Gulo gulo |

CEQA Animals & Habitat

This layer was developed to represent both known locations (sightings, etc.) and habitat quality for species falling under the California Environmental Quality Act (CEQA) . Known locations were obtained from the

California Natural Diversity Data Base (CNDDB), and habitat quality was obtained through the linkage of the GIC vegetation coverage to the CWHR Model (See Habitat Modeling section). For the habitat modeling purposes, CEQA species were identified by Bruce Deuel from the list of species modeled in CWHR. The HV for CEQA species ranged in magnitude from 0 to 10.19. The HV was then normalized to integer values between 0 and 10 and used as a feature rank for the CEQA Species Habitat Criterion Layer. The species used in the development of this criterion layer include the following:

| Common Name | Scientific Name |
|---|---|
| PALLID BAT | Antrozous pallidus |
| TAILED FROG | Ascaphus truei |
| CASCADES FROG | Rana cascadae |
| FOOTHILL YELLOW-LEGGED FROG | Rana boylii |
| OSPREY | Pandion haliaetus |
| COOPER'S HAWK | Accipiter cooperii |
| NORTHERN GOSHAWK | Accipiter gentilis |
| GOLDEN EAGLE | Aquila chrysaetos |
| BLACK SWIFT | Cypseloides niger |
| PILEATED WOODPECKER | Dryocopus pileatus |
| YELLOW WARBLER | Dendroica petechia |
| YELLOW-BREASTED CHAT | Icteria virens |
| TOWNSEND'S BIG-EARED BAT | Plecotus townsendii |
| MARTEN | Martes americana |
| FISHER | Martes pennanti |
| AMERICAN BADGER | Taxidea taxus |
| WESTERN POND TURTLE | Clemmys marmorata |

General Wildlife Habitat

This layer was developed to represent habitat quality for all species listed in CWHR that do not fall into the categories listed above (e.g., were not affected by the spill, are not listed, and do not fall under CEQA guidelines). Habitat quality for these species was obtained through the linkage of the GIC vegetation coverage to the CWHR Model (See Habitat Modeling section). The HV for these species ranged in magnitude from 0 to 97.51. The HV was then normalized to integer values between 0 and 10 and used as a feature rank for the General Wildlife Habitat Criterion Layer. The species used in the development of this criterion layer include the following:

| Common Name | Scientific Name |
|---|---|
| LONG-TOED SALAMANDER | Ambystoma macrodactylum |
| BLACK SALAMANDER | Aneides flavipunctatus |
| WESTERN TOAD | Bufo boreas |
| COMMON GOLDENEYE | Bucephala clangula |
| BARROW'S GOLDENEYE | Bucephala islandica |
| TURKEY VULTURE | Cathartes aura |
| RED-SHOULDERED HAWK | Buteo lineatus |

| | |
|---|---|
| RED-TAILED HAWK | Buteo jamaicensis |
| KILLDEER | Charadrius vociferus |
| GREAT HORNED OWL | Bubo virginianus |
| COMMON NIGHTHAWK | Chordeiles minor |
| COMMON POORWILL | Phalaenoptilus nuttallii |
| ANNA'S HUMMINGBIRD | Calypte anna |
| CALLIOPE HUMMINGBIRD | Stellula calliope |
| LEWIS' WOODPECKER | Melanerpes lewis |
| ACORN WOODPECKER | Melanerpes formicivorus |
| RED-BREASTED SAPSUCKER | Sphyrapicus ruber |
| WILLIAMSON'S SAPSUCKER | Sphyrapicus thyroideus |
| NUTTALL'S WOODPECKER | Picoides nuttallii |
| HAIRY WOODPECKER | Picoides villosus |
| WHITE-HEADED WOODPECKER | Picoides albolarvatus |
| BLACK-BACKED WOODPECKER | Picoides arcticus |
| NORTHERN FLICKER | Colaptes auratus |
| OLIVE-SIDED FLYCATCHER | Contopus borealis |
| WESTERN WOOD-PEWEE | Contopus sordioulus |
| HAMMOND'S FLYCATCHER | Empidonax hammondii |
| DUSKY FLYCATCHER | Empidonax oberholseri |
| BLACK PHOEBE | Sayornis nigricans |
| WESTERN KINGBIRD | Tyrannus verticalis |
| BARN SWALLOW | Hirundo rustica |
| STELLER'S JAY | Cyanocitta stelleri |
| SCRUB JAY | Aphelocoma coerulescens |
| CLARK'S NUTCRACKER | Nucifraga columbiana |
| COMMON RAVEN | Corvus corax |
| BUSHTIT | Psaltriparus minimus |
| BROWN CREEPER | Certhia americana |
| ROCK WREN | Salpinctes obsoletus |
| CANYON WREN | Catherpes mexicanus |
| BEWICK'S WREN | Thryomanes bewickii |
| HOUSE WREN | Troglodytes aedon |
| WINTER WREN | Troglodytes troglodytes |
| GOLDEN-CROWNED KINGLET | Regulus satrapa |
| RUBY-CROWNED KINGLET | Regulus calendula |
| BLUE-GRAY GNATCATCHER | Polioptila caerulea |
| TOWNSEND'S SOLITAIRE | Myadestes townsendi |
| HERMIT THRUSH | Catharus guttatus |
| AMERICAN ROBIN | Turdus migratorius |
| VARIED THRUSH | Ixoreus naevius |
| WRENTIT | Chamaea fasciata |
| CALIFORNIA THRASHER | Toxostoma redivivum |
| AMERICAN PIPIT | Anthus rubescens |
| CEDAR WAXWING | Bombycilla cedrorum |

| | |
|---|---|
| HUTTON'S VIREO | Vireo huttoni |
| ORANGE-CROWNED WARBLER | Vermivora celata |
| YELLOW-RUMPED WARBLER | Dendroica coronata |
| COMMON YELLOWTHROAT | Geothlypis trichas |
| GREEN-TAILED TOWHEE | Pipilo chlorurus |
| RUFOUS-SIDED TOWHEE | Pipilo erythrophthalmus |
| CALIFORNIA TOWHEE | Pipilo crissalis |
| CHIPPING SPARROW | Spizella passerina |
| LARK SPARROW | Chondestes grammacus |
| FOX SPARROW | Passerella iliaca |
| LINCOLN'S SPARROW | Melospiza lincolnii |
| GOLDEN-CROWNED SPARROW | Zonotrichia atricapilla |
| WHITE-CROWNED SPARROW | Zonotrichia leucophrys |
| DARK-EYED JUNCO | Junco hyemalis |
| RED-WINGED BLACKBIRD | Agelaius phoeniceus |
| WESTERN MEADOWLARK | Sturnella neglecta |
| BREWER'S BLACKBIRD | Euphagus cyanocephalus |
| BROWN-HEADED COWBIRD | Molothrus ater |
| PURPLE FINCH | Carpodacus purpureus |
| CASSIN'S FINCH | Carpodacus cassinii |
| HOUSE FINCH | Carpodacus mexicanus |
| RED CROSSBILL | Loxia curvirostra |
| PINE SISKIN | Carduelis pinus |
| AMERICAN GOLDFINCH | Carduelis tristis |
| EVENING GROSBEAK | Coccothraustes vespertinus |
| VAGRANT SHREW | Sorex vagrans |
| TROWBRIDGE'S SHREW | Sorex trowbridgii |
| SHREW-MOLE | Neurotrichus gibbsii |
| BROAD-FOOTED MOLE | Scapanus latimanus |
| HOARY BAT | Lasiurus cinereus |
| BRAZILIAN FREE-TAILED BAT | Tadarida brasiliensis |
| YELLOW-PINE CHIPMUNK | Tamias amoenus |
| ALLEN'S CHIPMUNK | Tamias senex |
| SONOMA CHIPMUNK | Tamias sonomae |
| CALIFORNIA GROUND SQUIRREL | Spermophilus beecheyi |
| GOLDEN-MANTLED GROUND SQUIRREL | Spermophilus lateralis |
| BOTTA'S POCKET GOPHER | Thomomys bottae |
| WESTERN POCKET GOPHER | Thomomys mazama |
| MOUNTAIN POCKET GOPHER | Thomomys monticola |
| CALIFORNIA KANGAROO RAT | Dipodomys californicus |
| WESTERN HARVEST MOUSE | Reithrodontomys megalotis |
| DEER MOUSE | Peromyscus maniculatus |
| BRUSH MOUSE | Peromyscus boylii |
| PINYON MOUSE | Peromyscus truei |
| DUSKY-FOOTED WOODRAT | Neotoma fuscipes |

| | |
|---|---|
| BUSHY-TAILED WOODRAT | Neotoma cinerea |
| WESTERN RED-BACKED VOLE | Clethrionomys californicus |
| MONTANE VOLE | Microtus montanus |
| CALIFORNIA VOLE | Microtus californicus |
| LONG-TAILED VOLE | Microtus longicaudus |
| CREEPING VOLE | Microtus oregoni |
| WESTERN JUMPING MOUSE | Zapus princeps |
| PORCUPINE | Erethizon dorsatum |
| COYOTE | Canis latrans |
| WESTERN SPOTTED SKUNK | Spilogale gracilis |
| STRIPED SKUNK | Mephitis mephitis |
| WESTERN FENCE LIZARD | Sceloporus occidentalis |
| SAGEBRUSH LIZARD | Sceloporus graciosus |
| WESTERN SKINK | Eumeces skiltonianus |
| WESTERN WHIPTAIL | Cnemidophorus tigris |
| SOUTHERN ALLIGATOR LIZARD | Gerrhonotus multicarinatus |
| NORTHERN ALLIGATOR LIZARD | Gerrhonotus coeruleus |
| RUBBER BOA | Charina bottae |
| RINGNECK SNAKE | Diadophis punctatus |
| SHARP-TAILED SNAKE | Contia tenuis |
| RACER | Coluber constrictor |
| CALIFORNIA WHIPSNAKE | Masticophis lateralis |
| GOPHER SNAKE | Pituophis melanoleucus |
| COMMON KINGSNAKE | Lampropeltis getulus |
| COMMON GARTER SNAKE | Thamnophis sirtalis |
| NIGHT SNAKE | Hypsiglena torquata |
| WESTERN RATTLESNAKE | Crotalus viridis |
| BLUE GROUSE | Dendragapus obscurus |
| RUFFED GROUSE | Bonasa umbellus |
| WILD TURKEY | Meleagris gallopavo |
| CALIFORNIA QUAIL | Callipepla californica |
| MOUNTAIN QUAIL | Oreortyx pictus |
| BAND-TAILED PIGEON | Columba fasciata |
| MOURNING DOVE | Zenaida macroura |
| SOLITARY VIREO | Vireo solitarius |
| NASHVILLE WARBLER | Vermivora ruficapilla |
| BLACK-THROATED GRAY WARBLER | Dendroica nigrescens |
| HERMIT WARBLER | Dendroica occidentalis |
| MACGILLIVRAY'S WARBLER | Oporornis tolmiei |
| WESTERN TANAGER | Piranga ludoviciana |
| BLACK-HEADED GROSBEAK | Pheucticus melanocephalus |
| LAZULI BUNTING | Passerina amoena |
| NUTTALL'S COTTONTAIL | Sylvilagus nuttallii |
| SNOWSHOE HARE | Lepus americanus |
| BLACK-TAILED HARE | Lepus californicus |

| | |
|---|---|
| WESTERN GRAY SQUIRREL | Sciurus griseus |
| DOUGLAS' SQUIRREL | Tamiasciurus douglasii |
| GRAY FOX | Urocyon cinereoargenteus |
| BLACK BEAR | Ursus americanus |
| ERMINE | Mustela erminea |
| MOUNTAIN LION | Felis concolor |
| BOBCAT | Felis rufus |
| AMERICAN KESTREL | Falco sparverius |
| BARN OWL | Tyto alba |
| FLAMMULATED OWL | Otus flammeolus |
| WESTERN SCREECH OWL | Otus kennicottii |
| NORTHERN PYGMY OWL | Glaucidium gnoma |
| NORTHERN SAW-WHET OWL | Aegolius acadicus |
| ASH-THROATED FLYCATCHER | Myiarchus cinerascens |
| PURPLE MARTIN | Progne subis |
| TREE SWALLOW | Tachycineta bicolor |
| VIOLET-GREEN SWALLOW | Tachycineta thalassina |
| MOUNTAIN CHICKADEE | Parus gambeli |
| CHESTNUT-BACKED CHICKADEE | Parus rufescens |
| PLAIN TITMOUSE | Parus inornatus |
| RED-BREASTED NUTHATCH | Sitta canadensis |
| WHITE-BREASTED NUTHATCH | Sitta carolinensis |
| PYGMY NUTHATCH | Sitta pygmaea |
| WESTERN BLUEBIRD | Sialia mexicana |
| MOUNTAIN BLUEBIRD | Sialia currucoides |
| ELK | Cervus elaphus |
| MULE DEER | Odocoileus hemionus |
| ENSATINA | Ensatina eschscholtzii |
| SHARP-SHINNED HAWK | Accipiter striatus |
| LONG-EARED OWL | Asio otus |
| SPOTTED BAT | Euderma maculatum |
| NORTHERN FLYING SQUIRREL | Glaucomys sabrinus |
| RINGTAIL | Bassariscus astutus |
| CALIFORNIA MOUNTAIN KINGSNAKE | Lampropeltis zonata |
| BIG FREE-TAILED BAT | Nyctinomops macrotis |
| WESTERN MASTIFF BAT | Eumops perotis |
| RED FOX | Vulpes vulpes |

Bat Day Roost Habitat

This layer was developed to identify important day roost habitat for bats. The layer was developed by identifying and ranking important habitat (WHR) types from the GIC vegetation coverage. Bruce Deuel provided the following list of habitat types and ranks:

| **Habitat Type** | **Rank** |
|---|---|
| PPN4D | 10 |

| | |
|---|---|
| PPN4M | 10 |
| MHW4M | 9 |
| PPN3M | 9 |
| JPN3D | 8 |
| JPN3M | 8 |
| MHC4M | 8 |
| MHW4D | 8 |
| MHW4P | 8 |
| PPN3D | 8 |
| PPN3P | 8 |
| MHC4D | 7 |
| MHC4P | 7 |
| MHW3M | 7 |
| PPN3S | 7 |
| MHC3M | 6 |
| MHW3D | 6 |
| MHW3P | 6 |
| MHC3D | 5 |
| MHC3P | 5 |
| MHW2M | 5 |
| MHW3S | 5 |
| MHC2M | 4 |
| MHC3S | 4 |
| MHW2D | 4 |
| MHW2P | 4 |
| MHC2D | 3 |
| MHC2P | 3 |
| MHW2S | 3 |
| MHC2S | 2 |

Deer Habitat

This layer was created to estimate mule deer habitat for the watershed. This was done based upon a similar model developed by CDFG biologists and Larry Fox at Humboldt State University for Roosevelt Elk habitat. The steps used are as follows:

**Step 1:**

We determined cover and forage ratings for each of the habitat types found in the watershed using the CWHR classifications for mule deer. This was done by relating CWHR values to the GIC vegetation coverage.

**Step 2:**

Using the CWHR cover and forage values for each vegetation type, we created an overall habitat index grid, cover grid, and forage grid using the following classification rules:

If Cover and Forage then Overall and the

| If Cover Rating was: | and Forage rating was: | then Overall Index was | and the Cover/Forage Code was |
|---|---|---|---|
| | | | |
| Zero | Zero | Zero(0) | None |
| Zero | Low | Low(1) | Forage |
| Zero | Moderate | Moderate(5) | Forage |
| Zero | High | High(10) | Forage |
| Low | Low | Low(1) | Forage |
| Low | Moderate | Moderate(5) | Forage |
| Low | High | High(10) | Forage |
| Moderate | Low | Low(1) | Cover |
| Moderate | Moderate | Moderate(5) | Forage |
| Moderate | High | High (10) | Forage |
| High | Low | Low(1) | Cover |
| High | Moderate | Moderate (5) | Cover |
| High | High | High (10) | Forage |

**Step 3:**

We generated distance coverages:

For all non-cover cells, we computed a distance to cover and reclassifying distances into the following:

| Distance to Cover | Distance Factor |
|---|---|
| 0 to 100 m | 9 |
| >100 m to 200 m | 7 |
| >200 m to 300 m | 3 |
| >300 m | 0 |

For all non-forage cells, we computed a distance to forage and reclassifying distances into the following:

| Distance to Forage | Distance Factor |
|---|---|
| 0 to 100 m | 10 |
| >100 m to 200 m | 8 |
| >200 m to 300 m | 4 |
| >300 m | 0 |

This resulted in a distance to cover grid and distance to forage grid.

**Step 4:**

The distance grids were multiplied by the overall index grid to create a distance weighted habitat index. Possible results were:

| Cover Cells: Distance to Forage | Forage Cells: Distance to Cover |
|---|---|
| 10 x 10 = 100 | 10 x 9 = 90 |
| 10 x 8 = 80 | 10 x 7 = 70 |
| 10 x 4 = 40 | 10 x 3 = 30 |
| 5 x 10 = 50 | 5 x 9 = 45 |
| 5 x 8 = 40 | 5 x 7 = 35 |
| 5 x 4 = 20 | 5 x 3 = 15 |
| 1 x 10 = 10 | 1 x 9 = 9 |
| 1 x 8 = 8 | 1 x 7 = 7 |
| 1 x 4 = 4 | 1 x 3 = 3 |

**Step 5:**

The Overall Habitat Index grid was created. All possible index values are:

| Index Value | Cell Value |
|---|---|
| 90* | High Forage |
| 70* | High Forage |
| 30* | High Forage |
| 100* | High Cover |
| 80* | High Cover |
| 40 | High Cover |
| 45* | Moderate Forage |
| 35* | Moderate Forage |
| 15* | Moderate Forage |
| 50* | Moderate Cover |
| 40* | Moderate Cover |
| 20 | Moderate Cover |
| 9 | Low Forage |
| 7 | Low Forage |
| 3 | Low Forage |
| 10 | Low Forage |
| 8 | Low Cover |

| | |
|---|---|
| 4 | Low Cover |

**Step 6:**

Index values with an asterisk indicate values used in the Resource Protection Plan. These were given a ranking for use in the model:

| Cell Value | I.V. | Rank |
|---|---|---|
| High forage very close to cover | 90 | 10 |
| High forage moderately close to cover | 70 | 9 |
| High cover very close to forage | 100 | 8 |
| Mod forage very close to cover | 45 | 7 |
| High forage far from cover | 30 | 6 |
| Mod forage moderately close to cover | 35 | 5 |
| Mod cover very close to forage | 50 | 4 |
| High cover moderately close to forage | 80 | 3 |
| Mod forage far from cover | 15 | 2 |
| Mod cover moderately close to forage | 40 | 1 |

The ranks were further modified to predict critical deer winter range by separating the index grid into areas greater than and less than 3000 feet in elevation. Aspect was calculated for the areas less than 3000 feet in elevation, and a factor was applied to the index values to give an advantage to south, southeast, and southwest facing slopes.

| Aspect | Factor |
|---|---|
| S | 1.0 |
| SE/SW | 0.8 |
| E/W | 0.5 |
| NE/NW | 0.2 |
| N | 0.1 |

This resulted in the following index values that were given modified ranks:

Aspect Modifier:

| S | Rank | SW/SE | Rank | W/E | Rank | NW/NE | Rank | N | Rank |
|---|---|---|---|---|---|---|---|---|---|
| 90 | 10 | 72 | 10 | 45 | 8 | 18 | 7 | 9 | 6 |
| 70 | 9 | 56 | 9 | 35 | 7 | 14 | 6 | 7 | 5 |
| 100 | 8 | 80 | 8 | 50 | 6 | 20 | 5 | 10 | 4 |
| 45 | 7 | 36 | 7 | 22.5 | 5 | 9 | 4 | 4.5 | 3 |
| 30 | 6 | 24 | 6 | 15 | 4 | 6 | 3 | 3 | 2 |
| 35 | 5 | 28 | 5 | 17.5 | 3 | 7 | 2 | 3.5 | 1 |
| 50 | 4 | 40 | 4 | 25 | 2 | 10 | 1 | 5 | 1 |
| 80 | 3 | 64 | 3 | 40 | 1 | 16 | 1 | 8 | 1 |
| 15 | 2 | 12 | 2 | 7.5 | 1 | 3 | 1 | 1.5 | 1 |
| 40 | 1 | 32 | 1 | 20 | 1 | 8 | 1 | 4 | 1 |

The ranked grids were created and joined to yield a final watershed-wide deer habitat index.

Bear Habitat

This layer was developed to estimate Black Bear habitat in the watershed. After discussion with biologists, it was decided that the outlying factor for bear habitat within the watershed was forage. As a result, we modeled bear habitat for the watershed by relating the GIC vegetation coverage to CWHR feeding values. This resulted in three forage classes, which were ranked as follows:

| | |
|---|---|
| High | 10 |
| Medium | 6 |
| Low | 3 |

Mast

The mast layer was developed to represent forest stands with mast producing species (e.g., oaks, etc.). Forest stand types containing these species were identified from the GIC vegetation coverage by Craig Martz. All seral stages of the identified type were included except the youngest (i.e., size class 1) under the assumption that all stages but the youngest produce acorns. The forest types were then ranked as follows:

| | |
|---|---|
| Montane Hardwood Stands (MHW) | 10 |
| Montane Hardwood-Conifer Stands (MHC) | 7 |

| | |
|---|---|
| Klamath and Sierran Mixed Conifer Stands (KMC/SMC) | 5 |
| Montane Chaparral Stands (MCP) | 3 |
| Douglas Fir and Ponderosa Pine Stands (DFR/PPN) | 1 |

Listed Plant Species

This criterion layer was developed to represent both known and potential occurrences of listed plant species. Known locations were obtained from the CNDDB coverage and each element occurrence was examined by Craig Martz to determine suitability for the model. Potential occurrences were modeled from the soils coverage by isolating serpentine soils in elevations of 7000' or greater. This criterion was handled as a presence/absence criterion. Parcels that contain an element occurrence receive a rank of 10, all others receive a rank of 7. Parcels containing the selected soils data are given a rank of 1. All other parcels receive a rank of 0. At the time of this analysis only one listed species (Trinity Buckwheat) was identified by CNDDB as being observed within the watershed. Only three element occurrences of Trinity Buckwheat (*Eriogonum alpinum*) were found in the CNDDB coverage.

CEQA Plant Species

This criterion layer was developed to represent known occurrences of plant species falling under CEQA guidelines. Known locations were obtained from the CNDDB coverage and each element occurrence was examined by Craig Martz to determine suitability for the model. Predicted occurrences were derived from soil substrate values and wet meadow locations derived from the GIC vegetation coverage. This criterion was handled as a presence/absence criterion. Parcels that contain an element occurrence receive a rank of 10, while parcels adjacent to an element occurrence receive a rank of 7. Parcels containing the selected soils data are given a rank of 1. All other parcels receive a rank of 0. A total of 85 CNDDB element occurrences were used in this analysis. Represented species include:

| **Common Name** | **Scientific Name** |
|---|---|
| CANTELOW'S LEWISIA | LEWISIA CANTELOVII |
| CASTLE CRAGS HAREBELL | CAMPANULA SHETLERI |
| CASTLE CRAGS IVESIA | IVESIA LONGIBRACTEATA |
| CRESTED POTENTILLA | POTENTILLA CRISTAE |
| GOLDEN DRABA | DRABA AUREOLA |
| KLAMATH MANZANITA | ARCTOSTAPHYLOS KLAMATHENSIS |
| LITTLELEAF HUCKLEBERRY | VACCINIUM SCOPARIUM |
| MASON'S SKY PILOT | POLEMONIUM CHARTACEUM |
| MT. EDDY DRABA | DRABA CARNOSULA |
| PALLID BIRD'S-BEAK | CORDYLANTHUS TENUIS SSP PALLESCENS |
| SCOTT MTN PHACELIA | PHACELIA DALESIANA |
| SHORE SEDGE | CAREX LIMOSA |
| SHOWY RAILLARDELLA | RAILLARDELLA PRINGLEI |
| THREAD-LEAVED BEARDTONGUE | PENSTEMON FILIFORMIS |
| WILKIN'S HAREBELL | CAMPANULA WILKINSIANA |

In-kind Terrestrial Communities

This layer was developed to represent non-aquatic in-kind communities in the watershed. These include riparian forests, riparian scrub, linear riparian, and isolated riparian areas (seeps and springs). Riparian forest and riparian scrub areas along the mainstem were determined using the GIC damage assessment data. The GIC vegetation coverage was used to identify linear riparian areas not along the mainstem. Isolated riparian areas (seeps and springs) were identified from USGS 7.5 minute quads.

The total acreage of each riparian type was calculated for each parcel in the watershed. Because mature riparian forest was considered by the Cantara Staff to be of particular importance from a conservation standpoint, a weighting system was applied to each parcel as follows:

Mature Riparian forest (delineated Riparian forest and WHR size class >= 3 ) 2

Riparian Scrub and other non-forest types (e.g., springs) 1

This weighting system was applied to each parcel to generate a weighted acreage for each in-kind community type within the parcel. In this way, it was possible to give higher value to parcels that have mature riparian forest as opposed to other in-kind community types.

A summary score was then calculated for each parcel by summing the weighted acreages of all in-kind community types within the parcel boundary. These summary scores were then normalized to rank values between 0 - 10 for all parcels within the watershed using the natural breaks method.

In-kind Aquatic Communities

This layer was developed to represent in-kind aquatic communities found within the watershed. To model in-kind aquatic communities, we used combination of the GIC damage assessment layer, a hydrology layer obtained from the USFS and a springs layer digitized from 7.5 minute quad maps. The USFS hydrology layer contained attribute data showing stream segments with presence or absence of resident fish, and flow regime. The mainstem of the Upper Sacramento River was extracted from the GIC damage assessment layer and given a rating of 10. The USFS hydrology layer provided data for perennial streams bearing fish that were rated 7, and intermittent and perennial streams that were non-fish bearing, which were given a rating of 3. Springs were given a rating of 5. This data was applied to the parcel coverage, and the parcels were attributed when an intersection of any of the above types within a parcel occurred.

Special Status Communities

This layer was developed to represent special status communities currently tracked by CNDDB found in the watershed. The layers used for this included a Port Orford Cedar coverage containing delineated polygons obtained from the USFS, and a coverage of Darlingtonia Seep and Fen communities. This was created by using substrate data obtained from a watershed-wide soils coverage, and the GIC vegetation coverage to predict habitat for the communities. These were combined into a single coverage, and the parcels layer was attributed on the presence or absence of the communities as follows:

| | |
|---|---|
| More than one community type present on the parcel | 10 |
| Single community type present on the parcel | 7 |
| Community type on adjacent parcel | 3 |

Forest Seral Stage

The Forest Seral Stage Criterion was developed to represent mature forest stands within the watershed. Using the GIC vegetation coverage, mature forest stands (i.e., size class 4 and 5) were identified. Forest stand types included CPC, DFR, KMC, LPN, MHC, MHW, MRI, PPN, RFR, SCN, SMC, and WFR. These stands were ranked as follows:

| | |
|---|---|
| WHR size class 5 or larger within 1/4 mile of mainstem | 10 |
| WHR size class 5 or larger not adjacent to mainstem | 7 |
| WHR size class 4 within 1/4 mile of mainstem | 5 |
| WHR size class 4 not adjacent to mainstem | 3 |

Reserve Proximity

This layer was developed to account for parcels that fell within a specified distance from designated USFS reserves. Reserve data was compiled by isolating parcels owned by USFS containing the following forest prescription types: unroaded non-motorized recreation, limited roaded-motorized recreation, wilderness, wildlife habitat management, LSR, Marten, Owl, or special area management (Research Natural Areas or Special Interest Areas). Parcels that completely fell within existing reserves were given a rating of 10, while parcels that were partially within or adjacent to existing reserves were given a rating of 7. Finally, any parcels that were within ¼ mile of an existing reserve were given a rating of 3.

Parcel Size

This criterion layer was developed to express the desirability of parcels of various sizes from a resource protection standpoint. Generally speaking, larger parcels are more desirable for acquisition. However, since the CTC wants to replace in-kind values, it was felt that medium to large sized parcels adjacent to the river would be most desirable. As such, the Parcel Size Criteria rankings were developed as follows:

| | |
|---|---|
| Parcel 10-50 acres adjacent to river | 10 |
| Parcel 50+ acres (regardless of location) | 7 |
| Parcel 10-50 acres not adjacent to river | 5 |
| Parcel 5-10 acres (regardless of location) | 3 |
| Parcels < 5 acres (regardless of location) | 0 |

Parcel acreage for this criterion was calculated by the GIS from the parcel coverage developed by ENPLAN.

Accessibility

This criterion layer was developed to identify parcels that were accessible via existing roads. Accessibility was felt to be valuable not only for providing public access, but also to provide access for land management purposes. The creation of this criterion layer consisted of coding the USFS for whether a road was paved or dirt, and developing a 200' buffer around all roads to rank the parcels in the following manner:

| | |
|---|---|
| Paved road to parcel | 10 |
| Dirt road to parcel | 7 |
| Paved road within 200' of parcel | 5 |
| Dirt road within 200' of parcel | 3 |

Adjacent Land Use

The adjacent land use criterion was developed to evaluate each parcel in terms of the ownership of its neighboring parcels. Since no "land use" maps for the upper Sacramento River watershed exist, adjacent land use was inferred from the parcel ownership layer. It was reasoned that a parcel would be more valuable from an acquisition standpoint if its neighboring parcels were owned by the State or Federal government rather than held in private ownership because it would be expanding on the protection afforded by government ownership. Parcels were coded based upon ownership as follows:

| | |
|---|---|
| DFG property | 10 |
| DPR property | 8 |
| USFS property | 7 |
| Commercial timberlands | 5 |
| Non-commercial private | 3 |
| Urban/residential | 1 |

Adjacency for each parcel was then calculated using the following formula:

$$\frac{\text{(Length of common border) x (neighboring parcel's ownership value)}}{\text{Total length}}$$

These values were then summed for each parcel, which gave us the ranked value of a parcel according to the amount of adjacency it had to each neighbor. Thus, a parcel which was completely surrounded by DFG property would get a value of 10, compared to a parcel with only a small piece of DFG property adjacent to it with the rest urban/residential land, would get a rating slightly above 1.

Erosion Hazard

This layer was developed to create a rating of erosion hazard for the watershed. The EHR was estimated by modifying the Computation of Erosion Hazard Rating, a calculation developed and used by USFS. This model uses a combination of soil factors, climate conditions, slope, and soil cover factors for computation of erosion hazards. Since a watershed-wide soil survey did not exist, some surveys had to be combined for complete coverage. The surveys were obtained from USFS, NRCS and CDF and used to derive soil texture for use in the EHR calculation. This was used along with a precipitation layer containing storm severity data, a slope layer derived from a digital elevation model, and a soil cover layer derived from the GIC vegetation coverage. The following EHR ratings were given these ranks, which were applied to the parcels coverage for final coding:

| | |
|---|---|
| High | 1 |
| Moderate | 4 |
| Low | 7 |
| None | 10 |

Recreational Value

This was developed to represent the recreation value of a given parcel within the watershed. Recreation value was based upon the hydrology layer containing fish presence data. The parcels coverage was given a ranking based upon whether a given parcel provided fishing access to the mainstem (a rating of 10), or fishing access to a tributary (a rating of 6). The third ranking of providing other recreational opportunities (upland) was created with a rating of 3, but will be an on-site evaluation since data did not exist for this criterion.

Stream Frontage

This was developed to represent a parcel's total length of river or stream frontage. This was created using the USFS hydrology layer for the mainstem and perennial streams. The parcels layer was intersected with the hydrology layer and attributed with total length of stream segments within a given parcel. The total length for stream and river segments were normalized five classes (1, 3, 5, 7, and 10) using natural breaks. These were used as ranks for the Stream Frontage criterion.

Slope Adjacent to River

This was developed to represent the percentage of slope in areas adjacent to perennial streams within the watershed. A 300' buffer was applied to the perennial streams coverage from the USFS streams data. This area was used to clip a slope percentage layer, which was derived from a Digital Elevation Model. The slopes were then recoded into the following ranks:

| | |
|---|---|
| 0 - 10% | 1 |
| 10 - 20% | 3 |
| 20 - 40% | 7 |
| 40 - 70% | 10 |

These ranks were then intersected with the parcels layer, and averaged for the buffer area within each parcel. These values were normalized to integer values between 0 and 10, and used as a feature rank for the Slope Adjacent to the River criterion layer.

Connectivity

This criterion was developed to identify landscape linkages (connectivity) between riparian and upland habitats. Bruce Deuel manually identified 129 species from CWHR that are dependent upon both riparian and upland habitats during their life history. The idea was to identify upland habitats that were of high value for many of these species that were also accessible from the riparian habitats. To this end we developed a Habitat Connectivity Index (HCI) which includes not only the value of a particular habitat for a given species, but also its spatial relationship to the riparian zone. The following steps were taken:

Step 1. Using the GIS, all riparian habitats (i.e., RIP and RIV WHR types) were selected throughout the watershed from the GIC Habitat Dataset.

Step 2. All upland habitats (excluding URB WHR types) immediately adjacent to the riparian system were identified.

Step 3. All upland habitats immediately adjacent to the set selected in step 2 were identified.

Step 4. The value (High, medium, low) of each habitat type identified in steps 2 and 3 were determined for

each of the 129 species.

Step 5. A Habitat Connectivity Index (HCI) was developed to express the value of each habitat patch for each species from a connectivity standpoint. Patches immediately adjacent to the riparian zone were directly coded for their habitat value for each species. Patches not adjacent to the river were coded for a combination of their habitat value and the value of the patch connecting them to the river. The HCI ranking system was as follows:

| **Habitat Connectivity Index** | **Rank** |
|---|---|
| HIGH value patch immediately adjacent to riparian (HIGH) | 12 |
| HIGH value patch connected by another HIGH value patch (HIGH, HIGH) | 11 |
| HIGH value patch connected by a MEDIUM value patch (MED, HIGH) | 10 |
| MEDIUM value patch immediately adjacent to riparian (MED) | 9 |
| MEDIUM value patch connected by a HIGH value patch (HIGH, HIGH) | 8 |
| MEDIUM value patch connected by a MEDIUM value patch (MED, MED) | 7 |
| HIGH value patch connected by a LOW value patch (LOW, HIGH) | 6 |
| MEDIUM value patch connected by a LOW value patch (LOW, MED) | 5 |
| LOW value patch immediately adjacent to riparian (LOW ) | 4 |
| LOW value patch connected by a HIGH value patch (HIGH, LOW) | 3 |
| LOW value patch connected by a MEDIUM value patch (MED, LOW) | 2 |
| LOW value patch connected by another LOW value patch (LOW, LOW) | 1 |

Step 6. The HCI value for all species was summed for each habitat patch. Summary patch values ranged between 8 and 997. These values were then normalized to rank values between 1 and 10.

Watershed Quality

This criterion was developed to identify sites (parcels) that are located in high quality watersheds. It was reasoned that high quality watersheds would be large watersheds with substantial acreages of natural, relatively undisturbed habitats and those that already had a great deal of public ownership. By targeting these high value watersheds for conservation activities, the CTC would be expanding the existing protection or enhancing the most valuable landscape level units in the upper Sacramento River watershed.

To model watershed quality we used relevant data from other parcel ranking criteria (e.g., in-kind aquatic communities, wildlife habitat, in-kind terrestrial habitat, etc.). These datasets were modified and used as watershed quality criteria. The watershed quality criteria included:

**Fish-bearing Streams**
- Miles of fish-bearing streams per square mile of watershed. Derived from "in-kind aquatic communities" criterion.

**Wildlife Habitat**
- Weighted sum (by area) of habitat values for species affected by the spill. High value watersheds were those containing relatively large areas of high value habitat for species affected by the spill. Derived from "Habitat Value for Species Affect by the Spill" criterion.

**In-kind Terrestrial**
- Weighted sum (by area) of in-kind terrestrial (riparian) habitats. In-kind community types were weighted such that mature riparian forests were worth twice as much per unit area as any other in-kind terrestrial community type. High value watersheds were those with significant amounts of in-kind types (particularly mature riparian forest) per unit area. Derived from "In-kind Terrestrial Communities" criterion.

**Seral Stage**
- Weighted sum (by area) of forest seral stages. High value watersheds were those with the greatest relative acreage of late successional forest stands. Derived from "Forest Seral Stage" criterion.

**Basin size** - Watersheds were ranked 1 - 10 by total acreage. Large watersheds given higher values.

**Erosion Hazard**
- Weighted sum (by area) of sites exhibiting erosion hazard potential. High value watersheds were those with few sites modeled as having an erosion hazard rating. Derived from "Erosion Hazard" criterion.

**Land Use**
- Weighted sum (by area) of ranked land use types. High value watersheds were those with large acreages of publicly protected lands (e.g., CDFG, USFS Late Successional Reserves, CDPR, etc.). Derived from "Adjacent Land Use" criterion.

**Connectivity**
- Weighted sum (by area) of lands exhibiting upland-riparian linkages. High value watersheds were those with relatively large acreages of habitats exhibiting connectivity. Derived from "Connectivity" criterion.

**Roads**
- Miles of roads per square mile of watershed. High ranking watershed were those with few roads per square mile of watershed.

Each of the above watershed criteria were ranked 1 - 10 for each watershed and a summary value was calculated. This summary value was then normalized to rank values between 1 and 10 using the natural breaks method. Finally, these normalized rank values were transferred to the parcels dataset using the weighted average (by area) method to rank each parcel for watershed quality. In this way, parcels that fell completely within the most highly ranked watershed received the maximum value (10) for this criterion.

Habitat Quality

Habitat Quality in the upper Sacramento River watershed was modeled through a linkage of the CWHR (California Wildlife Habitat Relationship) model to the GIC Vegetation Layer. Through this linkage, an overall Habitat Value Index (HV) was calculated for each habitat type identified in the GIC Vegetation Layer. For each habitat type, the HV is a function of both the number of species that utilize that habitat type and the quality of that habitat type for each species such that:

$$HV = \sum_{i=1}^{n} \frac{R_i + C_i + F_i}{3}$$

| | | |
|---|---|---|
| Where: | HV | = Habitat Value Index |

| | | |
|---|---|---|
| | n | = Number of species potential utilizing habitat |
| | R,C,F | = Reproduction, Cover, and Feeding Life Requisites for species i, respectively. The requisite levels High, Medium, and Low as identified by CWHR are converted to the numerical values 1.0, 0.66, and 0.33, respectively. |

| **Table 3. Criteria Weighting Table** | p = primary criteria | | | | | | |
|---|---|---|---|---|---|---|---|
| | s = secondary criteria | | | | | | |
| **Evaluation Criteria** | **Conservation Objectives** | | | | | | |
| | Access to river | River & Tributary Timber Buffer | Conserve Species Affected by Spill | Aquatic Refugia | Water Quality | Expand Existing Reserves | Recreation Opportunity |
| Deer Habitat | s/1 | s/1 | s/1 | s/1 | s/1 | s/1 | s/2 |
| Bear Habitat | s/1 | s/1 | s/1 | s/1 | s/1 | s/1 | s/2 |
| Habitat for Species Affected by Spill | s/5 | s/5 | p/5 | p/5 | s/1 | s/5 | s/5 |
| General Wildlife Habitat | s/2 | s/2 | s/1 | s/2 | s/1 | s/2 | p/2 |
| Bat Roosting Habitat | s/3 | s/3 | p/3 | s/3 | s/1 | s/3 | s/3 |
| Mast | s/2 | s/2 | s/2 | s/2 | s/1 | s/2 | s/2 |
| Listed Plant Species | s/3 | s/3 | s/3 | s/3 | s/1 | s/3 | s/3 |
| CEQA Plant Species | s/3 | s/3 | s/3 | s/3 | s/1 | s/3 | s/3 |
| Listed Animals | s/3 | s/3 | s/3 | s/3 | s/1 | s/3 | s/3 |
| CEQA Animals | s/3 | s/3 | s/3 | s/3 | s/1 | s/3 | s/3 |
| In-kind Terrestrial Communities | s/5 | s/5 | p/5 | p/5 | s/1 | s/5 | p/3 |
| In-kind Aquatic Communities | s/5 | s/5 | p/5 | p/5 | s/1 | s/5 | p/5 |
| Special Status Communities | s/4 | s/4 | s/4 | s/4 | s/1 | s/4 | s/4 |
| Forest Seral Stage | s/4 | p/4 | p/3 | s/4 | p/-2 | s/4 | p/2 |
| Connectivity | s/4 | p/4 | p/3 | p/4 | s/1 | p/5 | p/1 |
| Reserve Proximity | p/1 | p/3 | p/4 | p/3 | s/1 | p/5 | p/3 |
| Parcel Size | p/1 | p/2 | p/4 | p/2 | s/1 | p/4 | p/3 |
| Access | p/5 | s/3 | s/3 | s/3 | p/1 | p/2 | p/5 |
| Adjacent Land Use | s/2 | p/4 | p/3 | p/4 | s/1 | p/5 | p/4 |
| Erosion Hazard | p/2 | p/3 | s/2 | p/3 | p/-5 | s/2 | p/2 |
| Recreational Value | p/5 | s/3 | s/3 | s/3 | s/1 | p/1 | p/5 |
| Stream Frontage | p/5 | p/5 | p/4 | p/5 | p/2 | s/4 | p/4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Slope Adjacent to River | p/-1 | p/5 | s/1 | s/1 | p/1 | s/1 | p/-2 |
| Watershed Quality | s/1 | p/3 | p/4 | p/5 | p/-1 | p/4 | p/2 |

**Appendix B - Process for Ranking parcels using the GIS**

The following details the series of steps used to rank parcels for each of the conservation objectives.

**1.**
Collect data to support the criteria. Datasets should support the criteria as closely as possible. If, for instance, the criterion is wildlife habitat, the corresponding GIS layer should provide information about the range of habitat values found throughout the watershed. The collection process includes obtaining existing datasets, and developing new datasets. A variety of data quality control procedures, are performed to ensure that the data accurately represents the features.

**2.**
Rank the features in each data category (GIS layer). For this project, we have chosen a ranking system of integers between zero and 10, with zero being low or no value, and 10 having the maximum value for a feature within a given dataset. For example, using the wildlife habitat criteria, areas with little or no habitat value are coded to zero, whereas areas that provide habitat for many species receive a score of 10 (See Appendix A for the ranks used for project criteria). A direct comparison among all criteria layers is allowed by this system of rank ordering.

**3.** Transfer the criteria data to the site selection layer. The method of transfer depends on the criterion layer. If the criterion layer is a polygon coverage as in the case of the habitat coverage, an area-weighted average rank is calculated for each parcel. For other layers the (e.g., point, line, and some polygon coverages), the parcel is coded with the maximum ranked feature found in its boundaries. How this transfer takes place is completely dependent upon the criterion layer in question. The output from this step is a site selection coverage in which all sites have a score between one and ten for each criterion.

**4.**
Weight all criteria. This is an interactive process by which all 23 criteria are evaluated for relevance to a particular conservation objective. In this process we identified which of the 23 criteria were primary to the accomplishment of each objective. We then weighted the primary criteria with respect to each other using a weighting system with values that ranged from one to five, with one being of low value for a given conservation objective, and five representing high relative value.

We then identified which of the remaining criteria were of value but only secondarily. These criteria were typically those considered important and valuable, but not central to accomplishing the specific objective. As with the primary criteria, the secondary criteria were weighted with respect to each other on a scale of one to five.

The weighting system was then applied to the criteria scores in a multiplicative fashion. That is, the criteria score for each parcel was multiplied by the relative weight of that criteria for the specific objective. For instance, if a given parcel's criterion score is 10 for the criterion in question, and the weight of the criterion is assigned a 5, then that parcel would receive a weighted score of 50. This weighted score for a given parcel represents both the relative value of the parcel for the criterion in question and the relative value of the criterion to the objective at hand.

**5.**
Calculate the summary site score. After the weighted scores are calculated for all of the criteria, a summary

score is calculated for each parcel. This summary score is achieved by adding the weighted scores for all criteria. This method provides a means of identifying and prioritizing parcels with high value for a given conservation action.

**6.**
After model execution, each parcel that receives a high overall score will be visually examined in the GIS to verify that the model is accurately portraying the resource values. Following this visual inspection, it is recommended that extensive on-site evaluation of each high-ranking parcel be performed. The true utility of the GIS for this purpose is to narrow the possibilities, and to provide a first cut at parcel selection. It is not designed to replace in-depth field evaluation of potential sites.

## Appendix C

## CANTARA PROGRAM LAND ACQUISITION EVALUATION PROCEDURES AND OUTLINE

The following procedures will be used to ensure that all Cantara Program Land Acquisition Evaluations (CPLAE) receive a complete review and analysis by department personnel involved in the land acquisition process:

### A. LAND ACQUISITION EVALUATIONS

The CPLAE must be marked "DRAFT" to remain a confidential in-house document. It is never to be distributed to outside parties.

CPLAEs normally originate with Cantara Program staff; others may draft CPLAEs but the draft must be given to Cantara program staff for approval and submittal to the Cantara Trustee Council. Cantara program staff must visit the property to ensure the desired characteristics are present.

CPLAEs are evaluated, ranked, and given priority scores by program staff. These priorities will be reviewed and approved at the next scheduled Cantara Trustee Council meeting. Approved acquisitions will then be forwarded to the Wildlife Conservation Board under the director's signature.

### B. CONCEPTUAL AREA ACQUISITION PLAN

A conceptual area acquisition plan (CAP) differs from a CPLAE in the following ways:

1) CAPs will usually contain numerous properties and many ownerships (CPLAEs generally contain one or a few properties with a single or few ownerships).

2) CAPs tend to encompass larger geographic areas than CPLAEs and may serve as planning tools for the region to protect large blocks of habitat (CPLAE example: creek drainage with property within a canyon; CAP example: headwaters, creek drainage and properties in a surrounding canyon).

3) CAPs are long-term planning instruments with properties either a) listed in acquisition priority order; or b) grouped in tiers according to acquisition priority (e.g., Priority A, B, C).

The CAP should be named for its most significant geographical feature or location.

CAPs are presented to the Cantara Trustee Council in the same format used for CPLAEs. The only difference is the inclusion of all properties (including parcel numbers with maps), even if properties are not presently available for purchase. The properties should be listed in order of ecological significance (and, therefore, acquisition priority) and should meet a similar purpose for acquisition. Setting priorities for acquisition properties within the CAP is necessary for WCB action.

The CAP should receive the same level of review within program staff as a standard CPLAE. All procedures are the same for Council review. The Council will give one overall rank and one priority score for the entire CAP.

New acquisition evaluations are not required as each property within the CAP becomes available. Instead, a memo addressed to WCB noting availability should be prepared by the program staff for Council and director's signature. The memo should contain any additional information recently learned about the property and not described in the original CAP. This information is necessary for WCB's negotiations.

## LAND ACQUISITION EVALUATION OUTLINE

The following outline of the required format should be used in preparing a CPLAE or a CAP. For simplicity, the term, CPLAE, will be used in describing the format used for both CPLAEs and CAPS.

The purpose of a CPLAE is to describe the ecological values associated with a property and the importance of this property to the Council's goal of biological resource protection. It provides information necessary to establish watershed-wide priorities through comparison with other CPLAEs. All major subject areas must be completed; where information is unavailable, an explanation should be given. If certain subject areas are left uncompleted with no explanation, the CPLAE will not be accepted for Council review. It is essential that the CPLAE be as complete as possible in order for Council members to make responsible recommendations.

State of California, The Resources Agency, DEPARTMENT OF FISH AND GAME

LAND ACQUISITION EVALUATION FORMAT, October 1993

STAMP OR TYPE "DRAFT"

1. Site Name

The name selected should be chosen carefully so that changes are unnecessary in the future. Follow Fish and Game Commission policy for naming state lands based upon geographical location. If the property is to be managed and regulated as a Wildlife Area or Ecological Reserve, provide the proposed designation [i.e., Wildlife Area (WA), Ecological Reserve (ER)] and the reasoning behind your choice. The WA designation is used for areas that are more intensively managed (but not always), and have specific hunting or angling recreational values. The ER designation, according to F&G Code, Sections 15801584, is used to protect habitats for T&E native plants, wildlife or aquatic organisms, or special habitats, that are meant to be preserved in a natural condition for the benefit of the general public to observe native flora and fauna and for scientific study. This does not necessarily preclude hunting and/or angling as appropriate public uses on ERs. The department also has lands that have not been designated in Title 14 under Sections 550 (Wildlife Areas) and 630 (Ecological Reserves) though they contain significant

biological resources. If areas are not designated, the department's authority to regulate public use on these lands is more complicated. (A legal opinion is being developed on this issue by our Legal Services staff. Contact LNAP staff for additional information.)

2. Summary

Write a brief one or two paragraph statement summarizing the biological resources, management objectives, and other reasons why this site would be an important addition to DFG-administered lands. This summary will be used to describe the CPLAE for Regional Manager and Directorate concurrence with Lands Committee recommendations.

3. Geographical Location and Description

Give the general location of the property (include county, nearest towns, roads and important landmarks). Provide directions and access to the property. Provide topographic and/or elevation information and current land use.

Describe any improvements (such as fences, dwellings, wells, and non-movable structures) which exist on the property. For each property, provide the following information: 1) assessor parcel number, 2) acreage, and 3) township, range and section.

4. Purpose of Acquisition

State the primary purpose of acquisition (e.g., protection of habitats, communities and/or species, public access, restoration of habitats). Identify and describe each habitat type using the WHR habitat classification system. If a more precise delineation of habitat is necessary or useful to describe the resource, use the NDDB community classification system. Contact Mr. Barry Garrison, WMD, at 916-653-1738 for WHR questions or Mr. Todd Keeler-Wolf, NHD, at 916-324-6857 for NDDB questions. If possible, estimate the number of acres or percentage of each habitat type represented on the property. Describe species or communities to be benefitted.

If the property contains critical habitat for T&E or rare species, be specific in describing how the particular species use this habitat, and whether or not they are known to exist on or presently use the property. It is important to state clearly whether a listed species is a verified recent occurrence or whether it is only considered a potential resident or user based on critical habitat characteristics.

Describe how the property may implement regional planning efforts to protect wildlife resources. Describe its proximity to other conservation ownerships. Will this acquisition increase the value of other conservation-oriented land holdings in the region (BLM, USFS, DPR, DFG). Describe the long-term prospects for this property's ecological viability based on surrounding land use patterns.

Does the area encompassed by the CPLAE include any known Significant Natural Areas as described in Sections 2720-2721 of the Fish and Game Code? If you are not sure, contact the LNAP Land Conservation Planner for help in making a determination.

5. Management Objectives

Prepare a brief but clear summary of management objectives that should include some or all of the following, if they apply:

a. Conservation, protection, restoration, and/or enhancement of species, habitats, or communities

b. Re-introductions of extirpated species or habitats

c. Public use and access (for example, hunting, interpretive functions, exclusion)

State whether cooperative management agreements with other agencies and/or conservation groups will be considered or pursued. If joint management agreements are considered, describe their benefit to the resource and department.

6. Financial Information

The financial information requested below should be as complete as possible. Please give an explanation if, for some reason, you cannot supply all of the information requested.

a. Provide names and addresses of property owner(s).

b. Give the name of any outside contacts, such as realty agents, if known.

c. Provide the sales price, if known, and list comparable sales information if available.

d. Discuss the most suitable method available for protection of the property such as full fee acquisition, conservation easement, acquisition by other environmental organizations (e.g., TNC, TPL), lease agreement, joint management agreement, or any other method you choose. Justify your choice. Conservation easements should be given serious consideration.

e. Determine quality and quantity of any encumbrances associated with the property (e.g., timber, mineral, and water rights, access and utility easements). This is especially important when easements or other interests are retained by the seller. Water and timber rights have caused numerous problems for DFG when not purchased with property.

f. Provide a rough estimate of ongoing operations and maintenance expenses to maintain or restore the property according to the management objectives stated earlier in the CPLAE. The O&M estimate should be broken down within five categories: 1) Site Security; 2) Public Health and Safety; 3) Resource Management; 4) Infrastructure; and 5) Public Use (see attached form). Estimate annual in-lieu fee costs for properties to be designated as wildlife areas (in-lieu fee payment is based on the current property tax assessment at the time of purchase).

g. Provide a rough estimate of personnel requirements (e.g., quarterly inspection by unit biologist, weekly patrol by warden, on-site manager or staff).

h. If the property meets criteria for acquisition under Prop. 70 (Wildlife and Natural Areas Conservation Program) for Significant Natural Areas, provide the correct subsection of Fish and Game Code, Section 2721, [i.e., (a), (b),(c), or (d)]. Read Chapter 7.5 of the Fish and Game Code for a description of the program. The SNA Program in NHD can provide you with additional information.

i. i. The WCB can provide funds for start-up costs if they are known in advance. If you are certain that funds are required immediately (and will be expended within the same fiscal year as acquisition) for environmental hazards surveys, some types of archeological surveys, fencing (fencing requires CEQA compliance), land surveys (if really necessary), signage, describe them and provide a good estimate of their cost here. Contact a Wildlife Area for help with fence/signage and parking area cost estimates.

7. Cultural Resources

Identify known or suspected historical and archeological sites on the property (i.e., real property that meets criteria for historical significance and any American Indian cultural artifacts or sites). If the property has been surveyed in the past for cultural resources, present the results here. If no survey information exists, state whether there is a strong possibility that such resources exist on the property. Cultural resources may affect resource management efforts on the property and should be carefully considered.

8. Hazardous Materials

List any known present or historical usage or dumping of hazardous materials on the property (e.g., pesticide container storage, airstrip for aerial spray applicators, battery storage, old farms and barns sometimes have underground tanks for gasoline, oil dump pits, transmission lines, underground gas pipelines, dry wells, etc.).

9. Local and Regional Issues

Discuss potential opposition to or support of acquisition by local governments and/or organizations. If problems are anticipated, describe them here. Provide the names of Senate and Assembly District representatives.

10. Threats

Describe the specific type and degree (long or short-term) of threat to the resource we are attempting to protect by this acquisition. Provide your best estimate of how soon these threats could be realized.