Santa Clara River
Enhancement and Management Plan Study

Biological Resources

Volume I

Santa Clara River Project Steering Committee

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(bound separately)

Preface

The following report on the biological resources of the Santa Clara River has been prepared under the direction of the Biological Resources Subcommittee. The primary purpose of the document is to provide guidance for the incorporation of biological conservation goals into the next phases of the planning process for the multiple resource values within the 500-year floodplain of the Santa Clara River.

A variety of factors has caused the biological data collection effort to focus on providing a relatively uniform and consistent level of information throughout the study area. These factors primarily include the limitations of access, funding, and time. As a result, the report appears to ignore or downplay detailed data that are available for limited portions of the study area. This was intentional. The purpose of this planning effort was to look at the entire river system for its long-term potential for the conservation of biological resources. The incorporation of data from areas where detailed information is available distorts the comparison of the value of these areas with other areas where detailed information is not available (and was not possible to collect in this study).

The other side of providing a consistent and therefore less detailed evaluation of biological data is that the conservation recommendations must be conservative. A lesser degree of understanding of the distribution and status of key resources means that a greater level of conservation should be achieved. With more species-specific and location-specific information, the risk of more focused and limited conservation actions can be balanced.

This document provides data at a level of detail and content that will allow integration with the data for other resources and subsequent development of site-specific recommendations.

Summary

Objectives and Criteria

The following objectives and criteria form the basis for evaluation of existing resources on the Santa Clara River, and they provide the rationale for the development of a set of recommendations for future enhancement and management actions along the river which, in turn, provides a mechanism to balance biological conservation goals for the river with other resource and management goals within the frame work of the Santa Clara River

The general objectives for biological resources in the SCREMP planning process are:

1. Preservation of a continuous riparian corridor on the river with connections to adjacent native habitats;

2. Restoration of degraded resources; and

3. Management of the river to maintain the existing and restored resource values.

The following criteria were developed for use in the evaluation of the plan with respect to how it deals with the objectives enumerated above:

1. Maintain existing habitat resource values within and along the river.

2. Maintain existing species resource values within and along the river.

3. Enhance the value of key resources through conservation and enhancement.

4. Incorporate appropriate reserve design concepts into river planning.

5. Provide opportunities for mitigation of unavoidable impacts.

6. Provide a mechanism for expedited compliance with federal, state, and local regulations.

7. Ensure long-term viability of populations.

8. Enhance the management potential of biological resources.

9. Integrate biological resources with other issues.

Existing Conditions

Historical changes in the distribution of native habitats along the Santa Clara River have resulted in the loss of habitat, encroachment into the floodplain of the river, introduction of non-native plant species, and fragmentation of the remaining habitat areas.

The Santa Clara River is one of the last undammed rivers in southern California. Most of the other rivers in southern California have been channelized or dammed to allow development on the floodplains. Areas of riparian habitat that remain on the Santa Clara River are thus an important resource to conserve since it represents one of the last natural rivers in the region.

The riparian resources of the Santa Clara River that remain today have become fragmented by past and present encroachment into the floodplain and the river itself. However, examples of native riparian habitat still exist along small stretches of the river. Wildlife communities associated with these riparian habitats flourish in the scattered habitat patches. Some of the habitats and plant and animal species occupying the Santa Clara River are considered rare, threatened, or endangered.

The distribution of the riparian habitat types along the Santa Clara River in the 500-year floodplain was mapped using topographic maps, color aerial photographs, and field surveys conducted in March and April, 1995.

The habitats associated with the riparian areas of the Santa Clara River include beach, alkali marsh, southern foredune, active channel, mule fat scrub, southern willow scrub, southern willow riparian woodland, southern cottonwood-willow riparian forest, arrow weed scrub, alluvial scrub, big sagebrush scrub, and valley freshwater marsh and ponds.

Nonriparian habitats that occur adjacent to portions of the Santa Clara River include uplands characterized as coastal sage scrub, chamise chaparral, coast live oak woodland, juniper woodland, and disturbed areas.

Disturbed uplands and portions of the floodplain adjacent to the river include areas that have been urbanized, mined, cultivated, or otherwise cleared of the native riparian or upland vegetation.

A total of 7 plant, 1 insect, 5 fish, 18 bird, 2 amphibian, 6 reptile, and 3 mammal species considered to be sensitive were identified as occurring or having the potential to occur within the study area. A general habitat analysis was conducted to graphically depict areas of riparian habitat along the river that have the potential to support any of these sensitive species.

Institutional and Regulatory Setting

The laws and regulations that affect riparian habitat generally do not protect the entire riparian ecosystem. Federal and state laws have overlapping jurisdictions and may or may not include all riparian habitat at a particular location. Local governments and independent districts may also have plans and ordinances aimed at the protection of riparian areas. Each of these categories of regulators, federal, state, and local, are discussed.

Opportunities and Constraints

Conservation of Existing Resources

The conservation of the existing riparian habitats on the Santa Clara River would help prevent further declines in populations of native riparian-dependent plants and wildlife species. The diversity of wildlife species in the riparian and aquatic habitats on the Santa Clara River is of particular value given the degradation of most of the other river systems in the region. The conservation of riparian resources on the Santa Clara River will aid in the recovery of listed species such as the least Bell's vireo and unarmored threespine stickleback, in addition to many other sensitive species.

The conservation of the existing native riparian habitats on the Santa Clara River will also help preserve the natural hydrology and geomorphology of the river. The presence of riparian habitat influences sediment transport, erosion, and the course of the river itself.

The connection of the patches of habitat to form a continuous corridor of vegetation along the river is another important management opportunity. Connectivity in riparian habitat benefits wildlife by providing a contiguous corridor of vegetation cover for plant and wildlife dispersal and other natural movements between areas.

Potential for Enhancement and Restoration

Areas of the river that are disturbed by human activities, areas vegetated with mainly non-native plant species, or areas of native vegetation that have moderate levels of non-native plant species as components were all considered potential areas for restoration or enhancement.

The most prevalent non-native species on the Santa Clara River is giant cane. Other noxious weeds can be found along the river (e.g., castor bean, tamarisk, fennel, pampas grass, bull thistle), but not in large concentrations like giant cane. Almost 1,000 acres of relatively large, dense, pure stands of giant cane were mapped in Ventura County. The control of giant cane on the Santa Clara River is of paramount importance.

Non-native amphibians such as the bullfrog and African clawed frog can prey on native fish, insects, and other frogs and toads, including the young tadpoles. A bird species that is especially troublesome along the Santa Clara River is the brown-headed cowbird. Brown-headed cowbirds prefer to nest in riparian areas, where they parasitize the nests of host passerine species, such as the least Bell's vireo. Animal control programs developed for the Santa Clara River should include measures to control these species.

Potential Corridors and Connections within the River and to Adjacent Uplands

Corridors and connections are extremely important landscape features from a conservation perspective. They function to mitigate to some degree the effects of habitat fragmentation and isolation, both natural and human-caused. Connected subpopulations of species have greater effective population sizes, and consequently greater population viability, than nonconnected.

For this study, connections along the Santa Clara River were categorized as connections between riparian habitat areas along the river; connections between riparian habitat along the main stem of the river and similar habitat in tributary drainages; and connection of the riparian habitats along the river to adjacent upland habitats. Corridors and connections along the river were evaluated on the basis of their potential biological value and feasibility of their maintenance.

The active channel is a key corridor for aquatic and water-dependent species throughout the length of the river. Maintenance of active channel continuity of flows is especially critical for fish species such as the southern steelhead, arroyo chub, unarmored threespine stickleback, and Santa Ana sucker. The river channel is also important in the dispersal of many amphibians, the southwestern pond turtle, and many plant species. On the negative side, the active channel, particularly in flood events, acts as a conduit for exotic fish and plant species.

Enhancing connectivity of other habitats within the river corridor should build on the linear thread of the active channel. First priority should be to focus on fragmented areas of riparian and alluvial scrub and increase local connectivity between patches. Secondary priority should be given to providing some level of continuity between the first-priority areas, even if fragmented.

A number of tributaries provide varying degrees of connectivity to the Santa Clara River study area. The tributaries are assessed from west to east by river segment along with the assigned conservation priority.

There are four remaining areas where more or less direct connections remain between the habitat along the Santa Clara River with substantial areas of natural upland vegetation: South Mountain, Big Mountain, and Santa Susana Mountain areas west of Interstate 5 and to the San Gabriel Mountains area to the east of Interstate 5.

The connections are characterized by the occurrence of upland habitats, primarily coastal sage scrub and chaparral, on slopes that reach down to the floodplain and are generally unaffected by human activities. Agriculture, urbanization, and State Route 126 generally limit the connections to the north side of the river to the remaining tributaries described above. Agriculture and urbanization are the primary limiting factors on the south side of the river.

On a regional scale, the Santa Clara River provides a key nexus between the remaining open space areas to the northwest of the Los Angeles urban area (see Figure 4-32). The river and its habitat provide the primary remaining east-west connection between the Pacific coast and the San Gabriel Mountains and Angeles National Forest. The river also provides connections between the Los Padres National Forest and open areas to the north of the river (including Sulphur Peak, Santa Paula Peak, Hutton Peak, Valverde, Castaic, and Mint Canyon), with the Santa Susana Mountains on the south. Through the Santa Susana Mountains the river and these areas are connected, at least through the stepping stones of the Simi Hills and smaller open areas to the Santa Monica Mountains.

Many species, including a number of species of special concern dealt with in this study, depend upon the river as habitat and to provide for local migration. This includes fish, birds, reptiles and amphibians, and plant species.

Potential Impacts to the River from Adjacent Land Uses

Adjacent land uses can significantly affect, directly and indirectly, the biological resources within the river corridor. Understanding the kinds and scale of the potential effects of adjacent land uses is important from a planning perspective because they need to be anticipated in the development of the conservation plan and in the ultimate management of the conserved resources. The primary land uses adjacent to the Santa Clara River which could potentially affect biological resources include agriculture, development, roads and bridges, landfills, brush clearing, aggregate mining, tributary alterations, manufacturing, grazing, mineral extraction, and oil pipelines.

Recommendations

Recommendations for biological resources on the river are based on the information developed for this study as detailed in Sections 1 through 4 and focus on the following conservation objectives:

- Preservation of a continuous riparian corridor on the river with connections to adjacent native habitats;
- Restoration of degraded resources; and
- Management of the river to maintain the existing and restored resource values.

The recommendations include prioritization for conservation of existing and potential biological resources along the river, impact assessment and mitigation guidelines, mitigation programs, and management programs to achieve these goals. The ultimate objective of this exercise is to provide information on biological resources in a geographic information system format that will allow overlay and comparison with similarly prioritized information on other issues and to provide the basis for incorporation of biological conservation planning into the riverwide planning process.

River System Configuration

The focus of this evaluation has been to identify current biological values on the river, their context with adjacent habitats, and potential management and enhancement actions that would conserve the biological values or potentially increase these values, relative to the conservation goals outlined above.

For the purpose of this evaluation, the river was divided into 12 segments reflecting the type and quality of biological resources present, the interrelated general hydrologic conditions, and land uses in and adjacent to the 500-year floodplain. Each of these segments is assigned conservation value based on their attributes as follows:

- Segments which are relatively undisturbed and have significant conservation value;
- Segments which have significant potential for restoration and enhancement; and
- Segments which have value based on their contributions to connectivity.

Impact Assessment and Mitigation Guidelines

The assessment of impacts along the river should be made in the context of the value of the habitat that is affected. Specifically, the value of habitat affected should be evaluated relative to its importance to accomplishing the riverwide conservation goals and priorities.

With the intent of maintaining a dynamic river resources as well as conserving biological resources, the river channel should not be confined to any great extent. To achieve this, any river reaches proposed for channelization should be designed to convey flood flows while supporting riparian vegetation.

The following general guidelines should be followed in developing specific mitigation plans:

- Impacts to biological resources should be avoided wherever possible through alternative project designs.

- Where impacts are unavoidable, projects should be designed to minimize impacts to the maximum extent feasible.
- Where impacts are unavoidable, these impacts should be mitigated appropriate to the magnitude of the impact and the value of the resources.
- Mitigation that occurs on the Santa Clara River should be consistent with the river configuration described above.
- Impacts to areas with significant conservation value, including the major blocks of riparian habitat, should be avoided. Impacts that do occur to these resources should be mitigated through restoration of the same habitat type and value on or near the site of the impact.
- Impacts to areas which have significant potential for restoration and enhancement should be mitigated in-kind and on-site or in-kind, off-site in high-priority restoration or enhancement areas.
- Impacts to other areas should be mitigated by restoration or enhancement of higher-value habitat types in high-priority restoration or enhancement areas, or provision of connection/corridor between higher-value areas.

Mitigation Programs

All biological mitigation activities along the Santa Clara River should be planned and implemented so that they address one or more of the conservation goals outlined above. Mitigation should add to existing habitat areas, increase connectivity along the river, or increase connectivity to adjacent habitat areas. Landowners, local jurisdictions, and agencies with management or approval authority should incorporate the biological goals into their planning process. All proposed actions which could affect biological resources should be evaluated in the context of the river configuration discussion above, particularly with respect to conservation and management priorities. Preliminary recommendations are included for the appropriate conservation activities in each reach.

Restorable and enhanceable areas of the river could be set aside by landowners, local, state, or federal agencies as mitigation bank sites. Restoration and enhancement activities within areas identified as mitigation banks could be used to offset impacts to biological resources from projects on other parts of the Santa Clara River or, as appropriate, other areas. Project proponents could achieve mitigation by restoring or enhancing habitat on the mitigation bank sites or by buying habitat that already has been restored or enhanced for mitigation purposes on the site.

Management Programs

A number of management activities are critical to accomplish conservation and enhancement of biological resources on the Santa Clara River. These include specific management activities for riparian resources, aquatic resources, and endangered and other species of special concern; integration and coordination with flood control activities and integration with planning activities; and control programs for cowbirds and invasive plant species.

A management strategy most likely to be successful on the Santa Clara River might include some activities managed riverwide (such as giant cane control), with other activities managed by individual landowners or local jurisdictions (such as cowbird control). This would require a management group to facilitate communication, coordination, and cooperation among the landowners and agencies along the river. This management group could provide technical assistance and expertise as needed to individual landowners to accomplish specific management goals.

Section 1

Objectives and Criteria

The following section details the objectives and criteria used in the analysis of biological resources on the Santa Clara River. These objectives and criteria form the basis for evaluation of existing resources on the river. More importantly, they provide the rationale for the development of a set of recommendations for future enhancement and management actions along the river which, in turn, provides a mechanism to balance biological conservation goals for the river with other resource and management goals within the frame work of the Santa Clara River Enhancement and Management Plan (SCREMP).

The Biological Resources Subcommittee developed a draft goal statement in an attempt to define objectives for the SCREMP in March of 1995. This statement incorporates the ideas of Noss and Cooperrider (1994) and addresses the overall goal of the project:

> To preserve a dynamic river system in which native biodiversity and natural processes are maintained. Specifically, to achieve this, the river must: 1) continue to support all native habitat types and seral stages; 2) maintain viable populations of all native species; and 3) maintain physical, ecological, and evolutionary processes.

Objectives

The Biological Resources Subcommittee developed the following set of three general objectives for biological resources in the SCREMP planning process:

1. Preservation of a continuous riparian corridor on the river with connections to adjacent native habitats;

2. Restoration of degraded resources; and

3. Management of the river to maintain the existing and restored resource values.

Criteria

The following criteria have been developed for use in the evaluation of the plan with respect to how it deals with the objectives enumerated above:

1. Maintain existing habitat resource values within and along the river. To achieve this objective, the plan must provide for the maintenance of at least as much area of comparable quality and habitat value of each natural vegetation community type as is identified in this analysis. The SCREMP provides a baseline from which to assess amount and general quality of the major vegetation communities present along the river.

2. Maintain existing species resource values within and along the river. To achieve this objective, the plan must provide for the maintenance of at least as much area of comparable quality and habitat value of wildlife habitat, both aquatic and terrestrial, appropriate for key species as is identified in this analysis. The SCREMP provides a baseline from which to assess amount and general quality of the key habitat categories present along the river.

3. Enhance the value of key resources through conservation and enhancement. To achieve this objective, the plan must provide guidance as to which resources are most important for conservation purposes and where enhancement activities could be most valuable for conservation purposes.

4. Incorporate appropriate reserve design concepts into river planning. Key to the planning process for the Santa Clara River will be the incorporation of current conservation theory and practice (Thomas et al. 1990; Noss 1991; U.S. Fish and Wildlife Service 1994b). This body of thought includes a number of conservation concepts (Table 1-1) developed to address regional conservation planning for species such as the spotted owl (RECON 1992), desert tortoise (RECON 1991, 1994), Stephens' kangaroo rat (RECON 1990a), and least Bell's vireo (RECON 1990b), as well as ongoing multiple species planning processes.

Table 1-1 Conservation Planning Principles	
Principle	**Description**
Distribution	Reserves that are well distributed across a species' native range will be more successful in preventing extinction than reserves confined to small portions of a species' range.
Refugia	On a regional scale, some small and isolated populations should be conserved to reduce the potential for catastrophic effects.
Management	Within the constraints of existing land uses and the distribution of remaining habitat, the reserve system should include boundaries intended to maximize the potential for effective management and minimize edge-to-area ratios. The monitoring and management plan should recognize the need to more intensively manage critical edges.
Quality	The open space system should include the best remaining examples of habitat.
Ecosystem	The open space system should provide protection for the ecosystem upon which entire high-quality populations of species depend.
Heterogeneity	The open space system should include heterogeneous terrain and vegetation.
Fragmentation	Habitat that occurs in less fragmented, contiguous blocks is preferable to habitat that is fragmented.
Linkage	Interconnected blocks of habitat are better than isolated blocks, and corridors or linkages function better when the habitat within them is represented by protected, preferred habitat for the target species.
Size	Large blocks of habitat, containing large populations of the target species, are superior to small blocks of habitat containing small populations.
Proximity	Blocks of habitat that are close together are better than blocks far apart.
Edge	Habitat patches that minimize edge-to-area ratios are superior to those that do not.
Access	Blocks of habitat that are roadless or otherwise inaccessible to humans are better than roaded and accessible habitat blocks.

5. Provide opportunities for mitigation of unavoidable impacts. To achieve this objective, the plan identifies and prioritizes areas along the river where mitigation measures would be most appropriate and valuable for conservation purposes.

6. Provide a mechanism for expedited compliance with federal, state, and local regulations. Through identification of key resources, mitigation, enhancement opportunities, and management needs, the plan provides the framework for avoidance, minimization, and mitigation actions that would be required as part of any proposed actions or projects within and along the river. This will allow project proponents and reviewing agencies to take the conservation needs along the river into consideration in the planning process.

7. Ensure long-term viability of populations. This will be achieved by assuring the following: conservation of existing habitat values along the river and their enhancement where feasible and appropriate; enhancement of connectivity of existing resources within and along the river and to adjacent riparian and upland areas; provision of a framework for management of biological resources; and provision of a means to minimize and avoid conflict with measures developed for other resources.

8. Enhance the management potential of biological resources. This objective will be addressed primarily through identification and protection of the key resources, mitigation opportunities, and enhancement needs along the river, thus providing a mechanism to focus management activities on key resources and issues.

9. Integrate biological resources with other issues. Achieving this objective requires a twofold approach. First, the plan should provide a quantifiable assessment of biological resources in a form that allows comparison and contrasting with other resources and issues along the river. Second, the plan must provide guidance as to how measures developed to deal with other resources and issues can be compatible with measures identified for conservation and management of biological resources.

Section 2

Existing Conditions

Historical Trends

The Santa Clara River in southern California flows from east to west; it is fed by a number of streams flowing south out of the San Rafael and Santa Ynez Mountains and streams flowing north out of the San Gabriel and Santa Susana Mountains in the Transverse Range in Ventura and Los Angeles Counties. Mature willow and cottonwood/willow riparian woodlands occur on terraces above the riverbed and are most common downstream from the Highway 101 bridge and upstream of Santa Paula Creek. Riparian scrubs have developed on lower terraces and young, successional riparian vegetation occurs on recently flooded gravel and sandbars of the active channel area of the river. Freshwater marsh areas can be found around undisturbed siltation ponds and natural depressions along the banks of the Santa Clara River. The main tributary streams include Santa Paula Creek, Sespe Creek, and Piru Creek in Ventura County; and Castaic Creek, Bouquet Canyon Creek, Hopper Creek, and San Francisquito Creek in Los Angeles County. Several other canyons with small intermittent drainages in both counties also feed the Santa Clara River.

Historical changes in the distribution of native habitats along the Santa Clara River have resulted in the loss of habitat, encroachment into the floodplain of the river, introduction of non-native plant species, and fragmentation of the remaining habitat areas. The following information on the historical use of the Santa Clara River is summarized from "A History of the Santa Clara River," prepared by Schwartzberg and Moore (1995). The indigenous Chumash and Tataviam people lived along the Santa Clara River, trading food, pelts, and plant material. These native people had little impact on the riparian habitats of the river. Around 1782, Spanish priests established the San Buenaventura Mission and with it the first land developments along the river. Small agricultural areas and the first cattle grazing began to affect the riparian habitat of the river. In the 1800s, livestock grazing (i.e., cattle, sheep) increased as large ranchos sprang up along the river. Hide and tallow trade along with the

demand for meat by the gold miners in the Sierras supported the expansion of the livestock trade on the river. As the livestock trade waned during the late 1800s, agriculture increased, affecting the distribution of riparian habitat along the Santa Clara River. Oil enterprises also became established near the river during this period.

As agriculture and oil enterprises expanded in the river valley, the demand for water increased the removal of water from the river and groundwater. Population and commercial growth brought the railroad, whose construction involved bridges and berms that changed the character of the river. The construction of new roads and bridges in the early 1900s also affected the river. In recent decades, the demands on the river have become ever more complex. Water demand along the river has increased with expanding agriculture and population growth in Ventura and Los Angeles Counties.

Developments have encroached upon the floodplain of the river, increasing residential demands and recreational use of the river. Sand mining operations affected the riparian vegetation on the river by lowering groundwater tables during the early 1900s (Schwartzberg and Moore 1995). Over the last 50 years, off-road vehicle traffic, mining, urban development, and natural flood events have further thinned and fragmented the remaining riparian woodland and forests of the river. Flood control became an important issue that shaped the river system throughout the 1900s as people and agricultural lands were affected periodically by floods.

The increased use of the waters of the Santa Clara River and adjacent lands has resulted in an increased effort to balance the protection of natural resources and human uses on the river. In addition, tributary streams to the river have had alterations in flows and flooding due to dams and water transfers. Increased regulation of activities in the river at the city, county, state, and federal levels has had an effect on the recent history of the Santa Clara River valley.

Biological Resources

The Santa Clara River is one of the last undammed rivers in southern California. Most of the other rivers in southern California have been channelized or dammed to allow development on the floodplains. This has resulted in the loss of 95 to 97 percent of the riparian community from floodplain areas of southern California (Faber et al. 1989). Areas of riparian habitat that remain on the Santa Clara River are thus an important resource to conserve since it represents one of the last natural rivers in the region.

The riparian resources of the Santa Clara River that remain today have become fragmented by past and present encroachment into the floodplain and the river itself. However, examples of native riparian habitat still exist along small stretches of the river. Wildlife communities associated with these riparian habitats flourish in the scattered habitat patches. Some of the habitats and plant and animal species occupying the Santa Clara River are considered rare, threatened, or endangered (see Sensitive Species and Sensitive Habitat sections). The following sections address the current state of the biological resources on the river. The names of plant communities follow those proposed by Holland (1986). Plant species nomenclature follows the Jepson Manual (Hickman 1993). Zoological nomenclature for birds is in accordance with the American Ornithologists' Union Check-list (1983, 1989); for mammals, Jones et al. (1982); and for amphibians and reptiles, Collins (1990).

Riparian Habitats

The habitats associated with the riparian areas of the Santa Clara River are described below. A list of the dominant species for each habitat type including the status as native or non-native plants and the wetland indicator status (i.e., obligate, facultative-wet, facultative, or upland; Reed 1988) of each is given in Table 2-1. The distribution of these habitat types is shown on Figures 2-1 to 2-28. A summary of the estimated acreages of riparian habitat on the Santa Clara River is given in Table 2-2. Acreages for upland habitats and disturbed areas (i.e., agriculture, ornamental, etc.), excluding giant cane, were not calculated due to the variable limits of the base maps which may or may not have covered the complete 500-year

Table 2-1
List of Dominant Plant Species, Status as Native or Exotic, and Wetland Indicator Status by Community Type

Habitat Type	Plant Species	Native/ Introduced	Wetland Indicator Status*
Alkali marsh	alkali heath (*Frankenia salina*)	N	FACW
	jaumea (*Jaumea carnosa*)	N	OBL
	pickleweed (*Salicornia virginica*)	N	OBL
	salt grass (*Distichlis spicata*)	N	FACW
Southern foredune	sand verbena (*Abronia maritima*)	N	UPL
	beach-bur (*Ambrosia chamissonis*)	N	UPL
	beach evening-primrose (*Camissonia cheiranthifolia*)	N	UPL
	salt grass (*Distichlis spicata*)	N	FACW
	sea rocket (*Cakile maritima*)	I	FACW
Mule fat scrub	mule fat (*Baccharis salicifolia*)	N	FACW
	narrow-leaved willow (*Salix exigua*)	N	OBL
Southern willow scrub	arroyo willow (*Salix lasiolepis*)	N	FACW
	red willow (*Salix laevigata*)	N	FACW
	mule fat (*Baccharis salicifolia*)	N	FACW
	narrow-leaved willow (*Salix exigua*)	N	OBL
Southern willow riparian woodland	arroyo willow (*Salix lasiolepis*)	N	FACW
	red willow (*Salix laevigata*)	N	FACW

Table 2-1
List of Dominant Plant Species, Status as Native or Exotic, and Wetland Indicator Status by Community Type

Habitat Type	Plant Species	Native/ Introduced	Wetland Indicator Status*
	Fremont cottonwood or black cottonwood (*Populus fremontii*, or *P. balsamifera* ssp. *trichocarpa*	N	FACW
	mule fat (*Baccharis salicifolia*)	N	FACW
	narrow-leaved willow (*Salix exigua*)	N	OBL
	western sycamore (*Platanus racemosa*)	N	FACW
Southern cottonwood-willow riparian forest	Fremont cottonwood or black cottonwood (*Populus fremontii*, or *P. balsamifera* ssp. *trichocarpa*	N	FACW
	red willow (*Salix laevigata*)	N	FACW
	mule fat (*Baccharis salicifolia*)	N	FACW
	arroyo willow (*Salix lasiolepis*)	N	FACW
	arrow weed (*Pluchea sericea*)	N	FACW
	wild grape (*Vitis girdiana*)	N	FACW
	blackberry (*Rubus ursinus*)	N	FACW
	California bay (*Umbellularia californica*)	N	FAC
	hoary nettle (*Urtica dioica* ssp. *holosericea*)	N	FACW
	mugwort (*Artemisia douglasiana*)	N	FACW
Arrow weed scrub	arrow weed (*Pluchea sericea*)	N	FACW

Table 2-1
List of Dominant Plant Species, Status as Native or Exotic, and Wetland Indicator Status by Community Type

Habitat Type	Plant Species	Native/ Introduced	Wetland Indicator Status*
	big saltbush (*Atriplex lentiformis*)	N	FAC
	mule fat (*Baccharis salicifolia*)	N	FACW
Alluvial scrub	scalebroom (*Lepidospartum squamatum*)	N	UPL
	big sagebrush (*Artemisia tridentata*)	N	UPL
	California buckwheat (*Eriogonum fasciculatum*)	N	UPL
	chaparral broom (*Baccharis sarathroides*)	N	FAC
	interior goldenbush (*Ericameria linearifolia*)	N	UPL
Big sagebrush scrub (Great Basin sage scrub)	big sagebrush (*Artemisia tridentata*)	N	UPL
	fourwing saltbush (*Atriplex canescens*)	N	FACU
	hairy yerba santa (*Eriodictyon trichocalyx*)	N	UPL
	Palmer's goldenbush (*Ericameria palmeri*)	N	UPL
	California buckwheat (*Eriogonum fasciculatum*)	N	UPL
Valley freshwater marsh	broad-leaved cattail (*Typha latifolia*)	N	OBL

Table 2-1
List of Dominant Plant Species, Status as Native or Exotic, and Wetland Indicator Status by Community Type

Habitat Type	Plant Species	Native/ Introduced	Wetland Indicator Status*
	bulrush (*Scirpus* sp.)	N	OBL
	sedge (*Carex* sp.)	N	FACW
	rush (*Juncus* sp.)	N	FACW
	yerba mansa (*Anemopsis californica*)	N	OBL
	dwarf and hoary nettle (*Urtica urens*; *U. dioica* ssp. *holosericea*)	I; N (respectively)	FACW
	cocklebur (*Xanthium strumarium*)	N	FAC
	celery (*Apium graveolens*)	I	FACW
Coastal sage scrub	California sagebrush (*Artemisia californica*)	N	UPL
	California buckwheat (*Eriogonum fasciculatum*)	N	UPL
	purple sage (*Salvia leucophylla*)	N	UPL
	black sage (*Salvia mellifera*)	N	UPL
	common encelia (*Encelia californica*)	N	UPL
	California broom (*Lotus scoparius*)	N	UPL
Chamise chaparral	chamise (*Adenostoma fasciculatum*)	N	UPL
Coast live oak woodland	coast live oak (*Quercus agrifolia*)	N	UPL
Disturbed areas	giant cane (*Arundo donax*)	I	FACW

Table 2-1
List of Dominant Plant Species, Status as Native or Exotic, and Wetland Indicator Status by Community Type

Habitat Type	Plant Species	Native/ Introduced	Wetland Indicator Status*
	castor bean (*Ricinus communis*)	I	FACU
	tamarisk (*Tamarix* sp.)	I	FACW
	tree tobacco (*Nicotiana glauca*)	I	FAC
	black mustard (*Brassica nigra*)	I	UPL
	Russian thistle (*Salsola tragus*)	I	UPL

*Wetland indicator status conforms to Reed 1988.

OBL (= Obligate wetland). Species occurs almost always (estimated probability >99%) under natural conditions in wetlands.

FACW (= Facultative wetland). Species usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in nonwetlands.

FAC (= Facultative). Species equally likely to occur in wetlands or nonwetlands (estimated probability 34%-66%).

UPL (= Obligate Upland). Species occur in wetlands in another region, but occur almost always (estimated probability 99%) under natural conditions in nonwetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the national list.

Table 2-2
Estimated Acreage of Riparian Habitat Types Along the Santa Clara River in Los Angeles and Ventura Counties

Habitat Type	Ventura County	Los Angeles County	Total
Beach	59.3	0	59.3
Southern foredune	43.4	0	43.4
Active channel	606.5	1,649.8	2,256.3
Alkali marsh	22.8	0	22.8
Freshwater marsh*	36.0	5.0	41.0
Alluvial scrub	818.7	584.4	1,403.1
Arrow weed scrub	4.0	12.3	16.3
Mule fat scrub	14.4	321.2	335.6
Southern willow scrub	756.3	187.5	943.8
Great basin sage scrub	0	57.1	57.1
Southern willow riparian woodland	690.5	248.5	939
Southern cottonwood/ willow riparian woodland	55.3	824.1	879.4
Giant cane**	965.9	(0)	965.9

*Freshwater marsh acreage includes freshwater marsh, disturbed freshwater marsh, and disturbed freshwater marsh/alkali marsh mapping units.

**These values refer to the presence of high-density, relatively large, nearly pure stands of giant cane on the river. The low value for Los Angeles County is not meant to indicate that giant cane is not present, but that relatively large, dense, stands of this species were not observed. Areas containing medium to low densities of giant cane in both counties are not reflected in these values; acreages for these categories are included in the particular riparian habitat where the species is a component.

floodplain. In other words, the limits of the 500-year floodplain were not provided on the base maps; therefore, areas outside of the immediate riparian corridor of the river could not be mapped consistently. The result was that acreage values for uplands and disturbed areas outside of the riparian corridor were highly underestimated and not comparable between counties.

Beach

The beach habitat at the mouth of the river is comprised of loose sand and supports little, if any, vegetation. The beach areas are subject to heavy use by humans for recreational purposes. Some areas of the beach habitat are subject to periodic tidal flooding. Coastal birds and insects can be found using the beach habitat.

Alkali Marsh

Adjacent to the mouth of the river beyond the foredune habitat, small pockets of alkali marsh have formed. These low-lying marsh areas pond water or are saturated during the wet season for long periods but are dry during the summer. Species that can be found in the alkali marsh areas include alkali heath (*Frankenia salina*), jaumea (*Jaumea carnosa*), pickleweed (*Salicornia virginica*), and salt grass (*Distichlis spicata*). The community structure is confined to the herb/subshrub layer, which provides habitat for coastal birds and insects. Small inclusions of southern willow scrub occur in less alkaline areas. The frequency of flooding of this habitat type is moderate to high (i.e., flooding occurs at least once every year or more).

Southern Foredune

Foredunes occur where accumulations of sand have built up large sand dunes towards the upland side of coastal beaches (Holland 1986). A sparse vegetation cover grows on the dunes, primarily the result of the dunes being subject to onshore winds, salt spray, and shifting sand. Plant species that occur on southern foredunes include sand verbena (*Abronia maritima*), beach-bur (*Ambrosia chamissonis*), beach evening-primrose (*Camissonia*

cheiranthifolia), salt grass, and sea rocket (*Cakile maritima*). Foredune habitats are used by coastal birds, small mammals, and insects.

Active Channel

The active channel habitat area denotes that portion of the riverbed that is periodically, but regularly, scoured by seasonal flood flows. Physical characteristics of the active channel include a low-flow channel that may meander within the active channel area, and sandbars that form during the deposition of alluvium as flood flows subside. The low-flow channel has little vegetation due to the swift-flowing water during much of the year. The gravel and sandbars adjacent to the low-flow channel may be colonized by narrow-leaved willow (*Salix exigua*), mule fat (*Baccharis salicifolia*), and young cottonwoods during the dry season; however, these plants often do not reach a significant height before the next flood event scours the area. More stabilized sandbars in the active channel may temporarily develop a willow scrub or mule fat scrub. Often the sandbars are easily colonized by the non-native giant cane (*Arundo donax*). The active channel is used by fish, amphibians, some reptiles, birds, insects, and mammals.

Mule Fat Scrub

Mule fat scrub is a riparian habitat dominated by mule fat shrubs (Holland 1986). Co-dominant plant species often include narrow-leaved willow, giant cane, and some tamarisk (*Tamarix* sp.). This habitat type can be found along the Santa Clara River within the active channel following floods, along the banks, and on the low floodplain terraces. Soils tend to be alluvium composed of sand or silt with varying degrees of cobbles and rocks. The flood frequency of the majority of the mule fat scrub areas on the river is moderate to high, depending on the topographic location. Mule fat scrub is an early stage of the successional development of riparian woodlands often maintained by moderate- to high-frequency disturbance (Warner and Hendrix 1984). Birds and insects use mule fat scrub habitat.

The plant community structure of mule fat scrub habitat is confined to the shrub layer. The shrub layer is typically between five and eight feet tall in mature stands of mule fat scrub;

however, habitat in areas of the active channel may not reach these heights between seasonal flood events. Overall vegetation cover is generally moderate (greater than 75 percent). This community type may have inclusions of willow scrub or alluvial scrub on portions of the floodplain of the river.

Southern Willow Scrub

Southern willow scrub habitat is characterized by dense, broadleaf, winter-deciduous riparian thickets that are dominated by several willow species (Holland 1986). These dense stands of willows often have poor understory development due to the thick vegetation cover. Often there are scattered emergent cottonwood or sycamore trees. This habitat type is best represented on alluvium deposited near stream channels where the substrate is composed of loose sand and fine gravel.

This riparian habitat type is dominated by willow shrubs and small trees, such as arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and narrow-leaved willow. Mule fat shrubs are often co-dominant with the willows. These willow scrub thickets often lack a well-developed understory. Disturbed areas of southern willow scrub are often colonized by the aggressive non-native giant cane. Southern willow scrub is found along the Santa Clara River on first and second terraces of the floodplain and along the banks of the low-flow channel where frequent flood disturbance prevents the community from developing into a riparian woodland. Soils types are alluvium composed of sand or silt that contain gravel, cobbles, or rocks. The flood frequency is considered to be moderate. Willow scrub is the middle stage of riparian woodland succession. This community type may have inclusions of freshwater marsh, alluvial scrub, mule fat scrub, or southern willow woodland.

The plant community structure (vertical stratification and cover) of southern willow scrub habitat is typically confined to two layers: shrub and tree. Young willow trees, and in some instances scattered individuals of Fremont cottonwood (*Populus fremontii*) and western sycamore (*Platanus racemosa*), form the highest layer of the vegetation. These trees may range from young saplings to small trees (6-20 feet). Occasionally, large tree specimens of willow or cottonwood (30 feet) occur in the habitat. Beneath the tree willow canopy is a

dense stand of shrubby willows and mule fat. The shrub layer is typically between 5 and 8 feet tall. Overall vegetation cover is generally high (greater than 90 percent).

Willow scrub provides habitat for a variety of small birds and foraging raptors. Nests and perch sites are available in this habitat type for birds and cover for small mammals.

Southern Willow Riparian Woodland

This habitat type represents a mature riparian habitat. Provided areas of southern willow scrub are protected from disturbances such as flood scour for a long enough period of time (15 to 20 years), then this habitat type eventually develops into a willow woodland. Southern willow riparian woodland habitat is characterized by a dense to open stand of broadleaf, winter-deciduous trees that are dominated by several willow species (Holland 1986). These stands of willows have an understory of shrubby willows and mule fat with a somewhat limited herbaceous layer. Often there are scattered emergent cottonwood or sycamore trees. This habitat type is best represented on the mid to outer fringe of the floodplain on alluvial soils. Disturbance from floods is less frequent than with southern willow scrub habitat; however, periodic flooding of the habitat is required to maintain the vegetation growth and allow for germination and establishment of riparian species.

The willow riparian woodland habitat on the Santa Clara River is dominated by mature trees of red willow and arroyo willow with scattered individuals of Fremont cottonwood and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). A shrub layer of mule fat, narrow-leaved willow, and shrubby arroyo willows occurs under the trees. Disturbed areas of riparian woodland often have giant cane as a major understory component. Habitat inclusions in this community type include freshwater marsh and southern willow scrub.

The plant community structure of southern willow riparian woodland habitat is typically contained in two to three layers: tree, shrub, herbaceous. Mature willow trees, and in some instances scattered mature individuals of Fremont cottonwood and western sycamore, form the highest layer of the vegetation. These trees may range from small to large trees (20-30 feet). Occasionally, large tree specimens of cottonwood occur in the habitat. Beneath the

tree canopy is a dense to open stand of shrubby willows and mule fat. The shrub layer is typically between 8 and 10 feet tall. Overall vegetation cover is generally high (greater than 90 percent).

Willow riparian woodland provides habitat for a variety of small birds and foraging raptors. Nests and perch sites are available in this habitat type for birds and cover for small mammals.

Southern Cottonwood-Willow Riparian Forest

Cottonwood/willow riparian forests represent a mature to old riparian habitat. Provided areas of southern willow woodland are protected from disturbances such as flood scour for a long enough period of time (greater than 20 years), then this habitat type eventually develops into a cottonwood/willow forest. Southern cottonwood/willow riparian forest habitat is characterized by a tall, open, broadleaf, winter-deciduous riparian forest dominated by cottonwoods and several tree willow species (Holland 1986). These forests have an understory of shrubby willows and mule fat with an herbaceous layer. This habitat type is best represented on the mid to outer floodplain on alluvial soils composed of sands or loams (Holland 1986). Disturbance from floods is less frequent than with southern willow scrub and woodland habitats; however, periodic flooding of the habitat is required to maintain the vegetation growth and allow for germination and establishment of the riparian species.

The cottonwood/willow riparian forest habitat on the Santa Clara River is dominated by mature trees of Fremont cottonwood with scattered individuals of black cottonwood. Mature red willow trees are often co-dominant with the cottonwoods. A shrub layer of mule fat, shrubby willows, and arrow weed (*Pluchea sericea*) occurs under the trees. Vines of wild grape (*Vitis girdiana*) may be found in some areas growing over the shrubs and lower tree branches. Other species of the understory can include blackberry (*Rubus ursinus*), California bay (*Umbellularia californica*), hoary nettle (*Urtica dioica* ssp. *holosericea*), and mugwort (*Artemisia douglasiana*). Disturbed areas of riparian forest often have giant cane as a major understory component. Alluvial scrub is sometimes a habitat inclusion in the cottonwood/ willow forest community on the Santa Clara River.

The plant community structure of southern cottonwood/willow riparian forest habitat can contain up to four layers: tree, shrub, herbaceous, and vine. Mature cottonwood and willow trees form the highest layer of the vegetation. These trees are large (30-40 feet) and old. Beneath the tree canopy is an open stand of shrubby willows, mule fat, and arrow weed reaching heights of 8 to 10 feet. Dense stands of hoary nettle and mugwort can occur in the moister areas of the understory along with blackberry. Wild grapevines may cover the shrubs and lower portions of the trees in some areas, forming an additional vertical layer within the understory. Overall vegetation cover is generally high (greater than 80 percent), but with more open areas than scrubs and woodlands.

Willow scrub provides habitat for a variety of small birds and foraging raptors. Nests and perch sites are available in this habitat type for birds and cover for small mammals.

Arrow Weed Scrub

This riparian shrub–dominated plant community is characterized by a nearly pure stand of arrow weed shrubs (Holland 1986). Big saltbush (*Atriplex lentiformis*) and mule fat shrubs can be co-dominants in more open stands, especially along road cuts. Wet areas where this habitat has developed may have some freshwater marsh species occurring with the arrow weed. This plant community is located on the upper Santa Clara River floodplain and terraces at the edges of woodlands, forests, and along portions of the manufactured slopes of Highway 126. The flood frequency is low.

The community structure of arrow weed scrub is confined to a shrub layer unless there are openings that allow the development of an herbaceous layer. The arrow weed shrubs can reach a height of 10 feet. This habitat type is similar in successional stage as mule fat scrub. Birds and insects are the primary users of this habitat type.

Alluvial Scrub

Alluvial scrub habitat is characterized by a mixture of shrubs that colonize alluvial materials within intermittent creeks, arroyos, and the drier terraces within large washes (Holland 1986). The plant species observed in this habitat type include scalebroom (*Lepidospartum*

squamatum), big sagebrush (*Artemisia tridentata*), California buckwheat (*Eriogonum fasciculatum*), chaparral broom (*Baccharis sarathroides*), and interior goldenbush (*Ericameria linearifolia*). Often an understory of grasses and herbs can be found between the widely scattered shrubs. This community type may have habitat inclusions of mule fat scrub or willow scrub.

The community structure of alluvial scrub is primarily in two layers, shrub and herb. A few blue elderberry trees (*Sambucus mexicana*) and young willows may be found as scattered individuals in the habitat in some areas. The component shrubs reach a height of about three to four feet, on average. Alluvial scrub habitat supports various birds, small mammals, insects, and reptiles.

Big Sagebrush Scrub

Big sagebrush scrub is a plant community that is dominated by soft-woody shrubs with bare ground underneath and between the shrubs (Holland 1986). The dominant species is big sagebrush. Other species associated with big sagebrush in this habitat are fourwing saltbush (*Atriplex canescens*), hairy yerba santa (*Eriodictyon trichocalyx*), Palmer's goldenbush (*Ericameria palmeri*), and California buckwheat. This habitat occurs on the drier floodplain terraces adjacent to the river, especially on the eastern portion of the river in Los Angeles County. Flood frequency of this habitat is low to moderate depending on the position of the particular terrace. The community structure is mainly in the shrub layer, which can range from one to six feet tall. The habitat plays a similar role as alluvial scrub, providing habitat for birds, reptiles, and rodents on the drier portions of the riparian system. This habitat type is used by birds, small mammals, insects, and reptiles.

Valley Freshwater Marsh and Ponds

Freshwater marsh is a type of wetland habitat that occurs in areas which are inundated or saturated for prolonged periods of time and supports plant species adapted to tolerate these wet conditions. These wet areas are typically dominated by broad-leaved cattail (*Typha latifolia*), species of bulrush (*Scirpus* sp.), species of sedge (*Carex* sp.), and species of rush

(*Juncus* sp.). Wet margins of these marshes may have species such as yerba mansa (*Anemopsis californica*), dwarf and hoary nettle (*Urtica urens*; *U. dioica* ssp. *holosericea*), cocklebur (*Xanthium strumarium*), and celery (*Apium graveolens*). Freshwater marsh is found in portions of the Santa Clara River channel in areas where water ponds and along small tributary streams/drainages or in depressions in the scrubs, woodlands, and forests of the floodplain terraces. Freshwater marsh can provide habitat for amphibians (e.g., frogs, toads), reptiles (e.g., garter snake, southwestern pond turtle), and birds (e.g., red-wing blackbirds, tricolored blackbirds, various migratory birds such as ducks) and can provide a site for drinking water by wildlife species.

Man-made ponds can be considered a type of freshwater marsh habitat when the banks of the pond are vegetated, for example, with cattails or bulrushes. Ponds associated with water treatment, mining, and agricultural activities (e.g., watercress production) occur along portions of the river floodplain and may or may not support freshwater marsh vegetation.

Upland Habitats

Nonriparian habitats that occur adjacent to portions of the Santa Clara River include uplands characterized as coastal sage scrub, chamise chaparral, coast live oak woodland, juniper woodland, and disturbed areas. These upland habitats can provide a buffer between the riparian system of the river and development. Upland habitats often provide habitat for species that use riparian areas but breed elsewhere or provide additional foraging area for riparian species along the ecotone.

Disturbed/Ruderal Areas

Disturbed uplands and portions of the floodplain adjacent to the river include areas that have been urbanized, mined, cultivated, or otherwise cleared of the native riparian or upland vegetation. Agricultural fields and orchards are common along the Santa Clara River in Ventura County and western Los Angeles County. Edges of agricultural fields and drains often have rows of ornamental species such as eucalyptus planted as wind blocks. Several sand mining operations occur along the river, mostly on the adjacent floodplain. The cities

of Oxnard, Ventura, Santa Paula, Fillmore, and Santa Clarita have urbanized up to the edge of the river in some locations. Disturbed areas are plotted on the color vegetation maps as the following categories: disturbed (i.e., man-caused disturbed areas such as mines, roads, clearings, etc.), giant cane, ornamental, and agriculture (note—not all agricultural areas outside of the immediate riparian corridor were plotted) (see Figures 2-1 to 2-28). One community type that had been heavily grazed was mapped as disturbed freshwater marsh and disturbed freshwater marsh/alkali marsh (see Figures 2-9 and 2-10, respectively).

Areas cleared of native vegetation that have been abandoned develop a suite of non-native weeds—species such as tree tobacco (*Nicotiana glauca*), black mustard (*Brassica nigra*), milk thistle (*Silybum marianum*), pin clover and white-stemmed filaree (*Erodium botrys; E. cicutarium,* respectively), and Russian thistle (*Salsola tragus*). Low areas near the river that have been disturbed may be colonized by giant cane, castor bean (*Ricinus communis*), and tamarisk. These areas provide little wildlife habitat values for the native species of the riparian system.

General Wildlife

A number of sources contributed to the consideration of wildlife use of the Santa Clara River for this report. The primary sources of information for the occurrence or potential for occurrence of sensitive wildlife species on the river were the California Natural Diversity Data Base (NDDB) (State of California 1995); the U.S. Fish and Wildlife Service, Ventura Field Office; and various reports, including information published in the *Federal Register.* In an effort to compile a more generalized list of wildlife species that occur or have the potential to occur along the Santa Clara River to provide basic information of potential wildlife use of the riparian system, the California Wildlife Habitat Relationships database was used.

The California Wildlife Habitat Relationships (WHR) database was used to generate lists of terrestrial vertebrates potentially found in the types of habitats that exist on the Santa Clara River (Timossi et al. 1991; Zeiner et al. 1988, 1990a, 1990b). The WHR habitat designations are broader than those used in the NDDB (State of California 1995); however, each

WHR habitat is cross-referenced to the habitat types encompassed by the NDDB. Lists of potentially occurring terrestrial vertebrates were generated for three WHR habitat types: Valley-Foothill Riparian, Freshwater Emergent, and Riverine (Attachment 1). The Valley-Foothill Riparian WHR habitat encompasses the following NDDB habitat types: southern riparian forest (i.e., cottonwood/willow riparian forest, willow riparian woodland) and southern riparian scrub (i.e., mule fat scrub, southern willow scrub, alluvial scrub, big sagebrush scrub). The Freshwater Emergent WHR habitat includes the coastal and valley freshwater marsh of the NDDB. The Riverine WHR habitat covers all of the open water, submerged, periodically flooded mud, gravel, and rock areas, and shoreline areas of river systems, but does not have a corresponding NDDB habitat type.

The three WHR habitat types chosen include, in a broad sense, all of the major riparian habitats that occur along the Santa Clara River. Therefore, the wildlife species lists that were generated represent species that have the potential to occur in these habitat types within the given geographical area (Ventura and Los Angeles Counties). Not every species on these lists may occur on the Santa Clara River. Some species may have occurred on this river historically but have not been observed in the area in the last decade. Thus, these wildlife species lists should be used only as a general guide of the number and types of species that could occur on the Santa Clara River.

Sensitive Species

Sensitive species as used in this report refers to those taxa of plant and animal that belong to one of the following categories: taxa listed as endangered or threatened by state or federal resource agencies; taxa that are considered candidates for listing by state or federal resource agencies; taxa considered rare by other local public and private resource agencies (e.g., California Native Plant Society). The following list of sensitive species was generated from plant and animal species lists provided by the USFWS for the Santa Clara River. In addition, a database search using the NDDB was conducted for the area of the Santa Clara River, and additional species were added to the list. Some species presented occur on the list of wildlife species generated from the WHR system for the vicinity of the Santa Clara River. Federal candidate rankings given below are currently being reevaluated; however, since the

revised ranking categories are not final, the most recent existing candidate status is reported. Distribution maps of potential habitat areas for each of the sensitive species that may occur in the riparian corridor are provided in a separate volume (Volume II: Potential Habitat for Sensitive Species - Santa Clara River Enhancement and Management Plan). Potential habitat distribution maps for some of the sensitive plant species discussed below were not provided since these species are expected to occur primarily in either upland habitats adjacent to the Santa Clara River or in areas outside of the mapped riparian corridor (i.e., side canyons or drainages).

Plants

Peirson's morning-glory (*Calystegia peirsonii*) is a federal Category 2 candidate species and is considered a List 4 species by California Native Plant Society (CNPS) (Skinner and Pavlik 1994). The USFWS conducted a status review of this species in 1993 in which they determined that federal listing was not warranted. The USFWS has recommended that Peirson's morning-glory be removed from federal candidate status when the next candidate list is published, due to the large numbers discovered during the past few years.

The reported distribution of Peirson's morning-glory is on rocky slopes at 1,000-1,500 m (approximately 3,000-4,500 feet) elevation in the northern San Gabriel Mountains and adjacent Mojave Desert (Hickman 1993). However, records reported to the NDDB (State of California 1995) in 1982 reported the species in San Francisquito Canyon at an elevation of 1,800 feet and in Bitter Canyon at 1,300 feet elevation.

This prostrate perennial herb occurs in chaparral, chenopod scrub, cismontane woodland, coastal sage scrub, and lower coniferous forest in Los Angeles County. It flowers from May to June. The species is threatened by grazing and habitat loss. Peirson's morning-glory has the potential for occurrence in the Santa Clara River valley in Los Angeles County in coastal sage scrub and chaparral habitats adjacent to the river that are above approximately 1,000 feet elevation. Thus, this species is not likely to occur within the 500-year floodplain of the river.

Nevin's barberry (*Berberis nevinii*) is a federal Category 1 candidate, is listed as endangered by the state of California, and is considered a List 1B species by CNPS (Skinner and Pavlik 1994). It is a perennial evergreen shrub with stiff branched stems and spine-tipped leaves. The flowering period for this shrub is from March to April. This species is typically found in sandy and gravelly places in chaparral, cismontane woodlands, coastal sage scrub, and riparian scrub habitats. Its known distribution includes locations in Los Angeles, Riverside, San Bernardino, and San Diego Counties. Two populations are known from San Francisquito Canyon near the Santa Clara River (State of California 1995). Many historical populations have been extirpated and remaining populations are threatened by development and road maintenance. Nevin's barberry has the potential for occurrence along the Santa Clara River in riparian scrub habitats, especially in Los Angeles County.

Slender-horned spineflower (*Dodecahema leptoceras*) is both a federal and state listed endangered species. It is also considered a List 1B species by CNPS (Skinner and Pavlik 1994). It is a prostrate annual herb with small white to pink flowers which appear from April through June. It is restricted to older, stable sandy river terraces and washes in Los Angeles, Riverside, and San Bernardino Counties in alluvial scrub and chaparral habitats (State of California 1992). Many former occurrences have been lost to urbanization and the remaining localities are currently threatened by development, flood control, off-road vehicle activity, and a proposed reservoir. Recorded locations of slender-horned spineflower near the Santa Clara River include an observation made in 1937 in Mint Canyon (not seen at this location since) and a 1993 observation of a large population in Bee Canyon Wash, north of Soledad Canyon Road and the Lang R.R. siding (State of California 1995). Potential habitat for this species along the Santa Clara River includes all undisturbed areas of alluvial scrub, especially in Los Angeles County.

Short-joint beavertail cactus (*Opuntia basilaris* var. *brachyclada*) is a Category 2 federal candidate species and is a List 1B species by CNPS (Skinner and Pavlik 1994). This stem succulent of the cactus family flowers from April to June. It occurs in the desert slopes of the San Gabriel and San Bernardino Mountains in chaparral, pinyon-juniper woodland, and desert plant communities. Occurrences for this species have been recorded in Quigley

Canyon east and north of Newhall (State of California 1995). The species is threatened by urbanization, mining, horticultural collecting, grazing, and vehicles. Short-jointed beavertail could occur along the slopes above the Santa Clara River in Los Angeles County towards the eastern end of the watershed. This species is not anticipated to be within the 500-year floodplain of the river.

Ventura marsh milkvetch (*Astragalus pycnostachyus* var. *lanosissimus*) is a federal Category 2 candidate species. It is a perennial plant that grows in clumps and has compound leaves that are white-woolly. The flowers are greenish white to cream-colored and the fruits are somewhat inflated, papery pods. The historic distribution of Ventura marsh milkvetch was coastal salt marshes and coastal seeps below 100 feet elevation from north coastal to central south coastal California. Threats to the species are primarily from habitat loss due to land use changes of the coastal areas. Ventura marsh milkvetch is believed to be extinct since the species has not been seen in recent times. It was observed in 1967 adjacent to Harbor Boulevard near the entrance of McGrath Beach State Park near the mouth of the Santa Clara River, but has not been observed here since due to loss of habitat (State of California 1995). Potential, but marginal, habitat for this species occurs in the alkali marsh areas near the mouth of the Santa Clara River in Ventura County, but the probability of the species being at this location is low.

Ojai fritillary (*Fritillaria ojaiensis*) is a federal Category 2 candidate species and a CNPS List 1B species. This member of the lily family (Liliaceae) grows from a bulb and the stem has whorled leaves. The nodding flowers are a dull greenish yellow with dark spots. Ojai fritillary occurs on rocky slopes and river basins at elevations ranging from 900 to 1,500 feet. Its range extends from the outer ranges of the south coastal region of California (San Luis Obispo and Santa Barbara Counties) to the western transverse range in Ventura County. Occurrences in Ventura County for this species tend to be in more upland habitats at higher elevations in the adjacent coastal mountains.

Salt marsh bird's beak (*Cordylanthus maritimus* ssp. *maritimus*) is a federal and state listed endangered species. It once had a range that was widespread in coastal marshes from Morro Bay (San Luis Obispo County), south to San Diego County and northern Baja California,

Mexico. Presently, the species is restricted to scattered sites in fewer than 10 remnant salt marshes with half of the original occurrences now extirpated. Populations in California can be found at the Tijuana marsh and Sweetwater marsh in San Diego County; Upper Newport Bay and possibly Anaheim Bay in Orange County; Ormond Beach and Mugu Lagoon in Ventura County; Carpinteria marsh in Santa Barbara County; and Morro Bay in San Luis Obispo County.

Salt marsh bird's beak is a many-branched, low-growing perennial with white to cream-colored flowers tinged with purple. It grows in the higher reaches of salt marshes where inundation with salt water occurs only at the higher tides. Primary factors in the decline of the species are the loss or modification of coastal salt marshes, the restricted habitat of the species, and poor dispersal mechanisms. Marginal habitat for this species occurs near the mouth of the Santa Clara River in the alkali marsh areas that have inclusions of salt marsh species; however, the likelihood of salt marsh bird's beak actually occurring here is low.

Wildlife

Fish

Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*) is listed as an endangered species by both the state of California and the federal government. This small freshwater fish is usually less than three inches in length and has three sharp spines on the back in front of the dorsal fin (Moyle 1976). It lacks lateral bony plates, which is a weak distinguishing character from another more common subspecies of threespine stickleback found in southern California (*Gasterosteus aculeatus microcephalus*), the latter having lateral plates on the anterior portion of the body.

The unarmored threespine stickleback is a quiet water fish occurring in weedy pools and backwaters or among emergent plants along the edges of streams where the water stays below 23-24 degrees Centigrade. They prefer bottoms of sand or mud. Except during breeding, they tend to form loose schools. This stickleback feeds primarily on bottom

organisms or organisms living on aquatic plants (Moyle 1976). They are visual feeders and thus are not found in turbid waters.

The small size and shallow-water habits of sticklebacks make them ideal prey for avian predators (e.g., kingfishers and herons). Larger fish species may also prey on sticklebacks when present. Other predators can include the African clawed frog and belostomatid beetles (Bautista, pers. com. 1996).

The USFWS listed the species as endangered in 1970 and critical habitat was proposed in 1980. Critical habitat for the unarmored threespine stickleback has not been finalized to date. Three zones were proposed for critical habitat along the Santa Clara River drainage system: San Francisquito, Soledad Canyon, and Del Valle zones. The San Francisquito zone is located in a canyon bearing the same name for an 8.4-mile stretch of river from the Angeles National Forest boundary to Clearwater Canyon. This area is several miles north and east of the Newhall Ranch property. The Soledad Canyon zone is an 8.5-mile stretch of the Santa Clara River from the community of Lang, east to its confluence with Arrastre Canyon. The Del Valle zone is located along a 5.6-mile stretch of the Santa Clara River from its confluence with San Martinez Grande Canyon east to I-5. This zone encompasses a portion of the Santa Clara River on the Newhall Ranch property.

Historically, it is believed that the unarmored threespine stickleback occurred in the Santa Clara River, Los Angeles River, San Gabriel River, and Santa Ana River drainages (Haglund 1989). The once abundant Los Angeles Basin populations appear to have been extirpated by the mid-1940s. The unarmored threespine stickleback is now restricted to the upper Santa Clara River, above the confluence with Piru Creek. Recent recorded sightings of this species are from the following locations: Santa Clara River from junction of San Martinez Grande Canyon east to Interstate 5; in San Francisquito Creek from its confluence to approximately 10 kilometers upstream; and the downstream portion of the Santa Clara River from McBean Parkway through the proposed Del Valle critical habitat area (State of California 1995). In addition, the species has been observed on the easternmost segment of the river in Aliso Canyon (Bautista, pers. com. 1996). The species is threatened by stream channelization, urbanization, agricultural development, water diversions, groundwater pumping, introduction

of predators and competitors, off-highway vehicle use, and chemical (oil) spills (State of California 1992). Potential unarmored threespine stickleback habitat occurs along the Santa Clara River from east of the confluence of the river with Piru Creek, east to the Los Angeles aqueduct crossing upstream from Bouquet Canyon Road in appropriate portions of the low-flow channel.

Arroyo chub (*Gila orcuttii*) is a federal Category 2 candidate species and a California Department of Fish and Game (CDFG) species of special concern. It is native to the Santa Clara River drainage. Habitat includes sand- and mud-bottomed flowing pools and runs of headwaters, creeks, and small to medium rivers. It occasionally can be found in intermittent streams (Page and Burr 1991). This species grows to 16 inches in length. Arroyo chub are threatened by loss of habitat and changes in water quality. Potential habitat for the arroyo chub occurs along the length of the Santa Clara River in the low-flow channel east into Soledad Canyon.

Santa Ana sucker (*Catostomus santaanae*) is a federal Category 2 candidate species and a CDFG species of special concern. It occurs only in the Santa Clara, Los Angeles, San Gabriel, and Santa Ana River systems. It is believed that the population in the Santa Clara River is the result of the species being introduced (Moyle 1976). This sucker species prefers clear, cool, rocky, and gravelly streams where it feeds on algae, diatoms, detritus, and small insect larvae. Spawning takes place from early April to early July.

Occurrences of the Santa Ana sucker on the Santa Clara River contained in the NDDB are from Santa Paula east to San Francisquito Canyon and on Sespe and Piru Creeks (State of California 1995). This species has also been observed near the Soledad Campground (Bautista, pers. com. 1996). Loss of habitat is a major threat to the species and changes in water quality could be a threat (e.g., oil spills). Potential habitat for the species exists in the appropriate locations of the low-flow channel on the Santa Clara River from Santa Paula east to Acton.

Southern steelhead trout (*Oncorhynchus mykiss iridius*) are anadromous fish, traveling from sea to freshwater parent streams to spawn. Spawning occurs in fall/winter in the

headwaters of coastal streams with gravel bottoms, along the California coast south of San Francisco Bay. Water depth in spawning areas is typically at least 14 inches deep, while water depth in streams during adult migration must be around 7 inches (McEwan and Jackson 1994). Water velocities greater than 10 feet per second can inhibit migration to spawning areas that have gravel-sized material and the proper water temperature (i.e., 39 to 52 degrees Fahrenheit) (McEwan and Jackson 1994). Other factors affecting the migration of the southern steelhead trout include the timing of the flows, seasonal variations in flows, and the extent of continuous aquatic habitat along the Santa Clara River. The young remain in fresh water for two to three years, then move to sea for two to three years until they reach sexual maturity. Adults that survive spawning and the migration return to the same stream the following year to spawn again (Eschmeyer 1983).

Southern steelhead trout ranged in the past from south of San Francisco Bay to the Santo Domingo River in northern Baja California, Mexico. The furthest south this species is found spawning today is Malibu Creek in Los Angeles County. Southern steelhead trout are the most threatened of all of California's steelhead populations. The National Marine Fisheries Service is currently evaluating the status of steelhead trout in California. This review will determine which populations of steelhead meet evolutionary significant unit criteria for federal listing as threatened or endangered.

Major threats to southern steelhead trout are from urbanization, disturbances to the watershed, blocked access to headwater spawning and rearing areas, river mining, and dewatering of streams by water diversions and groundwater pumping (McEwan and Jackson 1994; Chubb 1996). Potential habitat for the southern steelhead trout on the Santa Clara River is from the river mouth east to Piru Creek, including Santa Paula and Sespe Creeks; however, steelhead have not been observed east of Sespe Creek in recent times. The capture of adult and juvenile steelhead trout in traps at Freeman Diversion Dam and the preliminary analysis of information gained from these fish show that steelhead spawn in the Santa Clara River watershed, that they are genetically pure, and that because of the quality of the habitat in Sespe Creek, the creek contributes significantly to the steelhead population found within the river (Cardenas, pers. com. 1996).

Tidewater goby (*Eucyclogius newberryi*) is a federal endangered species and a CDFG species of special concern. This species occurs along the coast of California where they are benthic, being restricted mostly to small coastal lagoons and near stream mouths in the uppermost brackish portions of larger bays (Lee 1980). Major threats to the species involve the degradation and loss of habitat due to urbanization and may include changes in water quality.

Spawning occurs April to June in water 15.5-18.3° C. The male digs the nest burrow vertically, 100-200 mm into sand in water 25-40 cm deep. Eggs are laid in this burrow and are guarded until hatched. Gobies eat small crustaceans, insects, and mollusks gleaned from the substrate (Lee 1980).

Tidewater gobies were sighted in 1984 in the Santa Clara River, from the mouth to 3.0 miles upstream, between Ventura and Oxnard (State of California 1995). This area coincides with the potential habitat present on the river for this species.

Insects

Sandy beach tiger beetle (*Cicindela hirticollis gravida*) is a federal Category 2 candidate for listing. Tiger beetles are common to areas with clean, dry, light-colored sand and occur in bright sunlight in open sandy areas, on sandy beaches, and on open paths or lanes. Their dexterity and strong mandibles make them well fitted for their predaceous habitats (Borror and White 1970). Loss of habitat is the major threat to this species. A documented sighting of sandy beach tiger beetles was recorded at McGrath Beach State Park, just south of the Santa Clara River mouth, on May 22, 1970 (State of California 1995). The southern foredune habitat near the mouth of the river and all areas of alluvial scrub habitat with appropriate soils on the Santa Clara River have the potential to support sandy beach tiger beetle.

Birds

Western least bittern (*Ixobrychus exilis hesperis*) is a federal Category 2 candidate for listing and a California species of special concern. In California, least bitterns are common

summer residents (April to September) and migrate to Mexico for the winter. However, part of the population in southern California (including Ventura County) is considered to be nonmigratory. Least bitterns nest in dense emergent wetland vegetation of cattails and tules. This extremely secretive species constructs its nests of dried and living plants, low in tules or cattails, usually above water which is 0.3 m deep. Bitterns forage by standing motionless in shallow water, then quickly strike at prey, in water or on emergent vegetation (Zeiner et al. 1990a). Loss of wetland habitat is a major threat to this species. Potential habitat for the western least bittern occurs along the Santa Clara River in the alkali marsh areas near the mouth of the river and in freshwater marsh areas of the floodplain.

Western snowy plover (*Charadrius alexandrinus nivosus*) is a California species of special concern and was listed a federal threatened species in the spring of 1993. In southern California, the western snowy plover is a common winter migrant and localized breeding resident of mud flats, sand flats, and sandy marine and estuarine shores (Zeiner et al. 1990a). Western snowy plovers build their nests in shallow depressions in sand lined with small pieces of shell. Plovers rely on camouflage for cover and frequently rest near or under objects such as driftwood or rocks. They feed almost exclusively on insects and crustaceans gleaned from the sand surface. Snowy plovers are sensitive to disturbance, threatened by the loss of habitat due to development, beach recreational activities by humans, off-road vehicles, and horses (Zeiner et al. 1990a).

Documented sightings of western snowy plover in the vicinity have been recorded at Ormond Beach, approximately 1.5 miles southwest of Port Hueneme, McGrath Beach State Park, Point Mugu, and the Santa Clara River mouth (State of California 1995). Potential habitat for this species is located on the beach and southern foredune areas near the mouth of the Santa Clara River.

California least tern (*Sterna antillarum browni*) is listed as a California and federal endangered species. Least terns nest in colonies along the California coast from San Francisco Bay south to central Baja California, Mexico. This migratory species is active in California primarily from mid-April through mid-September. Its wintering grounds are not known but are suspected to be in southern Mexico and Central America (State of California

1980). Historically, these birds have nested on the barrier sand dunes at river mouths and lagoon entrances. Nesting colonies tend to be well dispersed to reduce chances of discovery and predation. Nests are usually just scraped depressions in the sand located usually on sandy areas or mud flats with sparse vegetation (Unitt 1984).

Loss of wetland habitat and coastal development caused the significant decline in the overall tern population that led to its being listed as an endangered species. With increased human disturbance, urbanization, and habitat loss, least terns have become fairly opportunistic in nest site selection. These birds have been found nesting on artificial islands and other areas created by construction activities (e.g., dredged sand and construction pads). This tendency to be flexible in nest site selection aids in managing this species, since new nest sites can often be created to mitigate for the loss of previous sites.

Nest predation has been a major problem for many least tern colonies in California, and it appears that southern California colonies were especially hard-hit in 1989. Predation also strongly influences the use or disuse of previously used least tern nest colony sites. There is strong evidence to suggest that repeated predation on a particular nesting location will cause terns to abandon that site in subsequent years. After being absent for several years from one of these sites, terns will often return and have good breeding success. Therefore, just because a historical breeding site is not occupied for several years does not mean it will not be used in the future.

Documented sightings of California least terns have been recorded for the Santa Clara River mouth and Ormond Beach north of Southern California Edison Co. (State of California 1995). Potential habitat for this species occurs at the mouth of the Santa Clara River.

Elegant tern (*Sterna elegans*) is a federal Category 2 candidate for listing and a California species of special concern. During the 1950s, numbers of this population increased, and large flocks can now be seen in most years off the southern California coast. The elegant tern begins to arrive in California, from the breeding grounds in Mexico, in June; by October the population returns to Mexico for the winter (Zeiner et al. 1990a).

Preferred habitats of this species are inshore coastal waters, bays, estuaries, and harbors. They feed in shallow ocean water by diving into the water for fish and may also forage in protected bays and lagoons. When not feeding, terns will congregate on tidal flats and high up on beaches. Nests are typically a shallow scrape in sand about 18 meters from the surf line (Zeiner et al. 1990a). Threats to this species include the loss or degradation of coastal wetlands and impacts to breeding grounds in Mexico. Potential habitat for this species can be found near the mouth of the river.

Long-billed curlew (*Numenius americanus*) is a federal Category 2 candidate for listing and a California species of special concern. This species is a common winter migrant to the coast of California from early July to early April. Preferred winter (nonbreeding) habitats include large coastal estuaries, salt marshes, tidal flats, upland herbaceous areas, and croplands. On estuaries feeding is concentrated at intertidal mud flats, and during high tide, salt ponds are utilized for roosting. Nests are usually located in relatively flat areas with grass cover 10-20 cm high usually adjacent to lakes or marshes. Curlews use their long bills to probe deep into the mud substrate of estuaries and marshes in search of invertebrate prey (Zeiner et al. 1990a). Threats to this species include the loss or degradation of coastal wetlands and nesting grounds in upland short grass prairies and wet meadows. Potential habitat for this species can be found near the mouth of the river.

White-faced ibis (*Plegadis chihi*) is a federal Category 2 candidate for listing and a California species of special concern. The white-faced ibis is an uncommon summer resident in sections of southern California, but no longer breeds regularly anywhere in California probably due to the destruction of marshes required for nesting (Zeiner et al. 1990a). A southward migration is suggested for this species in the winter. It prefers to feed in fresh emergent wetland vegetation, shallow lacustrine waters, and the muddy ground of wet meadows and irrigated or flooded pastures and croplands. The ibis forages by probing its long bill deep into mud searching for miscellaneous invertebrates. Nests are constructed of dead tules or cattails built amidst tall marsh plants in extensive marshes (Zeiner et al. 1990a). Loss or degradation of wetlands is the major threat to this species. Potential habitat for this species can be found near the mouth of the river.

Bank swallow (*Riparia riparia*) is a California threatened species. It arrives in California from south America in early April and stays until September (State of California 1992). In summer, the bank swallow occurs primarily in riparian areas with vertical cliffs and banks with fine-textured or sandy soil, into which it digs nesting holes. Approximately 75 percent of the current breeding population in California is concentrated along banks of Central Valley streams (State of California 1992). This species forages by hawking insects over open riparian areas during long, gliding flights. They use holes dug in cliffs and river banks for cover. Burrows are constructed 2.5 to 5.5 cm wide and up to 140 cm deep with a small chamber located at the end of the burrow which contains the nest, lined with grasses and other plant material (Zeiner et al. 1990a). Loss of nesting habitat due to flood control projects and increased human activity are the major threats to the species (State of California 1992). Historical sightings of the bank swallow were made in 1926 at Santa Paula, along the Santa Clara River, and at the Santa Clara River estuary in 1976 (State of California 1995). Since bank swallows utilize cliffs for nesting, any such areas found in upland habitats adjacent to the river may be used.

Belding's savannah sparrow (*Ammodramus sandwichensis beldingi*) is a federal Category 2 candidate species and a California state listed endangered species. This resident subspecies is restricted to the coastal marshes from Santa Barbara County to northern Baja California, Mexico (State of California 1992). It typically builds its nests low to the ground under a pickleweed canopy (Unitt 1984). They prefer to build their nests in the upper littoral zone (areas flooded only by high spring tides or storm tides).

The Belding's savannah sparrow forages in the marsh they nest in and also in nearby mud flats, beaches, rocks, and low tide coastal strand vegetation. Savannah sparrows are threatened with extinction because of extensive loss of salt marsh habitat, human disturbance, and degradation of marsh habitat (State of California 1992).

A documented sighting of the Belding's savannah sparrow was recorded at McGrath Beach State Park, at the north edge of the beach on the south side of the Santa Clara River mouth; and at Ormond Beach, one mile southeast of Port Hueneme (State of California 1995). The

alkali marsh areas near the river mouth are potential habitat for this species on the Santa Clara River.

Least Bell's vireo (*Vireo bellii pusillus*) is a small, olive-gray bird with pale buffy yellow sides, light underparts, an indistinct white eye-ring, and narrow wing bars . Four subspecies of Bell's vireo exist in North America, but only least Bell's vireo occurs in coastal California. This subspecies breeds in California and northern Baja California, Mexico, and winters in southern Baja California, Mexico.

The least Bell's vireo arrives in southern California in late March to early April to begin breeding activities. The male birds tend to arrive several days before the female birds to set up breeding territories. Nesting territories are established in riparian habitat, usually in dense willow-dominated thickets. Detailed analyses of nesting habitat indicate that these vireos are found most frequently in riparian vegetation with significant tree cover in conjunction with a well-developed shrub understory. Common understory shrubs and young trees include narrow-leaved willow, mule fat, young arroyo willow, and young black willow. Although vireos forage primarily in riparian habitat, they sometimes expand their forage range to include adjacent upland habitats (RECON 1990b).

The least Bell's vireo has declined in numbers due to the loss of riparian habitat and increased cowbird parasitism. Riparian habitat has decreased dramatically in California over the past century. It has been estimated that in the Central Valley alone, the principal portion of the historic range of the species, more than 90 percent of the riparian woodland habitat that existed in the period before settlement has been cleared for development (Katibah 1984). A similar story could be told about riparian woodlands in other parts of the least Bell's vireos' historic range. In 1980, the least Bell's vireo was listed as an endangered species by the state of California, and it was added to the federal Endangered Species List in 1986. Critical habitat for the species has been designated in the following 10 areas: portions of the Santa Ynez River in Santa Barbara County; portions of the Santa Clara River in Los Angeles and Ventura Counties; portions of the Santa Ana River in Riverside and San Bernardino Counties; and portions of Coyote Creek, Santa Margarita River, San Luis Rey River, San

Diego River, Sweetwater River, Jamul-Dulzura Creeks, and Tijuana River in San Diego County.

Nest parasitism by the brown-headed cowbird has also had a strong negative impact upon vireo populations. Cowbird populations in southern California have increased dramatically in close correspondence to agriculture and livestock activities. Because intense parasitism from cowbirds on vireos is a relatively new phenomenon, beginning in the early twentieth century, least Bell's vireos have not yet adapted physical or behavioral defenses to it. Parasitism intensity is directly related to the proximity of dairies and stables, where cowbird populations are higher, to the riparian habitat. The development of these agricultural activities adjacent to riparian habitat has increased to a level higher than before the start of the twentieth century.

The least Bell's vireo populations have been expanding within its breeding range over the last five years. Observations of nesting vireos have increased not only along the major rivers where there were populations before, but nesting activities have also increased along some of the major tributaries of these rivers. Ongoing recovery programs involving regulatory protection of riparian habitat, habitat creation and enhancement projects, and brown-headed cowbird trapping programs within major southern California drainages have resulted in a significant increase in the region's least Bell's vireo population (USFWS 1995a).

Recorded occurrences of the least Bell's vireo on the Santa Clara River stretch from Saticoy east to Santa Clarita. Sightings of vireos have been reported recently (since 1988) in the following locations: northeast of Saticoy; near State Route 150 and State Route 101; upstream of Santa Paula near duck ponds; southwest of Santa Paula; near Fillmore; upstream from Piru; near the town of Cavin; near the Los Angeles and Ventura county lines on Newhall Ranch; near State Route 126 and Interstate 5; near Castaic Junction; and near McBean Parkway (Guthrie 1992, 1995; State of California 1995). Potential habitat for the least Bell's vireo occurs in these and other areas of the Santa Clara River in locations that support southern willow scrub and southern willow riparian woodland.

Southwestern willow flycatcher (*Empidonax trailii extimus*) was listed as a California state endangered species in 1988 and a federal endangered species in February 1995 (USFWS 1995b). The bird is a small (approximately 15 centimeters), grayish green–backed species that has a whitish throat, light olive gray breast, pale yellowish belly, and two wing bars. It is one of four subspecies of willow flycatcher most commonly recognized in North America. This willow flycatcher is migratory and a summer resident in the North American southwest. The breeding range of this species includes southern California, Arizona, New Mexico, extreme southern portions of Nevada and Utah, and western Texas. It likely winters in Mexico, Central America, and northern South America.

The southwestern willow flycatcher occurs in riparian habitats along rivers, streams, or other wetlands where stands of willows, mule fat, arrow weed, tamarisk, or other riparian plants are present, often with an overstory of cottonwood. It is an insectivorous bird that nests in dense stands of trees and shrubs approximately 4 to 7 m above the ground near surface water. The nest is a small cup of plant material about 4.5 cm in diameter and 3.8 cm deep.

The decline in the populations of southwestern willow flycatcher has resulted from the loss or degradation of riparian habitats throughout the range of the species. Habitat loss has resulted from many activities including urban and agricultural development, water diversion and impoundment, channelization, livestock grazing, and hydrological changes resulting from these and other land use changes. Of these factors, overuse of riparian areas by livestock is a major factor in the loss and degradation of habitat. Cattle affect riparian communities through negative effects on plant community structure, decreases in plant species composition, decreases in relative abundance of plant species, reductions in plant density, and reductions in plant diversity.

The invasion of riparian areas by non-native plants also alters the community structure and species composition. Cattle grazing can increase non-native plant invasion by eliminating the palatable broadleaf plants like willow and cottonwood saplings while allowing the unpalatable exotics to increase in density. Vegetation clearing and other disturbances of riparian areas also contribute to the spread of non-native plants.

Other factors affecting the abundance of southwestern willow flycatcher include the loss of wintering grounds to tropical deforestation and increases in brood parasitism by the brown-headed cowbird. Decreases in the amount of wintering habitat reduce populations by decreasing survivorship of adult birds which can be part of the next breeding season. Parasitism by brown-headed cowbirds has deleterious effects on the number of fledglings produced in a given breeding season.

No recorded instances of breeding by the southwestern willow flycatcher have been documented along the Santa Clara River. Potential breeding habitat for the species occurs on the Santa Clara River in the mature willow woodlands and cottonwood/willow riparian forests, particularly in Los Angeles County. It appears that although habitat suitable for breeding occurs along this portion of the river, the southwestern willow flycatcher populations have not expanded into this portion of its breeding range.

Yellow warbler (*Dendroica petechia brewsteri*) is a CDFG species of special concern found over much of the North American continent. They require riparian woodland for breeding but utilize a wide variety of trees during migration. In addition to loss of riparian habitat, this bird has experienced declines due to brood parasitism by brown-headed cowbirds. Potential habitat for the yellow warbler occurs in any of the riparian woodlands or scrubs on the Santa Clara River.

Yellow-breasted chat (*Icteria virens*) is a CDFG species of special concern. It can be found throughout most of the continental U.S. and Mexico. It is present in southern California during the spring and summer. Dense riparian woodlands in the coastal lowlands are its only breeding sites. Destruction of riparian woodlands by human activities and development have caused population declines. It is possible that cowbird parasitism may also have contributed to the decline of the species. Potential habitat for the yellow-breasted chat occurs in any of the riparian woodlands or scrubs on the Santa Clara River.

Loggerhead shrike (*Lanius ludovicianus*) is a CDFG species of special concern. It ranges over most of the continental U.S. and Mexico and is a resident species in southern California. It inhabits grasslands, agriculture, chaparral, and desert scrub; it is absent only from the

mountainous zones. Population declines due to urbanization have been noted. Loggerhead shrikes feed on small reptiles and insects, which they often impale on sticks or thorns before eating. Potential habitat for the loggerhead shrike occurs in any of the riparian woodlands or scrubs on the Santa Clara River. This species may also forage in adjacent upland habitats.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a California endangered species. A 1977 survey located this species in the Sacramento Valley, Kern River, Owens Valley, Amargosa River, Lower Colorado River, Santa Clara River, and Santa Ana River. It is restricted to dense riparian woodland during breeding. Loss of habitat has caused population declines in the species (State of California 1992). The NDDB has historical records of this species on the Santa Clara River at the following locations: near the mouth of the Santa Clara River in 1920; on the river near Montalvo in 1942; on the river near Santa Paula in 1977; and on the river east of Piru in 1979 (State of California 1995). Although an extremely rare bird in southern California, potential habitat for the western yellow-billed cuckoo exists along the Santa Clara River in Ventura and Los Angeles Counties in areas of mature southern willow woodland and cottonwood/willow riparian forest.

White-tailed kite (*Elanus caeruleus*) is a California fully protected species. It ranges over coastal California eastward to parts of the Caribbean gulf coast (Zeiner et al. 1990a). Locally, it nests in riparian woodlands, particularly those comprised of live oaks and sycamores, and forages over open areas and grasslands, where it feeds primarily on small rodents. Loss of nesting and foraging habitats to agriculture and urbanization have reduced population numbers. The white-tailed kite has the potential for occurrence in riparian habitats along the length of the Santa Clara River.

Cooper's hawk (*Accipiter cooperii*) is a CDFG species of special concern. It is a common migrant and rare summer resident in southern California. It breeds in oak woodland habitats and southern cottonwood-willow riparian woodland and can forage in the adjacent upland areas. Food items include small mammals, reptiles, and amphibians. Human disturbance, urban, and agricultural development are thought to be leading to loss of the hawk's riparian

woodland breeding habitat. The Cooper's hawk has the potential for occurrence in riparian habitats along the length of the Santa Clara River.

Northern harrier (*Circus cyaneus*) is a California species of special concern. It is distributed throughout North America (Robbins et al. 1983), in prairie, slough, wet meadow, and marsh habitats (Ehrlich et al. 1988). Like an owl, the harrier uses its round, sound-reflecting facial ruff to locate prey by sound. It can be seen flying within seven feet of the ground as it hunts over grassland, agricultural fields, and coastal and freshwater marshes (Ehrlich et al. 1988). Harriers build flimsy nests on the ground or in thick low-growing vegetation. Habitat loss, particularly wet meadow and marsh, has resulted in declines in this species. The northern harrier has the potential for occurrence in riparian habitats along the length of the Santa Clara River where the terrain is flat and open.

Sharp-shinned hawk (*Accipiter striatus*) is a California species of special concern. It inhabits most of North America, in woodlands, parks, and residential areas. Breeding takes place in mountainous coniferous/deciduous forests, with nests usually within 90 meters of water (Zeiner et al. 1990a). The proportion of birds in the sharp-shinned hawk's diet is the greatest of any of the hawks; they only rarely take small mammals, reptiles, and the like (Ehrlich et al. 1988). Breeding occurs April through August. Loss of riparian and other woodland habitats are factors affecting this species. There is a moderate potential for this species to occur in the riparian woodlands of the Santa Clara River. This species can use the adjacent upland areas for foraging.

Reptiles and Amphibians

San Diego horned lizard (*Phrynosoma coronatum blainvillii*) is a federal Category 2 candidate for listing and is a CDFG species of special concern. This species ranges from coastal southern California to the desert foothills and into Baja California (Jennings and Hayes 1994). It is often associated with coastal sage scrub, annual grassland, chaparral, oak woodland, and riparian woodlands, especially areas of level to gently sloping ground with well-drained loose or sandy soil. This animal avoids dense vegetation, preferring 20 to 40 percent bare ground coverage (Sherbrooke 1981).

Populations along the coast and inland have been severely reduced by loss of habitat; populations in the coast mountain ranges seem stable (Jennings and Hayes 1994). Collecting pressure (for pets and for the curio trade) has been especially great for this species. Where it can be found, the San Diego horned lizard can be locally abundant, with densities near 20 adults per acre (Sherbrooke 1981). They are largely dependent upon ant colonies for their prey. Adults are active from late March to late August; young are active from August to November or December. The San Diego horned lizard has the potential for occurrence along the Santa Clara River and adjacent uplands in areas that support the following habitat types: coastal sage scrub, alluvial scrub, southern willow woodland, cottonwood/willow riparian forest.

Two-striped garter snake (*Thamnophis hammondii hammondii*) is a federal Category 2 candidate for listing. It occurs from Monterey County south to Rio Rosario in Baja California. Highly aquatic, this species is most commonly found in or near permanent water (Stebbins 1985). It can occasionally be found in small and intermittent streams with rocky beds, in coastal sage scrub, and in grassland habitats (Jennings and Hayes 1994). Tree frogs are the primary prey item of this species. Threats to this species include the loss or degradation of wetlands and riparian habitat. The two-striped garter snake has the potential for occurrence along the Santa Clara River in nearly all areas of freshwater marsh, mule fat scrub, southern willow scrub and woodland, and cottonwood/willow riparian forest. This species may also use small-mammal burrows in adjacent upland areas for overwintering (Jennings and Hayes 1994).

South coast garter snake (*Thamnophis sirtalis* sp.) is a California endemic species that is known from only a few localities in southern California, including the Santa Clara River Valley in Ventura County south to the vicinity of San Pasqual (Jennings and Hayes 1994). Until the taxonomy of the subspecies is described, the south coast garter snake does not have an official state or federal status. This snake appears to be restricted to freshwater marsh and upland habitats near permanent water that have good cover of riparian vegetation (Jennings and Hayes 1994). Loss of habitat to agriculture, urbanization, and flood control projects, in addition to introduced aquatic predators, threatens this species. Habitat for the south coast

garter snake occurs along the Santa Clara River from the coast to the Ventura/Los Angeles County line.

Southwestern pond turtle (*Clemmys marmorata pallida*) is a federal Category 2 candidate species and a CDFG species of special concern. In California, it occurs uncommonly in and west of the coastal ranges, from San Francisco Bay to Baja California, and also in the Mojave River (Jennings and Hayes 1994). Habitat typically consists of ponds, small lakes, reservoirs, and slow-moving streams, where it may be seen basking on logs or mud banks. It has been reported in brackish and sea water and is frequently associated with areas having abundant aquatic vegetation. Southwestern pond turtles need an upland area in which to nest and, in general, may travel about 200 meters (or as much as 400 meters) from the aquatic habitat (Jennings and Hayes 1994). Threats to the species include collection and loss of riparian and adjacent upland habitat. This species has known records of occurrence in both Ventura and Los Angeles Counties (State of California 1995). Potential habitat for southwestern pond turtle occurs along the length of the Santa Clara River in appropriate portions of the low-flow channel, adjacent freshwater marsh areas, and man-made ponds within the floodplain of the river (e.g., watercress ponds, duck ponds).

Silvery legless lizard (*Anniella pulchra pulchra* [=*A. nigra argentea*]) is a federal Category 2 candidate species and a California species of special concern. This subspecies has a spotty distribution from near Antioch (Contra Costa County) south into Baja California, primarily west of and including the Coast Ranges, San Bernardino and San Gabriel Mountains, and Laguna Mountains (Jennings and Hayes 1994). It occupies herbaceous layers with loose soil in coastal scrub, chaparral, and open riparian habitats. Bush lupine (*Lupinus longifolius*) is a good indicator of appropriate habitat. Sand of washes and beach dunes are preferred for burrowing, and logs and leaf litter are used for cover and feeding. Primarily nocturnal and fossorial, the silvery legless lizard is susceptible to drying and must be in or near moist soil (Jennings and Hayes 1994). The use of pesticides on agricultural fields has decimated some populations of this lizard. The silvery legless lizard has the potential for occurrence in the following areas of the Santa Clara River: near the mouth of the river in the southern foredune

habitat and in all alluvial scrub and cottonwood/willow forest areas along the length of the river.

Coast patch-nosed snake (*Salvadora hexalepis virgultea*) is a federal Category 2 candidate for listing and is a California species of special concern. The coast patch-nosed snake ranges from the Carrizo Plain (San Luis Obispo County) south to Baja California (Jennings and Hayes 1994). It inhabits grasslands, chaparral, sage scrub, and sandy and rocky areas on the lower slopes of mountains. The patch-nosed snake has a single, white vertebral stripe and a conspicuously upturned rostral scale. It is a very active, diurnal snake. Habitat loss is the major threat to this species. Potential habitat for this species occurs in all alluvial scrub and coastal sage scrub habitats on the river east of Santa Paula and in similar coastal sage and chaparral habitats in upland areas adjacent to the river.

Arroyo toad (*Bufo microscaphus californicus*) was listed as an endangered species by the USFWS on January 17, 1995 (USFWS 1994a), and is a CDFG species of special concern. This species is restricted to the coastal slope of southern California and northern Baja California, Mexico, except for one small, isolated population in the Mojave River. Southern California populations are known to occur on the Sisquoc River, Santa Ynez River, and Mono and Indian creeks in Santa Barbara County; Sespe Creek, lower Piru Creek, and Agua Blanca Creek in Ventura County; upper Piru Creek and Big Tujunga Canyon in Los Angeles County; and additional drainages in San Bernardino and San Diego Counties (Sweet 1992; USFWS 1993a).

The arroyo toad averages 5 to 8 cm in length and has a greenish gray or tan coloration. It is restricted to rivers with shallow, gravelly pools adjacent to sandy terraces. Eggs are deposited in shallow pools with sand or pea gravel substrate overlain with flocculent silt. These pools have minimal current and little or no emergent vegetation. Juveniles and adults forage for insects on sandy terraces with nearly complete coverage of cottonwoods, oaks, and willows (USFWS 1994a). Adults are nocturnal except during the breeding season (March-July).

Because of historical and present agricultural activities along the Santa Clara River (e.g., crop production and grazing), most of the habitat characteristics used by this species have been lost south of the river in Ventura County (USFWS 1993a). In Los Angeles County, high terraces vegetated with cottonwoods and willows remain along portions of the Santa Clara River providing habitat for adult toads.

Recent surveys were conducted on Sespe Creek and Piru Creek in 1991 (Sweet 1992). The Sespe Creek population of arroyo toads is the largest known within the current range. The mouth of this creek is near Fillmore. The Piru Creek population is confined to two areas: from the vicinity of Blue Point Campground upstream to Piru Gorge and between Pyramid Lake and Bear Gulch upstream from the former. Construction and operation of Santa Felicia Dam and Pyramid Lake has resulted in the survival of arroyo toads only above the headwaters of each impoundment. Piru Creek enters the Santa Clara River at the town of Piru. Potential habitat for arroyo toad occurs on the Santa Clara River in Sespe and Piru Creeks, the active channel and riparian woodlands/forest from the Los Angeles County line east to Interstate 5, and the active channel and riparian woodlands/forest from the mouth of Soledad Canyon east to Acton.

California red-legged frog (*Rana aurora draytonii*) has been proposed for federal listing as an endangered species and is a CDFG species of special concern. This frog was formerly found from Humboldt County southward to Baja California Norte, including the Sierra Nevada Mountains up to 8,000 feet. It has now been extirpated from the entire Central Valley region and the foothills of the Sierra Nevada. Only four known populations remain south of the Tehachapi Mountains, compared to over 100 historical locality records in southern California (USFWS 1993b).

The preferred habitat of this species is characterized by a dense growth of shrubby riparian vegetation associated with deep still or slow-moving water (Hayes and Jennings 1988, Jennings and Hayes 1994). Vegetation is commonly composed of arroyo willows, but cattails and bulrushes can also provide habitat. Water at least 0.7 m deep must be available.

The red-legged frog was the original source of frog legs during the late 1800s and early 1900s, and this was the initial cause of the red-legged frog's decline (Jennings and Hayes 1994). Commercial harvests of 50,000-125,000 frogs per year were recorded between 1880 and 1900 (Jennings 1988). Further declines of the species throughout its range can be attributed to disturbance of riverbed substrates, disturbances to emergent and shoreline vegetation, competition from bullfrogs, and predation by introduced fishes.

Habitat for the red-legged frog along the Santa Clara is scarce due to the hydrogeo-morphological characteristics of the river. The vegetation in the active channel, where low flows are present, is periodically scoured by floods. This reduces the necessary cover around pools needed by the frog. A few small freshwater marsh areas on the floodplain may serve as potential habitat for the species, but the likelihood of this species occurring in these ponds is low. Potential habitat for the red-legged frog can also be found in the reach of the river in Soledad Canyon and east of Acton in Los Angeles County.

Mammals

Mountain lion (*Felis concolor*) is a California fully protected species. The species is widespread but uncommon throughout the state except areas that do not support mule deer populations such as the drier deserts (Zeiner et al. 1990b). Mountain lions can occur in many habitat types but seem to prefer riparian areas and brushlands. Mule deer are their primary food source, although other small mammals are eaten (e.g., skunk, rabbit, rodents). Mountain lions are mostly nocturnal. They can have home ranges between 40 km^2 to 250 km^2 and move seasonally in response to prey movements (Zeiner et al. 1990b). Habitat fragmentation is the major threat to this species, resulting in restrictions in movement and increased likelihood of contact with humans. Although mountain lions could occur anywhere on the Santa Clara River, the potential for occurrence is higher in the eastern portion of the river in areas of sparse development. Mountain lions have a high potential for occurrence in the national forest lands and other undeveloped upland areas adjacent to the river valley.

Townsend's big-eared bat (*Plecotus townsendii*) is a CDFG species of special concern. It is found uncommonly throughout the state of California in many habitats, being most abundant in mesic habitats (Zeiner et al. 1990b). Insects are the principal food of this bat, especially moths. Townsend's big-eared bats roost in caves, mines, tunnels, and buildings. The species is extremely sensitive to disturbance of the roost sites and the availability of roosting areas is the greatest limiting factor for this bat (Zeiner et al. 1990b). Townsend's big-eared bats have the potential to occur along the Santa Clara River, foraging near the riparian woodlands.

Western mastiff bat (*Eumops perotis*) is a CDFG species of special concern. It is an uncommon resident in southeastern San Joaquin Valley and Coast Ranges from Monterey County southward through southern California, from the coast eastward to the Colorado Desert (Zeiner et al. 1990b). This insectivorous bat roosts in crevices in cliff faces, high buildings, trees, and tunnels. Availability of roost sites appears to be a limiting factor of this species. The western mastiff bat has the potential for occurrence on the Santa Clara River, where it may forage near the riparian woodlands and roost in the rock outcrops and cliff faces in adjacent upland areas.

Habitat Distribution

The distribution of the riparian habitat types along the Santa Clara River in the 500-year floodplain was mapped using 1 inch = 400 feet topographic maps of the river for Ventura and western Los Angeles Counties and 1 inch = 1,000 feet topography in Los Angeles County east of Interstate 5. In addition, 1993 color aerial photographs and limited field reconnaissance conducted in 1995 aided in the final mapping. Field surveys were conducted in March and April, 1995. Locations on the river that allow public access and those locations where permission had been given by private landowners were visited and the vegetation mapped (minimum mapping unit was approximately 0.5 acre) using the classification scheme of Holland (1986). Locations on the river where access was not possible were mapped by interpretation of aerial photos in comparison to similar adjacent mapped areas. The distribution of vegetation on the stretch of the Santa Clara River under

the ownership of the Newhall Land and Farming Company (roughly from Torrey Road bridge in Ventura County east to Interstate 5 in Los Angeles County) was provided for use in this study by the landowner. The habitat mapping on this portion of the river was based on 1 inch = 400 feet orthophotographs of the river and field reconnaissance.

Boundaries on the vegetation maps were determined from interpretation of the aerial photo with the digital information or topographic features on the map with that observed in the field. Vegetation types were determined by the dominant plant species observed in an area in comparison to community descriptions found in Holland (1986). All mapped information was digitized and put in a geographic information system for data management and production of graphics.

Ventura County

Habitat mapping on the Santa Clara River in Ventura County was done on 1 inch = 400 feet scale topographic maps. Color aerial photographs taken in June (western Ventura County) and July (eastern Ventura County) of 1993 were used to verify the boundaries of vegetation units and aid in identification of vegetation on inaccessible areas of the river.

The major riparian habitats that occur along the Santa Clara River in Ventura County include coastal habitats at the mouth of the river (i.e., beach, southern foredune, alkali marsh), riparian scrubs and woodlands (i.e., mule fat scrub, alluvial scrub, southern willow scrub, southern willow riparian woodland), disturbed riparian habitat composed of primarily giant cane, and young successional vegetation growing in the active channel on sand and gravel bars. The general distribution of each of these major riparian types is described below and shown on Figures 2-1 through 2-19.

Coastal Habitats

The beach, southern foredune, and alkali marsh habitats are confined to the mouth of the river. Beach habitat lies north and south of the river mouth at the interface between the land and Pacific Ocean. The southern foredunes form a barrier, primarily south of the river mouth, between the beach and the inland habitats. Alkali marsh areas to the north and south

of the river mouth have formed in areas that are inundated during floods and have saline/alkaline soils.

Riparian Scrubs and Woodlands

Mule fat scrub, willow scrub, and willow riparian woodlands are found along the Santa Clara River in Ventura County in four main sections of the river. The first section is dominated by willow woodlands and scrubs from just upstream of the Highway 101 bridge west to the river mouth. The second segment is located to the west of Santa Paula to just east of the treatment ponds (on the south side of the river). The third location is from the Santa Paula Airport east to the river's confluence with Sespe Creek. The habitat patches of riparian scrub and woodland vary in size and quality along these sections. The fourth area of the river is characterized by large habitat patches of alluvial scrub. These alluvial scrub areas are primarily located from just downstream of the river confluence with Sespe Creek east to Newhall Ranch.

Young Successional (Active Channel)

Portions of the active channel of the Santa Clara River in Ventura County scour significantly each year during seasonal high flows and thus support little or no vegetation. Other portions of the active channel are conducive to the formation of sand and gravel bars that temporarily become colonized by young mule fat and willows. These vegetated bars occasionally reach maturity, but more often grow for a season or two before being scoured clean by flood-waters. Active channel habitat can be found in one form or another the entire length of the river in varying widths.

The aquatic habitat portion of the active channel is also an important resource of the Santa Clara River in Ventura County as it relates to aquatic wildlife species. The qualities of aquatic habitat, including substrates, riffle/pool frequencies, cover, emergent vegetation, and shading, are all characteristics that are affected by the dynamic hydrologic conditions of the river system. Seasonal and year-to-year fluctuations in the volume and velocities of the flows in the Santa Clara River can alter the distribution of the aquatic habitat of the active

channel and, thus, affect the distribution of organisms associated with this habitat type, particularly fish and aquatic plant species.

Giant Cane

Small to moderate patches (one to five acres, respectively) of giant cane can be found scattered along the Santa Clara River from the river mouth east to Santa Paula. Several relatively large stands of giant cane (greater than five acres) occur in the vicinity of Santa Paula east to just west of Torrey Road. The density of the giant cane in these patches ranges from very high densities (i.e., pure stand of giant cane) to moderate densities (i.e., a mixture of mostly giant cane with some inclusions of riparian scrub or woodland) to low densities (i.e., some giant cane within primarily native riparian habitat). High-, moderate-, and low-density patches of giant cane were categorized and the distribution of these patches are shown on Figures 2-28 through 2-54.

Los Angeles County

Vegetation mapping in Los Angeles County west of Interstate 5 was provided by the Newhall Land and Farming Company from data digitized from 1 inch = 400 feet orthophoto maps. East of Interstate 5, the vegetation was mapped on 1 inch = 1,000 feet topographic maps. Color aerial photos taken in April (western Los Angeles County) and July (eastern Los Angeles County) of 1993 and limited field reconnaissance aided in mapping the vegetation boundaries. The major riparian habitats on the Santa Clara River in Los Angeles County fall in to three main types: riparian scrubs and woodlands, riparian forests, and young successional vegetation of the active channel. The distribution of these habitat types on the Los Angeles County portion of the river are shown on Figures 2-19 through 2-28.

Riparian Scrubs and Woodlands

The distribution of the riparian scrubs and woodlands (i.e., mule fat scrub, southern willow scrub, southern willow riparian woodland, alluvial scrub) in Los Angeles County start at the county line and continue into the headwaters of the river to the east. Willow scrubs,

woodlands, and mule fat scrub habitats are most prominent from the county line east to the Los Angeles aqueduct crossing of the river upstream from Bouquet Canyon Road. Alluvial scrub occurs in small patches scattered along the banks of the river from Interstate 5 east to Soledad Canyon. Larger patches of alluvial scrub occur in Agua Dulce Canyon and its confluence with the river, the confluence of Soledad, Mattox, and Mill Canyons, and at Acton.

Riparian Forest

The distribution of riparian forest (i.e., cottonwood willow riparian forest) on the Santa Clara River in Los Angeles County occurs as scattered patches of habitat of varying size and quality. Several patches of riparian forest occur from the county line through Newhall Ranch, then east of Interstate 5 to near the Los Angeles aqueduct crossing of the river upstream from Bouquet Canyon Road. Narrow stands of riparian forest also occur in Soledad Canyon east to just downstream of Acton. The upper reach of the Santa Clara River upstream from Acton has a narrow band of riparian forest growing along the river.

Young Successional (Active Channel)

Portions of the active channel of the Santa Clara River in Los Angeles County scour significantly each year during seasonal high flows and thus support little or no vegetation. Some of these areas are subject to sand and gravel mining. Other portions of the active channel are conducive to the formation of sand and gravel bars that temporarily become colonized by young mule fat and willows. These vegetated bars occasionally reach maturity, but more often grow for a season or two before being scoured clean by floodwaters. Active channel habitat can be found in one form or another the entire length of the river in varying widths.

Potential Habitat for Sensitive Species

The sensitive species that occur or have the potential for occurrence on the Santa Clara River were discussed above. A general habitat analysis was conducted to graphically depict areas of riparian habitat along the river that have the potential to support any of the sensitive species mentioned earlier. The analysis involved reviewing the known habitat requirements of each species and then relating those requirements to similar riparian habitats on the Santa Clara River. This analysis provides a broad perspective of the potential for these sensitive species to occur on particular stretches of the river. However, the results of the habitat analysis should not be interpreted to mean that a particular species currently occupies all habitat areas chosen, but that habitat areas chosen have the potential to support a particular species given the dynamics of species populations and the river ecosystem over time.

Riparian habitat types on the Santa Clara River were associated with a particular species based on existing information on habitat requirements for the species in relation to known locations for the species in the region as reported in the NDDB (Table 2-3). All listed species and plant species were addressed separately. Other sensitive species that had a broad overlap in habitat requirements (i.e., hawks, nonlisted birds of riparian habitats) were lumped into more general categories such as birds of prey and riparian birds. The distribution of the potential habitat areas for each of the species or categories are given in a separate volume (Volume II: Potential Habitat for Sensitive Species- Santa Clara River Enhancement and Management Plan). This information was used later on in the prioritization of habitat values used in the design of the river system to be ultimately managed.

Table 2-3
Summary of Habitat Requirements for Sensitive Species and Habitat Types Occurring on the Santa Clara River

Species	Habitat Requirements	Potential Habitat Occurring on the Santa Clara River
Insects		
Sandy beach tiger beetle	clean, dry, light-colored sand; occur in bright sunlight in open sandy areas on sandy beaches and on open paths or lanes	southern foredune, alluvial scrub
Fish		
Tidewater goby	benthic, restricted mostly to small coastal lagoons and near stream mouths in the uppermost brackish portions of larger bays	active channel near mouth of river
Southern steelhead trout	Salt water; spawning occurs in fall/winter in the head-waters of freshwater coastal streams with gravel bottoms	active channel from mouth of river to Piru Creek (including Sespe and Santa Paula creeks)
Arroyo chub	sand- and mud-bottomed flowing pools and runs of headwaters, creeks, and small to medium rivers. It occa-sionally can be found in intermittent streams	active channel from mouth of river to Los Angeles County aqueduct crossing
Unarmored threespine stickleback	weedy pools and backwaters or among emergent plants along the edges of streams where the water stays below 23-24 degrees Centigrade; prefer bottoms of sand or mud	active channel from east of the confluence of Piru Creek and the Santa Clara River to Los Angeles County aqueduct crossing
Santa Ana sucker	clear, cool, rocky, and gravely streams	active channel from Santa Paula east to Acton

Table 2-3
Summary of Habitat Requirements for Sensitive Species and Habitat Types Occurring on the Santa Clara River

Species	Habitat Requirements	Potential Habitat Occurring on the Santa Clara River
Amphibians and Reptiles		
Arroyo toad	restricted to rivers with shallow, gravelly pools adjacent to sandy terraces	active channel in Sespe and Piru creeks; active channel and riparian woodlands and forests from LA county line east to I-5; active channel and riparian woodlands and forests from mouth of Soledad Canyon to Acton
California red-legged frog	intermittent cold water streams, especially those with dense cover of cattails, rushes, and willows providing shade over a large portion of the water's surface; Water at least 0.7 m deep must be available	freshwater marsh; active channel and riparian scrubs, woodlands, and forests from mouth of Soledad Canyon east to Acton
Southwestern pond turtle	ponds, small lakes, reservoirs, and slow-moving streams, where it may be seen basking on logs or mud banks	active channel, freshwater marsh, and in man-made ponds (e.g., water cress ponds, duck ponds) within the floodplain of the river
Silvery legless lizard	herbaceous layers with loose soil in coastal scrub, chaparral, and open riparian habitats; sand of washes and beach dunes are preferred for burrowing, and logs and leaf litter are used for cover and feeding	southern foredune, alluvial scrub, cottonwood/willow forest

Table 2-3
Summary of Habitat Requirements for Sensitive Species and Habitat Types Occurring on the Santa Clara River

Species	Habitat Requirements	Potential Habitat Occurring on the Santa Clara River
San Diego horned lizard	associated with coastal sage scrub and riparian woodlands, especially areas of level to gently sloping ground with well-drained, loose or sandy soil	alluvial scrub, coastal sage scrub, riparian woodlands and forests
Two-striped garter snake	Highly aquatic; most commonly found in or near permanent water; occasionally found in small and intermittent streams with rocky beds	riparian scrubs, woodlands, forests; freshwater marsh
Coast patch-nosed snake	inhabits grasslands, chaparral, sage scrub, and sandy and rocky areas on the lower slopes of mountains	alluvial scrub and coastal sage scrub from Santa Paula Creek east to Acton
Riparian Birds		
Least Bell's vireo	riparian habitat, usually in dense willow-dominated thickets	mule fat scrub, willow scrub, willow riparian woodlands from near river mouth to Bouquet Canyon Road
Southwestern willow flycatcher	riparian habitats along rivers, streams, or other wetlands where stands of willows, mule fat, arrow weed, tamarisk, or other riparian plants are present; often with an overstory of cottonwood	willow riparian woodland, cottonwood/willow riparian forest
Western yellow-billed cuckoo	restricted to dense riparian woodland during breeding	willow riparian woodland, cottonwood/willow riparian forest

Table 2-3
Summary of Habitat Requirements for Sensitive Species and Habitat Types Occurring on the Santa Clara River

Species	Habitat Requirements	Potential Habitat Occurring on the Santa Clara River
Yellow warbler	require riparian woodland for breeding, but utilize a wide variety of trees during migration	riparian scrubs, woodlands, and forests
Loggerhead shrike	inhabits grasslands, agriculture, chaparral, and desert scrub	riparian scrubs, woodlands, and forests
Yellow-breasted chat	dense riparian woodlands in the coastal lowlands	riparian scrubs, woodlands, and forests
Birds of Prey		
Sharp-shinned hawk	woodlands, parks, and residential areas	riparian scrubs, woodlands, and forests
Cooper's hawk	breeds in oak woodland habitats and southern cottonwood-willow riparian woodland	riparian scrubs, woodlands, and forests
Northern harrier	prairie, slough, wet meadow, and marsh habitats; hunts over grassland, agricultural fields, and coastal and freshwater marshes	riparian scrubs, woodlands, and forests up to mouth of Soledad Canyon
White-tailed kite	nests in riparian woodlands, particularly those comprised of live oaks and sycamores, and forage over open areas and grasslands	riparian scrubs, woodlands, and forests

Table 2-3
Summary of Habitat Requirements for Sensitive Species and Habitat Types Occurring on the Santa Clara River

Species	Habitat Requirements	Potential Habitat Occurring on the Santa Clara River
Coastal Birds		
Western snowy plover	mud flats, sand flats, and sandy marine and estuarine shores	beach, southern foredune
California least tern	barrier sand dunes at river mouths and lagoon entrances; nests are usually scraped depressions on sandy areas or mud flats with sparse vegetation	beach, southern foredune, alkali marsh, active channel areas near the river mouth
Belding's savannah sparrow	mud flats, beaches, rocks, and low tide coastal strand vegetation; nests low to the ground under a pickleweed canopy; build their nests in the upper littoral zone	alkali marsh near mouth of river
Western least bittern	nest in dense emergent wetland vegetation of cattails and tules	alkali marsh, freshwater marsh
Long-billed curlew	large coastal estuaries, salt marshes, tidal flats, upland herbaceous areas, and croplands	active channel near river mouth
Elegant tern	inshore coastal waters, bays, estuaries, and harbors	beach, southern foredune, alkali marsh, active channel areas near the river mouth

Table 2-3
Summary of Habitat Requirements for Sensitive Species and Habitat Types Occurring on the Santa Clara River

Species	Habitat Requirements	Potential Habitat Occurring on the Santa Clara River
White-faced ibis	fresh emergent wetland vegetation, shallow lacustrine waters, and the muddy ground of wet meadows and irrigated, or flooded pastures and croplands	alkali marsh, active channel near river mouth
Bank swallow	riparian areas with vertical cliffs and banks with fine-textured or sandy soil	vertical banks; cliffs adjacent to the river
Mammals		
Mountain lion	riparian and brushland habitats	riverwide, except areas of urban development
Townsend's big-eared bat	mesic habitats; roost in caves, mines, tunnels, and buildings	may forage in riparian woodlands and scrubs along entire river
Western mastiff bat	riparian and brushland habitats; roosts in crevices in cliff faces, high buildings, trees, and tunnels	may forage in riparian woodlands and scrubs along entire river
Plants		
Salt marsh bird's beak	higher reaches of salt marshes where inundation with salt water occurs only at the higher tides	alkali marsh near mouth of river
Ventura marsh milkvetch	coastal salt marshes and coastal seeps below 100 feet elevation	alkali marsh near mouth of river

Table 2-3
Summary of Habitat Requirements for Sensitive Species and Habitat Types Occurring on the Santa Clara River

Species	Habitat Requirements	Potential Habitat Occurring on the Santa Clara River
Slender-horned spineflower	sandy alluvium in coastal sage scrub and chaparral	alluvial scrub from Santa Paula east to Soledad Canyon
Nevin's barberry	sandy and gravelly places in chaparral, cismontane woodlands, coastal sage scrub, and riparian scrub	alluvial scrub from Santa Paula east to Bouquet Canyon Road
Short-jointed beavertail	desert slopes of the San Gabriel and San Bernardino Mountains in chaparral, pinyon-juniper woodland, and desert plant communities	uplands adjacent to the upper reaches of the river in Los Angeles County
Peirson's morning-glory	chaparral, chenopod scrub, cismontane woodland, coastal sage scrub, and lower coniferous forest	uplands adjacent to the river
Ojai fritillary	rocky slopes and river basins at elevations ranging from 900 to 1,500 feet	uplands adjacent to the river in Ventura County

Section 3

Institutional and Regulatory Setting

The laws and regulations that affect riparian habitat generally do not protect the entire riparian ecosystem (Faber et al. 1989). Federal and state laws have overlapping jurisdictions and may or may not include all riparian habitat at a particular location. Local governments and independent districts may also have plans and ordinances aimed at the protection of riparian areas. Each of these categories of regulators (federal, state, and local) are discussed below.

Federal Laws

Clean Water Act. Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers (USACE) to regulate the discharge of dredge or fill material into designated waters of the United States, including adjacent wetlands. Permits to deposit fill fall under two main categories, nationwide permits and individual permits. The jurisdictional limits of the USACE often do not include large portions of riparian habitat that occur on broad, flat floodplains. Other sections of the Clean Water Act regulate various aspects related to water quality (Section 303c, Water Quality Standards; Section 401, State Water Quality Certification) and the discharge of pollutants (Section 301/402, National Pollutant Discharge Elimination System [NPDES] and permits).

Fish and Wildlife Coordination Act. This act assures that consultation with the U.S. Fish and Wildlife Service occurs between federal agencies and the California Department of Fish and Game when "waters of any stream or other body of water are proposed to be controlled or modified." The USFWS also provides advice to the USACE on its regulatory role.

Federal Endangered Species Act of 1973, as amended. In the context of riparian habitats, this act allows the USFWS jurisdictional authority over areas supporting or having the

potential to support federal endangered or threatened species through consultation under Section 7 or the preparation of a habitat conservation plan under Section 10(a). Riparian areas may be affected by the designation of critical habitat, although riparian habitat does not necessarily have to be designated critical habitat to be considered important by the USFWS.

Two recent draft policy changes issued by the U.S. Department of the Interior can affect the interpretation of the federal Endangered Species Act. The first proposed policy is referred to as the "Safe Harbor" policy. The "Safe Harbor" policy was issued by the regional offices of the USFWS to clarify procedures for Section 7 consultations on agreements between the USFWS and private landowners who, in cooperation with the USFWS, create, restore, or manage their lands to benefit threatened, endangered, and other animal or plant species. A second policy, issued in July 1995, would, if finalized, modify the way candidate species are defined under the Endangered Species Act. Candidate species (formerly all Category 1 candidates) under the proposed policy would be those taxa for which the USFWS has sufficient information to support the publication of a proposal to list. Category 2 candidate species would be referred to as "species of concern" under the new policy. Both of these policies have not been finalized, to date, and therefore may be subject to modification.

Small Watershed Protection and Flood Prevention Act. This act authorizes the Secretary of Agriculture to direct the Soil Conservation Service to conduct soil conservation and flood control projects in areas not exceeding 250,000 acres and for reservoirs storing not more than 25,000 acre-feet of water.

Federal Flood Disaster Prevention Act. This act set up the Federal Flood Insurance Program providing some incentives for construction outside of flood-prone areas. This has reduced impacts to riparian habitat by development in a limited way. In a related effort, two executive orders were issued by President Carter that directed federal agencies in the following: EO11988 directs federal agencies to avoid construction of projects in flood-hazard areas and to provide restoration and preservation of the natural and beneficial values

of floodplains; and EO11990 directs federal agencies to minimize the loss or degradation of wetlands.

National Environmental Policy Act. The act sets general goals of environmental protection for federal agencies and requires the preparation of environmental impact statements for federally financed projects. The environmental document contains a description of the resources, describes the project alternatives analysis, identifies impacts and significance, provides mitigation measures to reduce impacts, and provides an avenue for public review. Riparian habitats affected by federal projects would be addressed in the environmental documents.

Coastal Zone Management (CZM) Act Reauthorization Act 1990. The original CZM Act and its subsequent reauthorization states the national policy to preserve, protect, develop, and restore or enhance the resources of the nation's coastal zone. Coordination and cooperation with a state coastal zone management plan is set forth. The CZM Act established mandates to regulate the management of coastal development, public access, and redevelopment of degraded coastal features; and to encourage the preparation of special area management plans and the protection of biological resources from nonpoint sources of pollution.

California State Laws

Doctrine of Public Trust. This doctrine provides an important philosophical, historic, and legal base for governmental regulations to protect tidal and submerged lands and navigable waterways. The doctrine can be used to require the reservation of in-stream flows necessary to support fish, wildlife, and habitat.

California Environmental Quality Act. CEQA provides mandates to protect the environmental quality of California. The act requires the evaluation of changes in land uses

by local lead agencies. This process typically involves the preparation of environmental documents that evaluate alternatives, identify resource issues and significant impacts to these resources, provide mitigation measures to reduce the significance of impacts, and provide for public review. Riparian systems are considered significant resources under CEQA guidelines, but the guidelines often do not provide the protection needed for preservation.

Resource Conservation Act. This law provides for a state–local cooperative process that could advance the use of "best management practices" for soils and streams management.

Surface Mining and Reclamation Act. This act requires the State Mining and Geology Board to adopt state policy for the reclamation of mined lands. Buffers and protection of water resources and riparian habitats are required under the act.

California Water Code (Section 1243). This section of the code declares that the enhancement and protection of fish and wildlife is a beneficial use of water and that the State Water Resources Control Board (SWRCB) shall take the amount of water needed for fish and wildlife and recreation uses into account when determining the amount of water available for appropriation. It requires the SWRCB to consult with CDFG regarding the amount of water needed to preserve and enhance fish and wildlife resources when considering an application to appropriate water.

Davis-Dolwig Act (Water Code, Sections 11900-11925). This act funds the mitigation of adverse impacts from water project development and requires direct planning efforts to protect resources as part of project design. Explicit state policies requiring projects to avoid or minimize impacts on waterways are set forth in this act.

Porter-Cologne Water Quality Control Act. The state's primary water law, this act gives the SWRCB and the nine Regional Water Quality Control Boards (RWQCBs) substantial authority to regulate water quality. All permits issued under Section 404 of the federal Clean

Water Act require certification by the SWRCB or RWQCB as stated under Section 401 of the act. The RWQCBs designate beneficial uses of rivers and establish water quality objectives to protect those uses. The RWQCBs are also responsible for issuing waste discharge requirements and NPDES permits for discharges to water bodies.

California Water Code (Sections 8125-8127). This section gives the counties authority to improve (for flood control purposes) nonnavigable streams.

Stream Alteration Controls (Water Code, Sections 5650, 5653, 5901, 5931, 5937, 5948, 6100, 1505, 1601-1606). While the protection of in-stream resources are governed by the CDFG under pertinent sections of the Fish and Game Code (Section 5650 regulates the discharge of pollutants into waters; Section 5653 regulates the use of suction dredges; Section 5901 prevents construction of any device or contrivance that may prevent fish from passing up- or downstream; Section 5931 requires owners of dams to provide fishways; Section 5937 requires the owner of a dam to provide sufficient water for fish below the dam; Section 5948 regulates the accumulation of debris such as log jams that may impede the movement of fish; Section 6100 requires the installation of screens on diversions that may affect salmon and steelhead; Section 1505 regulates alterations of fish spawning areas; and Sections 1601-1606 regulates alterations of streambeds in general), riparian habitat outside of the stream or overflow areas is often not covered under these regulations. However, the outer edge of riparian vegetation can be used as the transitional boundary between riparian areas and upland habitats under certain circumstances. The 1601-1603 agreements do not have the status of state approval under law but provide for a negotiation and agreement process.

Significant Natural Areas (Fish and Game Code, Chapter 12, Sections 1930-1933). These sections of the code acknowledge the need to protect the diverse ecological and geological characteristics of the state of California. The mandates require the identification of California's most significant natural areas and coordinate conservation efforts between federal, state, local, and private interests. The following areas of the Santa Clara watershed

have been identified as significant natural areas: LAX-082 Soledad Canyon; LAX-077 Hasley Canyon; VEN-011 & 012 Santa Clara River; VEN-014 Sespe Creek; and VEN-042 Piru.

Floodplain Management. The state has legislative authority to construct flood control projects but little authority to establish regulations limiting development in floodways and flood-risk areas.

Coastal Zone Management - The Coastal Act. One of the most effective wetland and stream protection policies can be found in the Coastal Act of 1976, particularly in Public Resources Code, Section 30231, which stipulates the protection of biological productivity and water quality of coastal waters, streams, wetlands, estuaries, and lakes. The policies of the Coastal Act are administered through the Coastal Commission's permit authority.

California Endangered Species Act (Fish and Game Code, Chapter 1.5, Sections 2050-2098). The state Endangered Species Act declares that it is the policy of the state to "conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat" and "to acquire lands for habitat for these species." "Take" of a state listed species may be allowed through permits or memoranda of understanding with CDFG under Section 2081 of the code. "Take" may also be allowed for scientific or management purposes as long as the act's goals regarding the protection of threatened and endangered species and their habitat can be achieved.

California Native Plant Protection (Fish and Game Code, Chapter 10, Sections 1900-1913). The intent and purpose of this legislation is the protection, preservation, and enhancement of endangered or rare native plants of California. Habitat loss and commercial exploitation are primary factors affecting the distribution of rare and endangered plant species and this section of the code outlines the regulatory mechanisms for protection of native plants in California.

Local Government Plans

Local governmental plans and ordinances for resource management are varied and usually have no state standards requiring consistency or for determining adequacy or effectiveness. Avenues available to local governments for resource management are the following:

1. **Plans:** Includes general plans, area plans, stream conservation plans, and significant resource area inventories.

2. **Ordinances:** Includes zoning ordinances; local ordinances; use permits; open space, conservation, or resource management districts; overlay or combining districts; water-course or streamside protection ordinances; floodplain management ordinances; setback requirements; grading ordinances; erosion control ordinances; surface mining and reclamation ordinances; and design control district ordinances.

3. **Integrated Plans and Ordinances:** Includes planned unit developments, specific plans, special planning area ordinances, subdivisions ordinances, and local coastal programs.

Southern Californian Jurisdictional Plans (Ventura and Los Angeles County Plans). Ventura County's protection of riparian systems is limited primarily to management of sand and gravel mining on the Santa Clara and Ventura Rivers. The county's Local Coastal Program designates Environmentally Sensitive Habitat Areas for use in the coastal zone and discusses the importance of protecting riparian vegetation along creek corridors, but no specific policies or ordinances are in effect to implement that goal.

Los Angeles County's Conservation/Open Space Element of the general plan includes language stating the need to protect watersheds, streams, and riparian vegetation in an effort to minimize water pollution, soil erosion, and sedimentation of natural habitats, and aid groundwater recharge. At least 65 identified Significant Ecological Areas (SEA) are contained in this element. The Santa Clara River in Los Angeles County has been

designated SEA-23, primarily due to the presence of the unarmored threespine stickleback and areas of relatively undisturbed stretches of riparian habitat. Streams, riparian habitat, and marshes are included in these areas but are protected primarily through the CEQA environmental review process. Los Angeles County's Department of Public Works requires that structures be kept away from stream courses to prevent bank erosion.

Section 4

Opportunities and Constraints

Conservation of Existing Resources

Riparian systems in North America are associated with rivers, streams, creeks, and natural drainages. Riparian systems are diverse not only in plant life but also in wildlife (Faber et al. 1989). In California, a significant number of wildlife species are found in association with riparian habitats; 25 percent of California mammals, 80 percent of amphibians, and 40 percent of reptiles are limited to or dependent upon riparian areas, and more than 135 species of California birds depend on or prefer riparian habitats (Abell 1989). Despite this knowledge of the importance of riparian areas for plant and animal life, between 70 and 90 percent of the riparian systems have been lost nationwide, with similar percentages for the loss of riparian areas in the state of California (Warner and Hendrix 1984; Faber et al. 1989; Abell 1989). The extent of the Santa Clara River riparian habitats has been decreasing along the length of the river since the late 1800s as much of the middle- and upper-terrace zones have been converted to agricultural use, urban development, and sand mining (Faber et al. 1989). The result has been a fragmentation of the riparian woodlands and scrubs along the river. In order to maintain the biological diversity along the Santa Clara River, the importance of the remaining areas of riparian habitat must be acknowledged.

From the standpoint of a riverwide management plan, it makes sense to begin by conserving as many of the existing biological resources on the Santa Clara River as possible to form a solid biological base for the plan. Native riparian habitats along the river have been altered by European man from the late 1800s to present times, resulting in the isolation and fragmentation of the Santa Clara riparian system. Conservation of the remaining areas of native riparian habitat provides the basis for the preservation of native plant and wildlife species, wildlife habitat values, and river hydrogeomorphology.

The conservation of the existing riparian habitats on the Santa Clara River would help prevent further declines in populations of native riparian-dependent plants and wildlife species. Willow scrubs and woodlands, cottonwood/willow forests, mule fat scrub, alluvial scrub, and freshwater marsh are all habitats that support native plant species. Native riparian plant species provide the best and most widely used habitat for native wildlife. The presence of wildlife species native to southern California riparian habitats on the Santa Clara River is of great value given the degradation of many of the other riparian areas in the region. Rivers such as the Santa Clara River which have areas of native riparian habitat remaining become refugia for many of those wildlife species requiring, in some way, these habitat types. For example, the conservation of riparian resources on the Santa Clara River will aid in the recovery of listed species such as the least Bell's vireo and unarmored threespine stickleback, in addition to many other sensitive species.

It is well known that wildlife habitat values are higher in riparian areas that support native habitat types than in habitats dominated by non-native plant species (Warner and Hendrix 1984; Abell 1989; Faber et al. 1989). The structural diversity of the plant community is higher in riparian habitats than shrubland and grassland habitats due to the presence of multiple layers of vegetation (i.e., tree, shrub, herb, and vine) (Abell 1989). Higher structural diversity increases the variety of microhabitats within the plant community; thus, the community has the potential to support a more diverse assemblage of wildlife. The Santa Clara River supports native insect, fish, amphibian, and reptile species which, in addition to the riparian bird and mammal species, increase the overall diversity of wildlife species and contributes to the wildlife values of the riparian system.

The conservation of the existing native riparian habitats on the Santa Clara River will also help preserve the natural hydrology and geomorphology of the river. Although the river ecosystem is dynamic in time, native riparian habitats are important to the functioning of the fluvial processes that make the river a unique system (Warner and Hendrix 1984; Faber et al. 1989). Native riparian scrubs, woodlands, and forests affect the fluvial processes shaping the river. The presence of riparian habitat influences sediment transport, erosion, and the course of the river itself (e.g., riparian vegetation can reduce erosion, stabilize banks, slow flows,

etc.). The importance of the interrelationships of the riparian system with the fluvial processes was stated by Faber et al. (1989) in the following statement: ". . . we must recognize that (1) the stream and river channels and adjacent floodplain comprise an erosional, transportational, and depositional environment in which form and process evolve in harmony; (2) significant changes in the fluvial system often occur when a threshold has been crossed; and (3) human interference with the fluvial system generally reduces the physical variability of the channel and floodplain, resulting in a loss of hydrologic variability and biological productivity."

Conservation of the existing native riparian habitats along the Santa Clara River is only the first opportunity towards management of the riparian system. The connection of the patches of habitat to form a continuous corridor of vegetation along the river is another important management opportunity. This management opportunity can be achieved conceptually through the enhancement and restoration of disturbed areas of the river between existing native habitat patches. The potential for the restoration and enhancement of specific areas of the river is discussed later in this section. Connectivity in riparian habitat benefits wildlife by providing a contiguous corridor of vegetation cover for dispersal and other natural movements between areas.

Habitat protection along the river can be achieved through a variety of ways. The most common is through the implementation of a conservation easement or a conservation agreement. Diehl and Barrett (1988) define a conservation easement as "a legal agreement a property owner makes to restrict the type and amount of development that may take place on his or her property." Easement restrictions may be specific to the particular property and to the interests of the individual landowner. What can and cannot be done to a particular property is identified by the owner and the prospective easement holder in an easement document. The landowner then entitles the enforcement of those restrictions to a qualified conservation recipient, such as a public agency, a land trust, or a historic preservation organization (Diehl and Barrett 1988).

A major constraint to the conservation of existing riparian resources and the connection of fragmented habitats along the river involves changes in land use. Some patches of existing

riparian habitat occur on privately owned lands. In addition, many of the areas between habitat patches that could be enhanced or restored to make connections between patches are also privately owned. Acquisition of these lands for the benefit of the river management plan could prove to be difficult and expensive. Financing such acquisitions, if the opportunity should arise, represents another major challenge. Any existing habitat patches conserved and any areas enhanced or restored to make connections would require management to ensure that the habitat values preserved do not degrade over time due to man-caused disturbance factors. Finding a responsible entity to take over the management of these conserved areas represents another challenge.

Potential for Enhancement and Restoration

This portion of the plan describes the distribution of those areas on the river that have the potential for enhancement/restoration and provides a set of general guidelines for restoring and enhancing these areas of the river. Restoration of habitats as referred to in this plan involves the complete restoration of a particular site (e.g., removal of all non-native vegetation, site/soil preparation, planting of native species). Enhancement refers to the removal of smaller patches of non-native plant species, trash, or other disturbances within existing patches of native vegetation in an effort to enhance the habitat quality. Some limited planting may be involved in certain enhancement efforts; however, natural colonization of the enhanced site by resident native species is recommended where possible.

Areas of the river that are disturbed by human activities, areas vegetated with mainly non-native plant species, or areas of native vegetation that have moderate levels of non-native plant species as components were all considered potential areas for restoration or enhancement. Disturbed areas considered for restoration included areas along the riparian corridor that are currently devoid of vegetation or support only a weedy herbaceous growth due to human activities. Dense stands of giant cane, especially the larger patches, that occur along the river are also areas considered to have restoration potential. Patches of native riparian habitat that have moderate densities of giant cane (or other non-native species) were

considered as areas that can be enhanced through the removal of the non-native species. The distribution of areas considered to have a high restoration potential (i.e., areas disturbed by human activity or that have a high density of non-native plant species) and those with enhancement potential (i.e., areas of native vegetation with minor human disturbance or a minor non-native plant species component) are shown of Figures 4-1 through 4-28.

The restoration or enhancement of a riparian area involves many steps to help ensure a successful effort. Guidelines for the design and implementation of a restoration/revegetation project and for the removal and control of the non-native giant cane (the most prominent non-native species on the river) are discussed later in this section. Major constraints associated with any restoration/enhancement project include, but are not limited to, cost, reliability of methods used, long-term maintenance, and habitat management.

Restoration/Mitigation Project Design

Proper design of restoration projects is paramount to ensure a successful mitigation effort. The steps necessary to design a restoration project from beginning to end are described in this report to provide guidance for projects requiring restoration/mitigation on the Santa Clara River that would be subject to the SCREMP. Steps involved in the design of a restoration/mitigation project are depicted graphically in Attachment 2.

One of the first steps in the design of a restoration/mitigation project is the development of the appropriate goals and objectives. This process involves input from both the project proponent, the surrounding community, and resource agencies. Once the goals and objectives are decided upon, the identification of an available restoration/mitigation site can begin. This process involves an analysis of the suitability of potential sites to support the mitigation effort, including a description of the existing conditions at the site(s). Candidate sites are then compared to determine the extent of the site improvements needed. This comparison aids in the selection of the preferred restoration/mitigation site. After the preferred site is chosen, a schematic or conceptual restoration/mitigation design can be done which can then be implemented as a revegetation plan.

Riparian Revegetation Planning

The selection of a preferred site and preparation of a conceptual restoration design allows the implementation of the design through a revegetation plan. Revegetation plans are the major implementation documents of any restoration plan. Steps needed to implement a riparian revegetation plan are provided as guidance for projects requiring restoration/mitigation on the Santa Clara River that would be subject to the SCREMP. Steps involved in the riparian revegetation planning are depicted graphically in Attachment 3.

The riparian revegetation planning effort begins with a detailed analysis of the site conditions such as soils and hydrology. At the same time, the selection of plant materials and a determination of site preparation needs can be prepared. All this information is used to prepare the preliminary planting design and layout. Plant protection measures needed at the site should be incorporated into the planting design/layout as well as irrigation system guidelines. Once the final site plans are completed, notes can be added to the plans that outline the methods and procedures for the installation of the plant materials. At this point a preliminary cost analysis can be conducted to establish budgetary constraints and realize the cost of implementation of the plan. The preparation of establishment period maintenance and monitoring/reporting programs need to be considered in the final cost estimate. The final riparian revegetation plan, in conjunction with the final landscape plans (planting design/layout), provides the mechanism for the implementation of the restoration/mitigation effort.

Eradication and Control of Noxious Species

Plants

The most prevalent non-native species on the Santa Clara River is giant cane. Other noxious weeds can be found along the river (e.g., castor bean, tamarisk, fennel [*Foeniculum vulgare*], pampas grass [*Cortaderia* sp.], bull thistle [*Cirsium vulgare*]), but not in large concentrations like giant cane. Almost 1,000 acres of relatively large, dense, pure stands of giant cane were mapped in Ventura County. Any noxious plant species control program developed for the

Santa Clara River should include control protocols for the above-mentioned plant species as well as any other plant species that are listed on the California Exotic Pest Plant Council's list of Exotic Pest Plants of Greatest Concern in California (Attachment 4). However, the control of giant cane on the Santa Clara River is of paramount importance.

Giant cane is a perennial grass native to the warm temperate regions of Europe. The species grows rapidly and reproduces primarily by vegetative means. New shoots can be produced from underground rhizomes or fallen stems that root at the nodes. Giant cane can reach heights of up to 30 feet and form dense stands covering acres of land. This noxious species is commonly found in riparian areas on the wet margins of the floodplain and on sand/gravel bars in rivers and streams. Once established on a river system, giant cane colonizes areas downstream through the transmission of stems and rhizomes via flood events. Left uncontrolled, giant cane can eventually replace native habitats or degrade the quality of native habitats over time. This has an overall effect on the wildlife use of the riparian system as few, if any, wildlife species use giant cane as habitat.

Control of giant cane is a problem throughout California. Efforts to develop and test methods for the eradication of this species from riparian areas has been an ongoing task. A recently held workshop addressing giant cane and issues associated with the problems of control provides the best information to be used in the preparation of guidelines for an eradication program for this species (Jackson et al. 1994). The outline given in Attachment 5 for the removal of giant cane and spraying of herbicides for giant cane control is taken from the proceedings of this giant cane workshop held in Ontario, California, in 1993. Some minor modifications were made to the outline to adjust it for the Santa Clara River.

Animals

Certain animal species also require control on the Santa Clara River due to their effects on populations of other native wildlife species, particularly sensitive species. Non-native amphibians such as the bullfrog (*Rana catesbiana*) and African clawed frog (*Xenopus laevis*) can prey on native fish, insects, and other frogs and toads, including the young tadpoles (Dickerson 1969; Stebbins 1985; Zeiner et al. 1988). A bird species that is especially

troublesome along the Santa Clara River is the brown-headed cowbird. Brown-headed cowbirds prefer to nest in riparian areas, where they parasitize the nests of host passerine species (Zeiner et al. 1990a). This species can parasitize the nests of sensitive birds along the river such as the least Bell's vireo. Animal control programs developed for the Santa Clara River should include measures to control bullfrogs, African clawed frogs, and brown-headed cowbirds. For example, brown-headed cowbird trapping programs using modified Australian bird traps have been effective at reducing cowbirds in localized areas (USFWS 1995a).

Potential Corridors and Connections within the River and to Adjacent Uplands

Corridors and connections are extremely important landscape features from a conservation perspective. They function to mitigate to some degree the effects of habitat fragmentation and isolation, both natural and human-caused. Connected subpopulations of species have greater effective population sizes, and consequently greater population viability, than nonconnected.

Wildlife corridors are defined as linear landscape elements, providing a linkage between historically connected habitat or natural areas, and are meant to facilitate movement between these natural areas (Soule and Gilpin 1991; McEuen 1993). Wildlife corridors can be described in terms of the types of movement and the types of habitat that they support. As used in this document, corridors represent continuous linear landscape features meeting the definition above. Connections may not provide for linear continuity of habitat but do serve to provide linkage and facilitate movement at some level.

Movements between subpopulations of plants and animals range from continuous population-level exchange of individuals to intermittent exchange of individuals (and their genetic material), maintaining some level of genetic continuity between the subpopulations. This includes movements within an individual's home range, migration or round-trip movements between habitat areas, and dispersal through one-time movements.

From a functional perspective, the best connections consist of habitat occupied by the species in question, providing for direct population continuity. Connections must provide habitat in a configuration that will allow occasional movement and exchange of individuals (at a minimum, once in a species generation). At this level the connection could be islands of habitat between which individuals can fly (birds), walk (rodents, reptiles, and amphibians); swim (fish, amphibians), or disperse through a variety of passive mechanisms (plants).Additionally, non-habitat areas such as agricultural fields or other open space may function as wildlife corridors, especially for some large mammals and birds.

Wildlife movement along corridors can be beneficial to populations in several ways: (1) they allow recolonization of locally extinct patches; (2) they boost local population growth; (3) they provide for gene-flow; and (4) they enhance overall metapopulation survival. Conversely, potentially adverse aspects of corridors must be taken into consideration when incorporating them into conservation plans. These include (1) the lack of data on corridor function and use by wildlife;(2) the risk of spreading catastrophes (such as predators, fire, disease, and floods); (3) the potential to serve as a dispersal route for weedy or exotic species (such as brown-headed cowbirds, tamarisk, dense reed grass, and non-native fish); and (4) higher management requirements due to higher edge-to-interior area ratios.

For this study, connections along the Santa Clara River were categorized as connections between riparian habitat areas along the river; connections between riparian habitat along the main stem of the river and similar habitat in tributary drainages; and connection of the riparian habitats along the river to adjacent upland habitats (Figures 4-29 through 4-31). Existing and potential corridors were evaluated using USGS and other topographic maps (7.5- and 15-minute series), aerial photographs, and vegetation maps produced in this study.

Corridors and connections along the river were evaluated on the basis of their potential biological value and feasibility of their maintenance. Feasibility of maintenance ranges from high (for maintaining an existing connection which contains appropriate habitat) to low (for establishing a connection by creating new habitat). The potential biological value of the connection ranges from high (for connections that would substantially increase the viability

of populations of listed species) to low (connections between dissimilar habitats with few or no shared species). These factors were assessed qualitatively from the mapped information to generate a ranking of the connections into three categories from the perspective of conservation priority: high, medium, and low. Medium- and low-ranked connections that are the only remaining connection to isolated habitat patches were elevated in ranking.

Habitat Continuity along the River

The majority of the length of the main stem of the Santa Clara River within the study area is connected by a nearly continuous strip of active channel. The active channel is of varying width and is characterized variously by sand bed, surface water, shoals and sandbars, or sparse scrubby vegetation (primarily mule fat scrub and alluvial scrub). The active channel has been modified by flood flows, mineral extraction, agriculture, channelization, and other human activities.

The general distribution of riparian habitat is discontinuous along the river, adjacent to or within the active channel. There are only two stretches of the river with relatively continuous riparian habitat distribution: from just west of the Ventura County line upstream to Honby; and from near the mouth of Soledad Canyon on upstream.

From east of Piru on downstream, riparian habitat and alluvial scrub habitats are distributed in various-sized patches. These patches are for the most part only connected by the active channel and, in many locations, patches dominated by giant cane.

The active channel is a key corridor for aquatic and water-dependent species throughout the length of the river. Maintenance of active channel continuity of flows is especially critical for fish species such as the southern steelhead, arroyo chub, unarmored threespine stickleback, and Santa Ana sucker. The river channel is also important in the dispersal of many amphibians, the southwestern pond turtle, and many plant species. On the negative side, the active channel, particularly in flood events, acts as a conduit for exotic fish and plant species.

Enhancing connectivity of other habitats within the river corridor should build on the linear thread of the active channel. First priority should be to focus on fragmented areas of riparian and alluvial scrub and increase local connectivity between patches. This will result in larger contiguous areas of habitat for riparian-dependent and -associated species such as the least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo. River segments where this is feasible should have a high priority for conservation activities including habitat restoration and enhancement, removal of exotics, and increased regulatory review. These areas include the river mouth, the area adjacent to Santa Paula, Newhall Ranch and Santa Clarita, and Soledad Canyon.

Secondary priority should be given to providing some level of continuity between the first-priority areas, even if fragmented. These areas include segments of the river corridor which do not offer as much opportunity for continuous or large blocks of habitat, either because of the natural conditions of the river or because of human activities in and adjacent to the river.

Connections with Adjacent Habitat

The following tributaries provide varying degrees of connectivity to the Santa Clara River study area (the 500-year floodplain; see Figures 4-29 through 4-31). The tributaries are listed in Table 4-1 from west to east by river segment along with the assigned conservation priority.

Connections to Uplands

There are four remaining areas where more or less direct connections remain between the habitat along the Santa Clara River with substantial areas of natural upland vegetation. These connections are all between the river and open areas on the south side of the river (see Figures 4-29 through 4-31): South Mountain, Big Mountain, and Santa Susana Mountain areas west of Interstate 5 and to the San Gabriel Mountains area to the east of Interstate 5.

The connections are characterized by the occurrence of upland habitats, primarily coastal sage scrub and chaparral, on slopes that reach down to the floodplain and are generally

Table 4-1
Connections Between the River and Upland Habitat and Adjacent Tributaries

Connection	Conservation Priority
Segments 1 and 2 (Reaches 1, 2, and 3)	
None	
Segment 3 (Reaches 4, 5, and 6)	
Ellsworth Barranca north into Aliso Canyon to Sulphur Mountain area	low
Todd Barranca north into Wheeler Canyon to Sulphur Mountain area	low
Santa Paula Creek north to upper Ojai Valley	high
Morgan Canyon south to South Mountain area	medium
Timber Canyon north to Santa Paula Peak area	medium
Unnamed creek north to Santa Paula Peak area	medium
Segment 4 (Reaches 7 and 8)	
Sespe Creek north to Los Padres National Forest	high
Unnamed creek south to west Oak Ridge area (2 miles east of Fillmore)	medium
Fairview Canyon north to Sulphur Mountain	medium
Segment 5 (Reaches 8 and 9)	
Drain north to Toms Canyon to Hopper Creek and Hopper Mountain area	medium
Wiley Canyon south to Oak Ridge area	medium
Piru Creek north to Lake Piru	high
Eureka Canyon south to Oak Ridge area	high

Table 4-1
Connections Between the River and Upland Habitat and Adjacent Tributaries

Connection	Conservation Priority
Segment 6 (Reaches 10 and 11)	
Unnamed creek north at Turkey Ranch, Newhall Land and Farming	high
Salt Creek south to Santa Susana Mountains area	high
Potrero Creek south to Santa Susana Mountains area	medium
San Martinez Grande Canyon north	medium
San Martinez Chiquito Canyon north	medium
Castaic Creek north to Castaic Lake	high
Segment 7 (Reach 12)	
San Francisquito Creek north into San Francisquito Canyon	high
Boquet Creek north to Boquet Canyon and Vasquez Canyon	low
Unnamed creek north to Plum Canyon area (between Bouquet Canyon and Honby)	medium
Segment 8 (Reach 12)	
Mint Canyon north to Angeles National Forest	low
Segment 9 (Reach 12)	
Sand Canyon south to Placerita Canyon State Park	medium
Oak Spring Canyon south to San Gabriel Mountains area	medium
Tapie Canyon north toward Angeles National Forest	medium
Bee Canyon north toward Angeles National Forest	medium

Table 4-1
Connections Between the River and Upland Habitat and Adjacent Tributaries

Connection	Conservation Priority
Segment 10 and 11 (Reach 13)	
Bear Canyon south to San Gabriel Mountains area	high
Agua Dulce Canyon north to Agua Dulce	high
Mattox and Mill Canyons south to San Gabriel Mountains area	high
Segment 12 (Reach 13)	
Aliso Canyon south to San Gabriel Mountains area	high

unaffected by human activities. Agriculture, urbanization, and State Route 126 generally limit the connections to the north side of the river to the remaining tributaries described above. Agriculture and urbanization are the primary limiting factors on the south side of the river.

- South Mountain. The riparian vegetation is sparse and fragmented in the stretch of river adjacent to the South Mountain area. This area is, for the most part, between Saticoy and Santa Paula, with a smaller area to the east of Santa Paula.

- Big Mountain. The vegetation in the river in this stretch is fragmented, primarily alluvial scrub with patches of riparian habitat. The upland connections are interspersed with agricultural fields along the floodplain edge.

- Santa Susana Mountain. The vegetation in the river is relatively continuous riparian habitat. The upland connection is along the bluffs on the southern edge of the river, to areas of coastal sage scrub and non-native grassland.

- San Gabriel Mountain. The vegetation in this stretch of the river is relatively continuous riparian and oak woodland habitats. This area has the most extensive upland connections along both sides of the river. The existing connections begin at Humphreys and continue upstream with small breaks into Soledad and Aliso Canyons.

Regional Connections

On a regional scale, the Santa Clara River provides a key nexus between the remaining open space areas to the northwest of the Los Angeles urban area (Figure 4-32). The river and its habitat provide the primary remaining east-west connection between the Pacific coast and the San Gabriel Mountains and Angeles National Forest. The river also provides connections between the Los Padres National Forest and open areas to the north of the river (including Sulphur Peak, Santa Paula Peak, Hutton Peak, Valverde, Castaic, and Mint Canyon),with the Santa Susana Mountains on the south. Through the Santa Susana Mountains the river and these areas are connected, at least through the stepping stones of the Simi Hills and smaller open areas to the Santa Monica Mountains.

Connections as Migration Routes

Many species, including a number of species of special concern dealt with in this study, depend upon the river as habitat and to provide for local migration. This includes fish, birds, reptiles and amphibians, and plant species.

A key value of the river is for migration of fish species, which use the active channel. The anadromous southern steelhead migrates from the ocean up the Santa Clara River and into the Piru Creek drainage to spawn as part of its breeding cycle. The resident populations of unarmored threespine stickleback, arroyo chub, and Santa Ana sucker live within the active channel and depend upon channel connectivity to enable dispersal into appropriate sections of the river as conditions change. The southwestern pond turtle, two-striped garter snake, and arroyo toad populations also make use of the active channel of the river for dispersal and movement.

Although it has been fragmented by both natural and human processes and activities, the riparian vegetation along the river is an important corridor for movement of many species, especially birds. The habitats along the river are used by migratory birds moving up and down the Pacific coast during spring and fall migrations. More importantly, the riparian corridor functions as both habitat and a route for east-west dispersal for riparian breeding species such as the least Bell's vireo and southwestern willow flycatcher. Local resident species, including raptors and large mammals, move up and down the river and into adjacent uplands habitat along the riparian corridor.

Potential Impacts to the River from Adjacent Land Uses

Adjacent land uses can significantly affect, directly and indirectly, the biological resources within the river corridor. Understanding the kinds and scale of the potential effects of adjacent land uses is important from a planning perspective because they need to be anticipated in the development of the conservation plan and in the ultimate management of the conserved resources. The potential effects of the primary land uses adjacent to the Santa Clara River are shown in Table 4-2, based on a preliminary list developed by CNPS and USFWS.

Table 4-2
Potential Effects of Land Uses on Biological Resources on the Santa Clara River

Land Use	Potential Effects on Biological Resources
Agriculture	• non-point source pollution • siltation • dust • herbicides and pesticides • introduction of exotics • increased invasive exotic vegetation
Development (urbanization)	• introduction of exotics through landscaping • increased invasive exotic vegetation • reduction of permeable soil surface • altered surface hydrology • air, water, light pollution • disturbance due to recreation • predation due to domestic pets • loss of native habitat and connectivity
Roads and Bridges	• reduction of permeable soil surface • altered surface hydrology • air and water pollution, including runoff from asphalt • herbicide use • roadkills • increased exotic vegetation • enhanced exotic seed dispersal • loss of natural habitats and connectivity
Landfills	• surface and subsurface water pollution • introduction of exotics • increased invasive exotic vegetation • alteration of surface hydrology • siltation • loss of natural habitat connectivity

Table 4-2
Potential Effects of Land Uses on Biological Resources on the Santa Clara River

Land Use	Potential Effects on Biological Resources
Brush Clearing	• increased erosion, siltation • loss of infiltration, lower water table • dust • increased invasive exotic vegetation • loss of natural habitats and connectivity
Aggregate Mining (off-river)	• alteration of water table • siltation • dust • increased invasive exotic vegetation • loss of natural habitat and connectivity
Tributary Alterations (channelization, water diversion, etc.)	• siltation • increased or decreased streamflow to river • loss of natural scouring regime • alteration of water table • loss of habitat and connectivity to uplands
Manufacturing	• thermal pollution • chemical pollutions (air and water) • light pollution
Grazing	• siltation • water pollution • increased invasive exotic vegetation • erosion, compaction, loss of infiltration
Mineral Extraction	• siltation • water pollution • alteration of water table • increased invasive exotic vegetation
Oil Pipelines	• water quality degradation

Section 5

Recommendations

The following section details the preliminary recommendations for enhancement and management of biological resources on the Santa Clara River. These recommendations are based on the information developed for this study as detailed in Sections 1 through 4 and are intended to address the objectives and criteria identified in Section 1. The recommendations focus on the following conservation objectives:

- Preservation of a continuous riparian corridor on the river with connections to adjacent native habitats;
- Restoration of degraded resources; and
- Management of the river to maintain the existing and restored resource values.

The recommendations include prioritization for conservation of existing and potential biological resources along the river, impact assessment and mitigation guidelines, mitigation programs, and management programs to achieve these goals. The ultimate objective of this exercise is to provide information on biological resources in a geographic information system format that will allow overlay and comparison with similarly prioritized information on other issues and to provide the basis for incorporation of biological conservation planning into the riverwide planning process.

These recommendations are, by design, general in nature, providing for flexibility in the planning process. More detailed, precise, and specific recommendations for actions and programs will be generated as the result of the integration of biological data with the data being developed for other resources and uses within the study area. This integration process will provide the means for evaluating the conservation of biological resources within the context of other goals on the river. This will allow the participants to focus attention on the areas of potential overlap of goals (and not on areas of general concurrence of goals), which is one of the primary reasons for the initiation of the planning process.

In addition, recommendations for conservation actions must take into consideration the dynamic nature of riparian and aquatic habitats associated with a "live" river. From a practical standpoint, this means that preliminary recommendations, in particular, cannot be overly site-specific; the river changes from year to year, and therefore, locations appropriate for some actions change from year to year. Therefore, the conservation recommendations have focused on river segments rather than specific sites.

River System Configuration

River system configuration refers to the overall distribution of biological resources within the study area and the relationship of the river with other biological resources adjacent to the river, both tributaries and upland habitat areas. The focus of this evaluation has been to identify current biological values on the river, their context with adjacent habitats, and potential management and enhancement actions that would conserve the biological values or potentially increase these values, relative to the conservation goals outlined above.

For the purpose of this evaluation, the river was divided into 12 segments reflecting the type and quality of biological resources present, the interrelated general hydrologic conditions, and land uses in and adjacent to the 500-year floodplain (Figures 5-1 to 5-3). Each of these segments is characterized below as to

- Existing habitat values, based on the amount and diversity of habitat and number of species of concern using the habitat in the segment (summarized in Table 5-1);
- Future conservation goals, based on appropriateness for conservation of existing biological resources, for restoration and enhancement, and for provision of connectivity;
- Restoration and enhancement potential, based on the evaluated biological and physical characteristics of the site and the existing biological values and conservation goals; and

Table 5-1
Distribution of Species of Special Concern on the Santa Clara River

	Ventura County															
Map Sheet Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Figure Sequence Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Least Bell's vireo	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Western yellow-billed cuckoo	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Southwestern willow flycatcher	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Non-listed riparian birds	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sensitive raptors	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tiger beetle	x										x	x	x	x	x	x
Tidewater goby	x															
California least tern	x															
Western least bittern	x								x	x						
Long-billed curlew	x															
Elegant tern	x															
White-faced ibis	x															
Western snowy plover	x															
Belding's savannah sparrow	x															
Southern steelhead	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Unarmored threespine stickleback								x	x	x	x	x	x	x	x	x
Arroyo chub	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Santa Ana sucker											x	x	x	x	x	x
Arroyo toad											x				x	x
California legless lizard	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
San Diego horned lizard	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
California red-legged frog		x				x										
Southwestern pond turtle	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Coast patch-nosed snake								x	x	x	x	x	x	x	x	x
Two-striped garter snake	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Salt marsh bird's beak	x															
Ventura marsh milkvetch	x															
Slender-horned spineflower											x	x	x	x	x	x
Nevin's barberry											x	x	x	x	x	x
Total Number of Species	22	12	11	11	11	12	11	13	14	14	18	17	17	17	18	17
River Segment	1	1	2	2	2	2/3	3	3	3	3	4	4	4	5	5	5
SCREMP River Reach	1	2	3	3	3	3/4	4	5	5/6	6	7	7	8	8	8	9

Table 5-1
Distribution of Species of Special Concern on the Santa Clara River

	Newhall Ranch						Los Angeles County				
Map Sheet Number	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**
Figure Sequence Number	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Least Bell's vireo	x	x	x	x	x	x	x	x	x	x	x
Western yellow-billed cuckoo	x	x	x	x	x	x	x	x	x	x	x
Southwestern willow flycatcher	x	x	x	x	x	x	x	x	x	x	x
Non-listed riparian birds	x	x	x	x	x	x	x	x	x	x	x
Sensitive raptors	x	x	x	x	x	x	x	x	x	x	x
Tiger beetle							x	x	x		
Tidewater goby											
California least tern											
Western least bittern											
Long-billed curlew											
Elegant tern											
White-faced ibis											
Western snowy plover											
Belding's savannah sparrow											
Southern steelhead											
Unarmored threespine stickleback	x	x	x	x	x	x	x				
Arroyo chub	x	x	x	x	x	x	x				
Santa Ana sucker	x	x	x	x	x	x	x	x	x	x	x
Arroyo toad		x	x	x	x	x			x	x	x
California legless lizard	x	x	x	x	x	x	x	x	x	x	x
San Diego horned lizard	x	x	x	x	x	x	x	x	x	x	x
California red-legged frog			x	x	x	x			x	x	x
Southwestern pond turtle	x	x	x	x	x	x	x	x	x	x	x
Coast patch-nosed snake										x	x
Two-striped garter snake	x	x	x	x	x	x	x	x	x	x	x
Salt marsh bird's beak											
Ventura marsh milkvetch											
Slender-horned spineflower							x	x	x		
Nevin's barberry							x				
Total Number of Species	1	1	1	1	1	1	1	1	1	1	1
River Segment	5/6	6	6	6	6	6	7	8/9	9/10	11	12
SCREMP River Reach	9/10	10	11	11	11	11	12	12	12/13	13	13

- Regional conservation value.

River segments were assigned conservation value based on their attributes, as follows (and summarized in Table 5-2):

- Segments which are relatively undisturbed and have significant conservation value;
- Segments which have significant potential for restoration and enhancement; and
- Segments which have value based on their contributions to connectivity.

All river segments potentially contribute to connectivity, especially for aquatic species; only those which lack the other attributes fall into the third category.

The segments were delineated on the basis of the general similarity and continuity of existing biological resources and biophysical characteristics, as well as existing land use context. The intention in delineating the segments this way was to enable the prescription of general management and conservation activities and goals that are appropriate for each segment, while allowing for the development of site-specific approaches within the segments that are consistent with the other competing interests and goals that may exist. In particular, the segments were defined as having similar types and distribution of vegetation (from the results reported in this study), general hydrological conditions (based on the draft study of Water Resources for the Santa Clara River, May 1995), and existing land uses (based on aerial photographs used in this study).

As a result, the river segments defined in this study for biological resources are not entirely consistent with the river reaches defined for the overall SCREMP work program. The correspondence between the segments and reaches is outlined in Table 5-3.

Table 5-2
Summary of Conservation Values by Segment

Segment	Conservation Value	River Miles
1	Significant conservation value	5.8
2	Connectivity value	5.0
3	Significant conservation value	11.1
4	Restoration and enhancement potential	7.6
5	Restoration and enhancement potential	7.6
6	Significant conservation value	9.9
7	Significant conservation value	5.4
8	Connectivity value	4.0
9	Connectivity value	5.0
10	Significant conservation value	10.0
11	Significant conservation value	4.6
12	Significant conservation value	-

Table 5-3
Correspondence Between the River Reaches Defined for the SCREMP and the Segments Defined in this Study

Reach	SCREMP	Segment	Biological Resources Study
1	Pacific Ocean to Harbor Blvd.	1	McGrath State Beach to One-Half mile East of U.S. 101
2	Harbor Blvd. to Highway 101	2	One-Half Mile East of U.S. 101 to Freeman Diversion
3	Highway 101 to Freeman Diversion		
4	Freeman Diversion to Adams Barranca	3	Freeman Diversion to Two Miles West of Sespe Creek
5	Adams Barranca to Willard Road		
6	Willard Road to Upstream of the Sespe Confluence	4	Two Miles West of Sespe Creek to Cavin
7	Upstream of the Sespe Confluence to the Fillmore Fish Hatchery		
8	Fillmore Fish Hatchery to Upstream of the Piru Creek Confluence	5	Cavin to Tapo Canyon
9	Upstream of the Piru Creek Confluence to the Newhall Land Property Line		
10	Newhall Land Property Line to the Ventura/L.A. County Line	6	Tapo Canyon to Interstate 5
11	Ventura/L.A. County Line to Interstate 5		

Table 5-3
Correspondence Between the River Reaches Defined for the SCREMP and the Segments Defined in this Study

Reach	SCREMP	Segment	Biological Resources Study
12	Interstate 5 to USGS Gage at Lang	7	Interstate 5 to the Aqueduct
		8	Aqueduct to State Route 14
		9	State Route 14 to Mouth of Soledad Canyon
13	Above USGS Gage at Lang	10	Mouth of Soledad Canyon to Acton
		11	Acton to Aliso Canyon
		12	Aliso Canyon into Angeles National Forest

1. McGrath Beach to One-Half Mile East of U.S. 101 (Reaches 1 and 2)

Existing Habitat Values

The primary habitat resources in this river segment are the estuary and dune habitat at the mouth of the river and scattered willow woodland and willow scrub habitat along the active channel. Potential habitat for 22 species or species groups of concern exists in this segment, including a number of species associated on the Santa Clara River only with the coastal resources. This segment is key for southern steelhead, arroyo chub, and 10 coastal species.

Future Conservation Goals

The primary conservation goal for the habitats in this segment of the river is to maintain existing habitat values at the river mouth and adjacent to the river channel. Opportunities for increasing connectivity upstream are limited.

Restoration and Enhancement Potential

Habitat restoration potential in this segment is limited by adjacent golf courses and agricultural activities and urbanization on the Oxnard Plain. Hydrological conditions appear to provide mixed expectations for riparian restoration. The constrained channel increases the likelihood of habitat loss due to flood flows. Enhancement opportunities exist in areas with giant cane.

Regional Conservation Value

The focus of conservation on this segment of the river should be the habitat complex at the Santa Clara River mouth. The near-coast river channel riparian habitat is important in adding to the total area and habitat heterogeneity to the river mouth habitats, increasing the long term viability of the resources in this area.

Because of the uniqueness of the coastal strand and estuary habitats and existing and potential habitat for several listed and special concern species, this river segment has significant conservation value.

2. One-Half Mile East of U.S. 101 to Freeman Diversion (Reach 3)

Existing Habitat Values

There are few habitat resources in this river segment. Patches of willow woodland and willow scrub habitat occur in scattered locations along the active channel. The channel is bordered by a flood control levee on the south side and agricultural activities on the lower floodplain terraces on the north. This segment provides connectivity for southern steelhead and arroyo chub.

Future Conservation Goals

The primary conservation goal for the habitats in this segment of the river is to maintain the river channel connection through the segment. Existing riparian and scrub habitat should be conserved. Preservation of even a narrow continuous band of willows or scrub habitat on either or both sides of the river would be beneficial.

Restoration and Enhancement Potential

Habitat restoration potential in this segment is limited by adjacent agricultural activities and the flood control levee. Hydrological conditions appear to provide low expectations for riparian restoration except at the east end near Saticoy, where there is an area of rising water in the channel. The constrained channel increases the likelihood of habitat loss due to flood flows. Areas with giant cane provide some limited enhancement opportunities by eradicating the cane and restoring the areas to native habitat.

Regional Conservation Value

The primary regional importance of this segment of the river is to provide connectivity between aquatic habitat areas upstream and downstream.

3. Freeman Diversion to Two Miles West of Sespe Creek (Reaches 4, 5, and 6)

Existing Habitat Values

The primary habitat resources in this river segment are large stands of willow woodland and willow scrub adjacent to the active channel. An area of high-quality old cottonwood-willow forest occurs just above the Freeman Diversion dam. This segment has been disturbed by mineral extraction activities and is heavily impacted by giant cane. The extensive giant cane may be the result of disturbance of sand and gravel extraction and flood flow disturbance. Key resources in this segment are riparian bird species, southern steelhead, arroyo chub, and unarmored threespine stickleback in the upstream portion.

Future Conservation Goals

Although much of the habitat in this segment has been degraded by past activities, this portion of the river has high potential to support a relatively continuous band of riparian habitat. The habitat also has direct connections to upland areas to the south and through tributaries to upland habitat area to the north. Restoration and enhancement activities, added to conservation of existing riparian habitat, would be of great benefit to biological resources.

Restoration and Enhancement Potential

This segment offers high potential for both restoration and enhancement of riparian resources in the extensive areas infested with giant cane. Areas of rising water in the Santa Paula Basin occur at both ends of the segment, although groundwater levels in wells occur at depths of up to 100 feet.

Regional Conservation Value

A wide band of undeveloped land connects the Santa Clara River and the uplands of South Mountain to the south. At least four tributaries to the Santa Clara River, including Santa Paula Creek, provide connectivity to the upland areas of Sulphur Mountain and Santa Paula Peak areas to the north.

Because of the existing and potential riparian habitat value and the connections to larger upland areas both north and south of the river, this river segment has significant conservation value.

4. Two Miles West of Sespe Creek to Cavin (Reaches 7 and 8)

Existing Habitat Values

The primary resource in this river segment is alluvial scrub habitat, with patches of willow scrub. The river is primarily a dry channel bordered by agriculture on the south and agriculture, water treatment facilities, and the City of Fillmore on the north. This segment also has extensive areas of giant cane. This segment provides potential habitat for fish species, riparian birds, slender-horned spineflower, and Nevin's barberry.

Future Conservation Goals

A primary conservation goal in this portion of the river should be the control of giant cane. This is the upstream extent of major areas of giant cane. Control efforts for giant cane in downstream portions of the river will be compromised if the species is not controlled in this segment. Existing areas of habitat should be conserved and connected through enhancement and restoration activities.

Restoration and Enhancement Potential

Restoration potential for riparian habitat in this area is moderate, with enhancement opportunities in areas of giant cane. Riparian restoration is possibly limited by hydrologic

conditions; however, more xeric alluvial scrub vegetation would provide important transition habitats connecting riparian areas up- and downstream. Alluvium in the channel is from 60 to 100 feet deep, with only one area of rising water (groundwater flowing toward the surface due to hydrologic and geologic conditions) near the eastern end of the segment.

Regional Conservation Value

The primary regional importance of this segment of the river is to provide connectivity between aquatic habitat areas upstream and downstream. The major tributary connection through Sespe Creek with the Los Padres National Forest to the north provides an important corridor to the river. This tributary is probably the upstream range of southern steelhead runs up the river.

This river segment has value based on its importance to aquatic resources, restoration and enhancement potential, and connections to larger upland areas north of the river.

5. Cavin to Tapo Canyon (Reaches 8 and 9)

Existing Habitat Values

The primary resource in this river segment is alluvial scrub habitat, with patches of willow woodland and scrub, primarily on the south side of the river. The river is primarily a dry channel bordered by agriculture on both sides. This segment provides potential habitat for unarmored threespine stickleback, slender-horned spineflower, and Nevin's barberry.

Future Conservation Goals

The conservation goals for this segment are to maintain the existing riparian and alluvial scrub habitat, to increase connectivity upstream and downstream through restoration or enhancement, and to facilitate cross-river connectivity.

Restoration and Enhancement Potential

This river segment has moderate to low restoration and enhancement potential for riparian habitat. This is primarily due to the apparently low water table and deep alluvium in the Piru Basin. There is some potential for alluvial scrub enhancement to increase connectivity.

Regional Conservation Value

This segment of the river has a relatively continuous distribution of alluvial scrub adjacent to the channel. There are numerous direct and tributary connections from the river channel to the upland area of Oak Ridge to the south and two tributary connections to the north, the most important along Piru Creek.

This river segment has value based on its importance to aquatic resources, restoration and enhancement potential, and connections to larger upland areas north and south of the river.

6. Tapo Canyon to Interstate 5(Reaches 10 and 11)

Existing Habitat Values

The primary biological resources in this segment of the river are cottonwood willow forest, cottonwood willow woodland, and willow scrub habitat. This segment supports a relatively continuous band of high- to moderate-quality riparian habitat with upland and tributary connections to the south and tributary connections across State Route 126 to the north. Agricultural areas are both north and south of the channel. Giant cane has invaded some riparian areas, and understory has been modified by cattle grazing.

This area provides habitat for a diversity of species and is a key area for riparian birds and unarmored threespine stickleback.

Future Conservation Goals

The principal goal for this segment is conservation of the high-quality riparian resources along the river and maintenance of connectivity, especially to the downstream riparian habitat and tributary habitats up San Francisquito Creek and Bouquet Canyon to the north. The value of the habitat here could benefit from enhancement and restoration activities.

Restoration and Enhancement Potential

There is limited restoration and enhancement potential in this segment of the river.

Regional Conservation Value

This segment of the river supports high-quality relatively continuous riparian habitat. The active channel is also important aquatic habitat, especially for the stickleback. A major connection to the north occurs through San Francisquito Creek and Bouquet Canyon.

Because of the existing and potential riparian habitat value and the connections to larger upland area both north and south of the river, this river segment has significant conservation value.

8. Aqueduct to State Route 14 (Reach 12)

Existing Habitat Values

This segment of the river is heavily disturbed and channelized. The active channel is constrained by the floodplain configuration and flood control facilities.

Future Conservation Goals

Conservation actions in this river segment would be limited to maintaining the continuity of the active channel. Development of even a narrow band or patches of riparian and scrub habitat through the length of the segment would be beneficial.

Restoration and Enhancement Potential

Restoration and enhancement potential on this segment of the river is limited by high flow velocities and inappropriate hydrology.

Regional Conservation Value

The primary regional importance of this segment of the river is to provide connectivity between aquatic habitat areas upstream and downstream.

9. State Route 14 to Mouth of Soledad Canyon (Reach 12)

Existing Habitat Values

This segment of the river is heavily disturbed by mineral extraction activities and channelization. The active channel is constrained by the State Route 14 on the north and flood control facilities on the south.

Future Conservation Goals

Conservation actions in this river segment would be limited to maintaining the continuity of the active channel. Development of even a narrow band or patches of riparian and scrub habitat through the length of the segment would be beneficial.

Restoration and Enhancement Potential

Restoration and enhancement potential on this segment of the river is limited by high flow velocities and inappropriate hydrology.

Regional Conservation Value

The primary regional importance of this segment of the river is to provide connectivity between aquatic habitat areas upstream and downstream. There is also the potential for

cross-river connectivity through a broad direct connection to upland habitat on the south and Tapie and Bee Canyons on the north.

10. Mouth of Soledad Canyon to Acton (Reach 13)

Existing Habitat Values

The primary biological resource in this segment is mostly mature cottonwood willow forest. Much of the habitat has well-developed understory, although the understory has been removed in the several campgrounds.

Future Conservation Goals

The primary conservation goal in this segment should be to conserve the existing high-quality habitat. A secondary goal should be to encourage the development of willow woodland or scrub along the river channel through the campgrounds and other disturbed areas.

Restoration and Enhancement Potential

Restoration potential is limited in this river segment because most of the segment supports high-quality vegetation. Habitat along the river channel through disturbed areas could be enhanced.

Regional Conservation Value

This segment of the river provides habitat continuity throughout its length and broadly across the river between the San Gabriel Mountains and upland areas to the north.

Because of the existing and potential riparian habitat value and the connections to larger upland areas both north and south of the river, this river segment has significant conservation value.

11. Acton to Aliso Canyon (Reach 13)

Existing Habitat Values

The primary biological resource on the river in this segment is high-quality alluvial scrub adjacent to the active channel.

Future Conservation Goals

The primary goal for this segment is conservation of the alluvial scrub habitat.

Restoration and Enhancement Potential

There is limited restoration and enhancement potential in this segment of the river because most of the segment supports high-quality vegetation.

Regional Conservation Value

The habitat in this segment of the river provides continuity between the areas of riparian habitat upstream and downstream. The river has connectivity on tributary canyons to the north and upland areas to the south.

Conservation Priority Ranking

Because of the existing high-quality alluvial scrub and the connections to larger upland area both north and south of the river, this river segment has significant conservation value.

12. Aliso Canyon into Angeles National Forest (Reach 13)

Existing Habitat Values

The primary biological resource in this segment of the river is cottonwood willow woodland adjacent to the stream channel. The stream in this segment is narrow, with well-developed riffles and pools. The major constraint is the presence of Aliso Canyon Road.

Future Conservation Goals

The primary conservation goal for this segment is preservation of the existing riparian habitat.

Restoration and Enhancement Potential

There is limited restoration and enhancement potential in this segment of the river because high-quality habitat is already present throughout the segment.

Regional Conservation Value

This river segment provides high-quality riparian and stream habitat, as well as connection of the river to the Angeles National Forest.

Conservation Priority Ranking

Because of the existing riparian habitat value and the connections to larger upland areas both north and south of the river and into the Angeles National Forest, this river segment has significant conservation value.

Impact Assessment and Mitigation Guidelines

Impact Assessment

The assessment of impacts along the river should be made in the context of the value of the habitat that is affected. Specifically, the value of habitat affected should be evaluated relative to its importance to accomplishing the riverwide conservation goals and priorities discussed above. In general, the following significance criteria should be considered when evaluating actions which would impact natural habitats and the river channel within the 500-year floodplain of the Santa Clara River:

- impacts to areas of habitat within river segments with significant conservation value should be considered generally significant and not easily mitigable
- impacts to areas of habitat within river segments with significant potential for restoration and enhancement should be considered generally significant but potentially mitigable
- impacts to habitat areas within river segments with value based primarily on contributions to connectivity along the river should be considered potentially significant but mitigable

With the intent of maintaining a dynamic river resources as well as conserving biological resources, the river channel should not be confined to any great extent. To achieve this, any river reaches proposed for channelization should be designed to convey flood flows while supporting riparian vegetation. Achieving this goal would require incorporation of appropriate assumptions about the roughness coefficients of channel cross sections that are fully vegetated with riparian vegetation.

Although land uses outside the 500-year floodplain were not specifically addressed or evaluated in this study, current and future development of adjacent uplands and tributaries could result in significant impacts to biological resources in the river. Specifically, development adjacent to the river corridor could result in an increase in runoff and a reduction of debris flows into the system due to the creation of more impervious surfaces in the upper and middle portions of the watershed. The maintenance and management of biological resources in the river will require evaluation and mitigation of the effects of changes in adjacent land uses on hydrological conditions in the study area.

Additionally, activities which alter the streambed above or below habitat areas may produce indirect or subsequent adverse effects. These activities should be evaluated on the basis of the potential significance of these indirect effects.

Mitigation Guidelines

The following general guidelines should be followed in developing specific mitigation plans:

- Impacts to biological resources should be avoided wherever possible through alternative project designs.
- Where impacts are unavoidable, projects should be designed to minimize impacts to the maximum extent feasible.
- Where impacts are unavoidable, these impacts should be mitigated appropriate to the magnitude of the impact and the value of the resources.
- Mitigation that occurs on the Santa Clara River should be consistent with the river configuration described above.
- Impacts to areas with significant conservation value, including the major blocks of riparian habitat, should be avoided. Impacts that do occur to these resources should be mitigated through restoration of the same habitat type and value on or near the site of the impact.
- Impacts to areas which have significant potential for restoration and enhancement should be mitigated in-kind and on-site or in-kind, off-site in high-priority restoration or enhancement areas.
- Impacts to other areas should be mitigated by restoration or enhancement of higher-value habitat types in high-priority restoration or enhancement areas, or provision of connection/corridor between higher-value areas.

Mitigation Programs

Coordination of Mitigation Activities

All biological mitigation activities along the Santa Clara River should be planned and implemented so that they address one or more of the conservation goals outlined above. Mitigation should add to existing habitat areas, increase connectivity along the river, or increase connectivity to adjacent habitat areas.

The Biological Resources Subcommittee identified a preliminary set of tasks which might be necessary to achieve the objectives of conservation of biological resources on the river:

1. Map habitat and wildlife populations on the river;

2. Establish population maintenance requirements;

3. Maintain fish passage;

4. Maintain/restore linkages to other (out-of-river) natural habitats;

5. Control exotics;

6. Establish guidelines for protections of natural resources for activities that might take place in the river (e.g., river crossings, bank protection);

7. Identify important areas for land acquisition;

8. Develop a public information and education program about the values of the river and living with wildlife;

9. Identify suitable mitigation sites;

10. Establish a biological management or oversight committee; and

11. Establish a long-term monitoring program (focusing on habitat quality and wildlife populations trend) with reference sites.

Landowners, local jurisdictions, and agencies with management or approval authority should incorporate the biological goals into their planning process. All proposed actions which could affect biological resources should be evaluated in the context of the river configuration discussion above, particularly with respect to conservation and management priorities.

A key to the successful coordination of mitigation activities along the river, in addition to focusing on the conservation goals and priorities outlined above, is communication among

all of the participants. Specific programs and activities that should be developed and implemented to achieve conservation of biological resources on the Santa Clara River are described below. Preliminary recommendations for the appropriate activities in each reach are summarized in Table 5-4.

Mitigation Banking Program

Restorable and enhanceable areas of the river could be set aside by landowners or local, state, or federal agencies as mitigation bank sites, as encouraged in *Federal Guidance for the Establishment, Use and Operation of Mitigation Banks,* a Memorandum to the Field dated November 20, 1995, and jointly issued by the Departments of the Army, Agriculture, Interior, and Commerce and the U.S. Environmental Protection Agency. Restoration and enhancement activities within areas identified as mitigation banks could be used to offset impacts to biological resources from projects on other parts of the Santa Clara River or, as appropriate, other areas. Project proponents could achieve mitigation by restoring or enhancing habitat on the mitigation bank sites or by buying habitat that already has been restored or enhanced for mitigation purposes on the site.

The area of the mitigation site to be restored or amount of credit acquired would depend upon the value of the habitat impacted by the project relative to the value of the habitat on the mitigation bank site. The value of the mitigation bank sites should be dependent upon the value of the site relative to achieving riverwide conservation goals.

Lands appropriate as mitigation bank sites are restorable areas adjacent to the active channel and on the first or second floodplain terrace. Many suitable sites are those locations identified as being dominated by giant cane. Some lands currently or formerly under agriculture would be suitable as mitigation or mitigation banking sites, as well.

TABLE 5-4
Recommended Primary (X) and Secondary (x) Biological Conservation Actions on Each River Segment

	River Segment											
Conservation Action	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Conservation of existing habitat	X	x	X	X	x	X	X	x	x	X	X	X
Riparian restoration and enhancement			X	X	x	x	X			x		
Mitigation banking			X	X	X	X	X					
Exotic species control	x	x	x	X	x	x	x					
Aquatic habitat conservation and enhancement	x	x	x	X	x	x	x	x	x			
Enhancement/establishment of river corridor/aquatic connectivity		X	X	X	x	x	x	X	X			
Enhancement/establishment of connections to uplands	X		X	x	x	X	X	X				
Endangered species management	x		x	x	x	x	x					

Management Programs

A number of management activities are critical to accomplish conservation and enhancement of biological resources on the Santa Clara River. These include specific management activities for riparian resources, aquatic resources, and endangered and other species of special concern; integration and coordination with flood control activities and integration with planning activities; and control programs for cowbirds and invasive plant species. For these individual programs to be effective, a mechanism for overall coordination of all activities which affect biological resources along the river would be needed.

Riparian Resource Management

The riparian habitats (primarily the riparian scrubs, woodlands, and forests) are the main riparian resources requiring management on the Santa Clara River. These habitats are comprised of native vegetation that supports many wildlife species, including several potentially occurring sensitive species (i.e., least Bell's vireo, southwestern willow flycatcher, western yellow-billed cuckoo, yellow-warbler, and yellow-breasted chat). Some of the reptile and amphibian species also depend on these riparian habitats for portions of their life cycle (e.g., arroyo toad, two-striped garter snake, and silvery legless lizard). Important management needs involve the conservation of habitats, habitat values, and habitat quality. The control of exotic species (i.e., giant cane, cowbirds) are also important management considerations.

The primary elements of management for riparian resources are:

- conservation of existing patches of native riparian scrubs, woodlands, and forests
- restoration and enhancement of disturbed and degraded areas of riparian habitat
- maintenance of viable connections between habitat patches through conservation of exiting riparian habitats or by creating connections through habitat restoration or enhancement

- management of riparian habitats with respect for sensitive species
- management of exotic pest species through control programs
- coordination and integration of riparian management needs with agriculture and grazing practices
- management of off-highway vehicle access
- coordination and integration of riparian management needs with the construction of roads and bridges
- management of recreational activities along the river (e.g., hiking, fishing, camping)

Aquatic Resource Management

The primary issues involved in the management of aquatic resources are maintenance of appropriate habitat conditions, water flows, and water quality. The primary aquatic species that would benefit from management activities are the unarmored threespine stickleback, tidewater goby, Santa Ana sucker, arroyo chub, southern steelhead, and southwestern pond turtle. Management activities that would benefit these species would also provide general benefits to aquatic habitat in the Santa Clara River.

The primary elements of management for these species are:

- development of baseline data on populations' status
- monitoring of populations and potential factors affecting them
- management responses to factors affecting populations
- coordination with other conservation and resource management activities

Management activities should be implemented so as to maximize their benefit with respect to the riverwide conservation goals and priorities outlined above. Specific management goals to improve the continuity of wetted habitat in the river include:

- additional seasonal flows,

- in-channel modifications,
- improved canopy cover,
- enhanced emergent habitat,
- restoration of past channelization,
- establishment of a primary thalweg,
- modification of in-channel barriers.

Endangered Species Management

Species-specific management programs should be developed for several riparian-dependent species along the Santa Clara River. These species include the least Bell's vireo, western yellow-billed cuckoo, southwestern willow flycatcher, and arroyo toad. Management for these species should be coordinated with management of riparian resources along the river.

The primary elements of management for these species are:

- development of baseline data on populations' status
- monitoring of populations and potential factors affecting them
- management responses to factors affecting populations
- coordination with other conservation and resource management activities
- establishment of conservation goals consistent with recovery plan goals for those species with approved recovery plans

Management activities should be implemented so as to maximize their benefit with respect to the riverwide conservation goals and priorities outlined above.

Effective management for these species will require cooperative agreements with all affected landowners, both public and private. Because of state and federal permit requirements and

species population status, management of endangered species and species of special concern will require close coordination with state and federal resource agencies.

Integration of Biological Conservation with Other Land Uses

The integration of biological conservation with other land uses could be best achieved through incorporation of the riverwide conservation goals and river configuration priorities into local general plans and community plans. In addition, regulatory agencies should take these goals and priorities into consideration as part of their discretionary review process. This would include local land use decisions, as well as decisions on state and federal actions.

Riverwide Management Program

The actual implementation of these programs can be achieved by individual landowners (both public and private), in smaller or larger river segments (e.g., within local jurisdictions), or riverwide. Having responsibility rest with individual landowners for implementing management activities is the easiest from a legal stand point, but would require the greatest level of communication, coordination, and cooperation. The effectiveness of management at this level is also problematic, because individual landowners could not be expected to have the experience and expertise necessary to effectively manage the resources. Piecemeal management activities would also increase the overall cost of management when summed over the entire river.

Riverwide management by a single entity would be the most cost-effective way to implement management programs on the river. Appropriate levels of expertise could be applied to all segments of the river in the most cost-effective manner. The level of effort required for communication and coordination would be substantially reduced as compared with implementation by individual landowners. However, riverwide management would require a level of commitment to allow access and constraint on activities by individual property owners that has been very difficult to achieve in other regional scale programs.

A management strategy between these two extremes would be most likely to be successful on the Santa Clara River. This might include some activities managed riverwide (such as giant cane control), with other activities managed by individual landowners or local jurisdictions (such as cowbird control). This would require a management group to facilitate communication, coordination, and cooperation among the landowners and agencies along the river. This management group could provide technical assistance and expertise as needed to individual landowners to accomplish specific management goals.

Section 6

Bibliography

Abell, Dana L., technical coordinator. *Proceedings of the California Riparian Systems Conference: Protection, Management, and Restoration for the 1990's.* 1988 September 22-24; Davis, California. General Technical Report PSW-110. Berkeley, California: Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture. 1989.

American Ornithologists' Union. *Check-list of North American Birds.* 6th ed. Washington, D.C.: American Ornithologists' Union. 1983.

_____. "Thirty-seventh Supplement to the American Ornithologists' Union Check-list of North American Birds." *Auk.* Vol. 106, pp. 532-538. 1989.

Borror, J. D., and R. E. White. *A Field Guide to Insects: America North of Mexico.* R. T. Peterson, ed. Boston: Houghton Mifflin. 1970.

Bautista, Shawna L. Wildlife Biologist, United States Department of Agriculture Forest Service. Letter to Paul Fromer. January 16, 1996.

California, State of. *At the Crossroads: A Report of the Status of California's Endangered and Rare Fish and Wildlife.* Sacramento: California Department of Fish and Game. 1980.

_____. *Annual Report on the Status of California's State Listed Threatened and Endangered Plants and Animals.* Sacramento: Nongame-Heritage Program, Department of Fish and Game. 1992.

_____. Natural Diversity Data Base. Sacramento: Nongame-Heritage Program, Department of Fish and Game. (Database search current through December 1996). 1995.

Cardenas, Mauricio. Fisheries Biologist, California Department of Fish and Game. Letter to Paul Fromer. January 17, 1996.

Chubb, Sara L. *Draft Watershed Analysis of Sespe Creek.* U.S. Forest Service, Los Padres National Forest. 1996.

Collins, Joseph T. *Standard Common and Current Scientific Names for Amphibians and Reptiles.* 3rd ed. Herpetological Circular No. 19. Athens, Ohio: Society for the Study of Amphibians and Reptiles. 1990.

Dickerson, Mary C. *The Frog Book: North American Toads and Frogs.* New York: Dover Publications. 1969.

Diehl, Janet, and T. S. Barrett. *The Conservation Easement Handbook.* Washington, D.C.: Land Trust Alliance. 1988.Ehrlich, Paul R. et al. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds.* New York: Simon and Schuster. 1988.

Eschmeyer, N. W. et al. *A Field Guide to Pacific Coast Fishes of North America.* R. T. Peterson, ed. Boston: Houghton Mifflin. 1983.

Faber, P. A. et al. "The Ecology of Riparian Habitats of the Southern California Coastal Region: A Community Profile." *U.S. Fish and Wildlife Service Biol. Rep.* Vol. 85, No. 7.27. 1989.

Guthrie, Daniel A. Evaluation of Least Bell's Vireo Habitat along the Santa Clara River. Prepared for Best, Best, and Krieger. Unpublished. October 1992.

_____. Bird Surveys along the Santa Clara River, 1995: Castaic Creek Downstream to Just Below Las Brisas Crossing. Prepared for Newhall Ranch Company, Valencia, California. Unpublished. July 1995.

Haglund, Thomas R. Current Status of the Unarmored Threespine Stickleback (*Gasterosteus aculeatus williamsoni*) along Portions of the Santa Clara River Drainage. Prepared for Newhall Land and Farming Company, Valencia, California. Unpublished. May 1989.

Hayes, Marc P., and M. R. Jennings. Habitat Correlates of the California Red-legged Frog (*Rana aurora draytonii*) and the Foothill Yellow-legged Frog (*Rana boylii*): Implications for Management. *Proceedings of the Symposium: Management of Amphibians, Reptiles, and Small Mammals in North America.* 1988. U.S. Forest Service General Technical Report RM-166. Pp. 144-158. 1988.

Hickman, J. C., ed. *The Jepson Manual: Higher Plants of California.* Berkeley and Los Angeles, California: University of California Press. 1993.

Holland, R. F. *Preliminary Descriptions of the Terrestrial Natural Communities of California.* Sacramento: Nongame Heritage Program, California Department of Fish and Game. October 1986.

Jackson, N. E. et al. *Arundo donax* Workshop Proceedings. Ontario, California: TEAM ARUNDO and the California Exotic Pest Plant Council. 1994.

Jennings, Mark R. Natural History and Decline of Native Ranids in California. *Proceedings of the Conference on California Herpetology.* H. P. De Lisle et al., eds. Southwestern Herpetologists Society. 1988.

Jennings, M. R., and M. P. Hayes. Amphibian and Reptile Species of Special Concern in California. Report submitted to the California Department of Fish and Game Inland Fisheries Division, Rancho Cordova, California. Unpublished. 1994.

Jones, J. K. et al. "Revised Check-list of North American Mammals North of Mexico." *Occasional Papers of the Museum, Texas Tech University.* Vol. 80. 1982. Pp. 1-22.

Katibah, E. F. *A Brief History of Riparian Forests in the Central Valley of California.* Sacramento: Nongame Heritage Program, California Department of Fish and Game. October 1984.

Lee, David S. *Atlas of North American Freshwater Fishes.* North Carolina Biological Survey. Publication No. 1980-12. 1980.

McEuen, Amy. "The Wildlife Corridor Controversy: A Review." *Endangered Species UPDATA.* Vol. 10, Nos. 11 & 12, pp. 1-6. 1993.

McEwan, D., and T. A. Jackson. Draft Steelhead Management Plan for California. Prepared for the California Department of Fish and Game. Unpublished. April 1994.

Moyle, P. B. *Inland Fishes of California.* Berkeley and Los Angeles: University of California Press. 1976.

Noss, R. F. "Protecting Habitat and Biological Diversity." Guidelines for Regional Reserve Systems (part 1). Report to the National Audubon Society. Unpublished. 1991.

Noss, R. F. and Cooperrider. *Saving Nature's Legacy.* 1994.

Page, Lawrence M., and Brooks M. Burr. *A Field Guide to Freshwater Fishes, North America, North of Mexico.* Boston: Houghton Mifflin. 1991.

RECON. Final Environmental Impact Statement and Environmental Impact Report: Section 10(a) Permit to Allow Incidental Take of the Endangered Stephens' Kangaroo Rat in Riverside County, California. Volume 1. Prepared for the U.S. Fish and Wildlife Service and the County of Riverside, Cities of Riverside, Perris, Moreno Valley, Lake Elsinore, and Hemet, California. Unpublished. March 1990a.

_____. Comprehensive Species Management Plan for the Least Bell's Vireo. Prepared for the San Diego Association of Governments. Unpublished. 1990b.

_____. Short-term Habitat Conservation Plan for the Desert Tortoise in Las Vegas Valley, Clark County, Nevada. Prepared for Clark County, Las Vegas, Nevada. Unpublished. 1991.

_____. Habitat Conservation Plan for the Northern Spotted Owl on the California Timberlands of Simpson Timber Company. Prepared for Simpson Timber Company, Arcata, California. Unpublished. April 1992.

_____. Clark County Desert Conservation Plan. Prepared for Clark County, Las Vegas, Nevada. 1994.

Reed, P. B., Jr. "National List of Plant Species That Occur in Wetlands: California (Region 0)." U.S. Fish and Wildlife Service Biol. Rep. Vol. 88, No. 26.10. 1988.

Robbins, Chandler S. et al. *Birds of North America: A Guide to Field Identification.* New York: Golden Press. 1983.

Schwartzberg, B. J., and P. A. Moore. A History of the Santa Clara River. Prepared for the Santa Clara River Enhancement and Management Plan Study. Unpublished draft report. April 1995.

Sherbrooke, Wade C. *Horned Lizards: Unique Reptiles of Western North America.* Southwest Parks and Monuments Association. 1981.

Skinner, Mark W., and B. M. Pavlik. *Inventory of Rare and Endangered Vascular Plants of California.* California Native Plant Society Special Publication No. 1 (5th ed.). February 1994.

Stebbins, Robert C. *A Field Guide to Western Reptiles and Amphibians.* 2nd ed., revised. Boston: Houghton Mifflin. 1985.

Soule, M. E., and M. E. Gilpin. "A Metapopulation Approach to Viability Analysis: The Concho Water Snake. *Journal of Wildlife Management.* 1991.

Sweet, Samuel S. *Initial Report on the Ecology and Status of the Arroyo Toad (Bufo* microscaphus californicus*) on the Los Padres National Forest of Southern California, with Management Recommendations.* Contract report to the U.S. Department of Agriculture, Forest Service, Los Padres National Forest, Goleta, California. Revised March 1992.

Thomas, J. W. et al. *A Conservation Strategy for the Northern Spotted Owl.* Portland, Oregon: Interagency Scientific Committee to Address the Conservation of the Northern Spotted Owl, U.S. Department of Agriculture, Forest Service, and U.S. Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, National Park Service. 1990.

Timossi, I. et al. *User's Manual for the California Wildlife Habitat Relationships Microcomputer Database, Version 5.* Prepared for the California Department of Fish and Game. 1991.

Unitt, P. A. *Birds of San Diego County.* Memoir No. 13, San Diego Society of Natural History. 1984.

U.S. Fish and Wildlife Service (USFWS). "Endangered and Threatened Wildlife and Plants: Determination of Endangered Status for the Arroyo Southwestern Toad; Proposed Rule." *Federal Register.* Vol. 58, p. 41231. 1993a.

_____. "Endangered and Threatened Wildlife and Plants: Determination of Endangered Status for the California Red-legged Frog; Proposed Rule." *Federal Register.* Vol. 58. 1993b.

_____. "Endangered and Threatened Wildlife and Plants: Determination of Endangered Status for the Arroyo Southwestern Toad; Final Rule." *Federal Register.* Vol. 59, p. 64859. 1994a.

_____. *Desert Tortoise (Mojave Population) Recovery Plan.* Portland, Oregon. 1994b.

_____. Notes from least Bell's vireo working group held at USFWS field office, Carlsbad, California. January 25, 1995a.

_____. "Endangered and Threatened Wildlife and Plants: Final Rule Determining Endangered Status for the Southwestern Willow Flycatcher" *Federal Register.* Vol. 60, p. 10694. 1995b.

Warner, Richard E., and K. M. Hendrix. *California Riparian Systems: Ecology, Conservation, and Productive Management.* Berkeley and Los Angeles, California: University of California Press. 1984.

Zeiner, David C. et al., eds. *California's Wildlife.* Volume I: Amphibians and Reptiles. California Statewide Wildlife Habitat Relationships System. Sacramento, California: California Department of Fish and Game. May 1988.

_____. *California's Wildlife.* Volume II: Birds. California Statewide Wildlife Habitat Relationships System. Sacramento, California: California Department of Fish and Game. November 1990a.

_____. *California's Wildlife.* Volume III: Mammals. California Statewide Wildlife Habitat Relationships System. Sacramento: California Department of Fish and Game. April 1990b.

ATTACHMENTS

ATTACHMENT 1

Attachment 1A
General List of Wildlife Species With the Potential for Occurrence on the Santa Clara River: Valley-foothill Riparian

The following information is the result of a database search of the California Statewide Wildlife Habitat Relationships System (CWHR). The purpose of the CWHR is to provide basic biological information to users about all terrestrial vertebrate species resident or regularly migrating to California based on known distribution of habitat types and habitat utilization by wildlife. The database search presented is based on a particular habitat selection criteria of habitat type and relative cover contained in the CWHR system. The CWHR database version is 1990, although the printout states 1989. All stages were used for each habitat type selected. No elements or habitat/element suitability levels were specified. The wildlife species list generated by the CWHR was then revised so that only species with the potential to occur in the area or habitats of the Santa Clara River are shown. The database search and wildlife list presented below is based on the selection criteria for all stages of valley-foothill riparian habitat as defined in the CWHR system.

CALIFORNIA DEPARTMENT OF FISH AND GAME WILDLIFE HABITAT RELATIONSHIP SYSTEM PROGRAMMED BY IRENE TIMOSSI FOR PACIFIC GAS AND ELECTRIC COMPANY
Database Version: 08/08/89 10:50:01 11/19/95

SELECTION CRITERIA:

Habitats:

1	VALLEY-FOOTHILL RIPARIAN	SEEDLING TREE	(1)
2	VALLEY-FOOTHILL RIPARIAN	SAPLING TREE SPARSE 10-24%	(2S)
3	VALLEY-FOOTHILL RIPARIAN	SAPLING TREE OPEN 25-39%	(2P)
4	VALLEY-FOOTHILL RIPARIAN	SAPLING TREE MODRTE 40-59%	(2M)
5	VALLEY-FOOTHILL RIPARIAN	SAPLING TREE DENSE 60-100%	(2D)
6	VALLEY-FOOTHILL RIPARIAN	POLE TREE SPARSE 10-24%	(3S)
7	VALLEY-FOOTHILL RIPARIAN	POLE TREE OPEN 25-39%	(3P)
8	VALLEY-FOOTHILL RIPARIAN	POLE TREE MODRTE 40-59%	(3M)
9	VALLEY-FOOTHILL RIPARIAN	POLE TREE DENSE 60-100%	(3D)
10	VALLEY-FOOTHILL RIPARIAN	SMALL TREE SPARSE 10-24%	(4S)
11	VALLEY-FOOTHILL RIPARIAN	SMALL TREE OPEN 25-39%	(4P)
12	VALLEY-FOOTHILL RIPARIAN	SMALL TREE MODRTE 40-59%	(4M)
13	VALLEY-FOOTHILL RIPARIAN	SMALL TREE DENSE 60-100%	(4D)
14	VALLEY-FOOTHILL RIPARIAN	MED/LARGE TREE SPARS 10-24%	(5S)
15	VALLEY-FOOTHILL RIPARIAN	MED/LARGE TREE OPEN 25-39%	(5P)
16	VALLEY-FOOTHILL RIPARIAN	MED/LARGE TREE MODRTE40-59%	(5M)
17	VALLEY-FOOTHILL RIPARIAN	MED/LARGE TREE DENS 60-100%	(5D)

ID	SPECIES NAME	SCIENTIFIC NAME
A007	#CALIFORNIA NEWT	Taricha torosa
A012	#ENSATINA	Ensatina eschscholtzi
A015	BLACK-BELLIED SLENDER SALAMANDER	Batrachoseps nigriventris
A016	PACIFIC SLENDER SALAMANDER	Batrachoseps pacificus
A032	#WESTERN TOAD	Bufo boreas
A035	#SOUTHWESTERN TOAD	Bufo microscaphus
A038	#CALIFORNIA TREEFROG	Hyla cadaverina
A039	#PACIFIC TREEFROG	Hlya regilla
A046	#BULLFROG	Rana catesbeiana
B044	#DOUBLE-CRESTED CORMORANT	Phalacrocorax auritus
B051	#GREAT BLUE HERON	Ardea herodias
B052	#GREAT EGRET	Casmerodius albus
B053	#SNOWY EGRET	Egretta thula
B057	#CATTLE EGRET	Bubulcus ibis
B058	GREEN-BACKED HERON	Butorides striatus
B059	BLACK-CROWNED NIGHT HERON	Nycticorax nycticorax
B076	#WOOD DUCK	Aix sponsa
B079	#MALLARD	Anas platyrhynchos
B105	#COMMON MERGANSER	Mergus merganser
B108	#TURKEY VULTURE	Cathartes aura
B110	#OSPREY	Pandion haliaetus
B111	#BLACK-SHOULDERED KITE	Elanus caeruleus
B113	#BALD EAGLE	Haliaeetus leucocephalus
B114	#NORTHERN HARRIER	Circus cyaneus
B115	#SHARP-SHINNED HAWK	Accipiter striatus
B116	#COOPER'S HAWK	Accipiter cooperii
B119	#RED-SHOULDERED HAWK	Buteo lineatus
B123	#RED-TAILED HAWK	Buteo jamaicensis
B124	#FERRUGINOUS HAWK	Buteo regalis
B126	#GOLDEN EAGLE	Aquila chrysaetos
B127	#AMERICAN KESTREL	Falco sparverius
B128	#MERLIN	Falco columbarius
B129	#PEREGRINE FALCON	Falco peregrinus
B131	#PRAIRIE FALCON	Falco mexicanus
B140	#CALIFORNIA QUAIL	Callipepla californica
B141	#MOUNTAIN QUAIL	Oreortyx pictus
B145	#VIRGINIA RAIL	Rallus limicola
B251	#BAND-TAILED PIGEON	Columba fasciata

VALLEY-FOOTHILL-RIPARIAN (CONT.)

ID	SPECIES NAME	SCIENTIFIC NAME
B255	#MOURNING DOVE	Zenaida macroura
B259	#YELLOW-BILLED CUCKOO	Coccyzus americanus
B262	#COMMON BARN OWL	Tyto alba
B264	#WESTERN SCREECH OWL	Otus kennicottii
B265	#GREAT HORNED OWL	Bubo virginianus
B273	#SHORT-EARED OWL	Asio flammeus
B282	#WHITE-THROATED SWIFT	Aeronautes saxatalis
B286	#BLACK-CHINNED HUMMINGBIRD	Archilochus alexandri
B287	#ANNA'S HUMMINGBIRD	Calypte anna
B288	#COSTA'S HUMMINGBIRD	Calypte costae
B293	#BELTED KINGFISHER	Ceryle alcyon
B296	#ACORN WOODPECKER	Melanerpes formicivorus
B299	#RED-BREASTED SAPSUCKER	Sphyrapicus ruber
B302	#NUTTALL'S WOODPECKER	Picoides nuttallii
B303	#DOWNY WOODPECKER	Picoides pubescens
B304	#HAIRY WOODPECKER	Picoides villosus
B307	#NORTHERN FLICKER	Colaptes auratus
B311	#WESTERN WOOD-PEWEE	Contopus sordioulus
B315	#WILLOW FLYCATCHER	Empidowax traillii
B320	#WESTERN FLYCATCHER	Empidonax difficilis
B321	#BLACK PHOEBE	Sayornis nigricans
B326	#ASH-THROATED FLYCATCHER	Myiarchus cinerascens
B331	#CASSIN'S KINGBIRD	Tyrannus vociferans
B333	#WESTERN KINGBIRD	Tyrannus verticalis
B339	#TREE SWALLOW	Tachycineta bicolor
B340	#VIOLET-GREEN SWALLOW	Tachycineta thalassina
B341	#NORTHERN ROUGH-WINGED SWALLOW	Stelgidopteryx serripennis
B343	#CLIFF SWALLOW	Hirundo pyrrhonota
B344	#BARN SWALLOW	Hirundo rustica
B348	#SCRUB JAY	Aphelocoma coerulescens
B353	#AMERICAN CROW	Corvus brachyrhvnchos
B354	#COMMON RAVEN	Corvus corax
B356	#MOUNTAIN CHICKADEE	Parus gambeli
B358	#PLAIN TITMOUSE	Parus inornatus
B360	#BUSHTIT	Psaltriparus minimus
B361	#RED-BREASTED NUTHATCH	Sitta canadensis
B362	#WHITE-BREASTED NUTHATCH	Sitta carolinensis
B364	#BROWN CREEPER	Certhia americana

VALLEY-FOOTHILL-RIPARIAN (CONT.)

ID	SPECIES NAME	SCIENTIFIC NAME
B367	#CANYON WREN	Catherpes mexicanus
B368	#BEWICK'S WREN	Thryomanes bewickii
B369	#HOUSE WREN	Troglodytes aedon
B370	#WINTER WREN	Troglodytes troglodytes
B372	#MARSH WREN	Cistothorus palustris
B373	#AMERICAN DIPPER	Cinclus mexicanus
B375	#GOLDEN-CROWNED KINGLET	Regulus satrapa
B376	#RUBY-CROWNED KINGLET	Regulus calendula
B377	#BLUE-GRAY GNATCATCHER	Polioptila caerulea
B380	#WESTERN BLUEBIRD	Sialia mexicana
B385	#SWAINSON'S THRUSH	Catharus ustulatus
B386	#HERMIT THRUSH	Catharus guttatus
B389	#AMERICAN ROBIN	Turdus migratorius
B390	#VARIED THRUSH	Ixoreus naevius
B391	#WRENTIT	Chamaea fasciata
B393	#NORTHERN MOCKINGBIRD	Mimus polyglottos
B398	#CALIFORNIA THRASHER	Toxostoma redivivum
B407	#CEDAR WAXWING	Bombycilla cedrorum
B408	#PHAINOPEPLA	Phainopepla nitens
B410	#LOGGERHEAD SHRIKE	Lanius ludovicianus
B411	#EUROPEAN STARLING	Sturnus vulgaris
B413	#BELL'S VIREO	Vireo bellii
B417	#HUTTON'S VIREO	Vireo huttoni
B418	WARBLING VIREO	Vireo gilvus
B425	#ORANGE-CROWNED WARBLER	Vermivora celata
B430	#YELLOW WARBLER	Dendroica petechia
B435	#YELLOW-RUMPED WARBLER	Dendroica coronata
B436	#BLACK-THROATED GRAY WARBLER	Dendroica nigrescens
B437	#TOWNSEND'S WARBLER	Dendroica townsendi
B438	#HERMIT WARBLER	Dendroica occidentalis
B461	#COMMON YELLOWTHROAT	Geothlypis trichas
B463	#WILSON'S WARBLER	Wilsonia pusilla
B467	#YELLOW-BREASTED CHAT	Icteria virens
B471	#WESTERN TANAGER	Piranga ludoviciana
B475	#BLACK-HEADED GROSBEAK	Pheucticus melanocephalus
B476	#BLUE GROSBEAK	Guiraca caerulea
B477	#LAZULI BUNTING	Passerina amoena
B483	#RUFOUS-SIDED TOWHEE	Pipilo erythrophthalmus

VALLEY-FOOTHILL-RIPARIAN (CONT.)

ID	SPECIES NAME	SCIENTIFIC NAME
B484	#BROWN TOWHEE	Pipilo fuscus
B489	#CHIPPING SPARROW	Spizella passerina
B495	#LARK SPARROW	Chondestes grammacus
B499	#SAVANNAH SPARROW	Passerculus sandwichensis
B504	#FOX SPARROW	Passerella iliaca
B505	#SONG SPARROW	Melospiza melodia
B506	#LINCOLN'S SPARROW	Melospiza lincolnii
B509	#GOLDEN-CROWNED SPARROW	Zonotrichia atricapilla
B510	#WHITE-CROWNED SPARROW	Zonotrichia leucophrys
B512	#DARK-EYED JUNCO	Junco hyemalis
B519	#RED-WINGED BLACKBIRD	Agelaius phoeniceus
B520	#TRICOLORED BLACKBIRD	Agelaius tricolor
B524	#BREWER'S BLACKBIRD	Euphagus cyanocephalus
B528	#BROWN-HEADED COWBIRD	Molothrus ater
B530	#HOODED ORIOLE	Icterus cucullatus
B532	#NORTHERN ORIOLE	Icterus galbula
B536	#PURPLE FINCH	Carpodacus purpureus
B538	#HOUSE FINCH	Carpodacus mexicanus
B542	#PINE SISKIN	Carduelis pinus
B543	#LESSER GOLDFINCH	Carduelis psaltria
B544	#LAWRENCE'S GOLDFINCH	Carduelis lawrencei
B545	#AMERICAN GOLDFINCH	Carduelis tristis
M001	#VIRGINIA OPOSSUM	Didelphis virginiana
M006	ORNATE SHREW	Sorex ornatus
M018	#BROAD-FOOTED MOLE	Scapanus latimanus
M023	#YUMA MYOTIS	Myotis yumanensis
M025	#LONG-EARED MYOTIS	Myotis evotis
M026	#FRINGED MYOTIS	Myotis thysanodes
M027	#LONG-LEGGED MYOTIS	Myotis volans
M028	#CALIFORNIA MYOTIS	Myotis californicus
M029	#SMALL-FOOTED MYOTIS	Myotis leibii
M031	#WESTERN PIPISTRELLE	Pipistrellus hesperus
M032	#BIG BROWN BAT	Eptesicus fuscus
M033	#RED BAT	Lasiurus borealis
M034	#HOARY BAT	Lasiurus cinereus
M036	#SPOTTED BAT	Euderma maculatum
M037	#TOWNSEND'S BIG-EARED BAT	Plecotus townsendii
M038	#PALLID BAT	Antrozous pallidus

VALLEY-FOOTHILL-RIPARIAN (CONT.)

ID	SPECIES NAME	SCIENTIFIC NAME
M039	#BRAZILIAN FREE-TAILED BAT	Tadarida brasiliensis
M042	#WESTERN MASTIFF BAT	Eumops perotis
M045	#BRUSH RABBIT	Sylvilagus bachmani
M047	#DESERT COTTONTAIL	Sylvilagus audubonii
M051	#BLACK-TAILED HARE	Lepus californicus
M060	#MERRIAM'S CHIPMUNK	Tamias merriami
M072	#CALIFORNIA GROUND SQUIRREL	Spermophilus beecheyi
M081	#BOTTA'S POCKET GOPHER	Thomomys bottae
M103	#PACIFIC KANGAROO RAT	Dipodomys agilis
M113	#WESTERN HARVEST MOUSE	Reithrodontomys megalotis
M116	CALIFORNIA MOUSE	Peromyscus californicus
M117	DEER MOUSE	Peromyscus maniculatus
M119	BRUSH MOUSE	Peromyscus boylii
M120	#PINYON MOUSE	Peromyscus truei
M122	#SOUTHERN GRASSHOPPER MOUSE	Onychomys torridus
M127	#DUSKY-FOOTED WOODRAT	Neotoma fuscipes
M134	#CALIFORNIA VOLE	Microtus californicus
M140	#BLACK RAT	Rattus rattus
M142	#HOUSE MOUSE	Mus musculus
M146	#COYOTE	Canis latrans
M149	#GRAY FOX	Urocyon cinereoargenteus
M151	#BLACK BEAR	Ursus americanus
M152	#RINGTAIL	Bassariscus astutus
M153	#RACCOON	Procyon lotor
M157	#LONG-TAILED WEASEL	Mustela frenata
M160	#BADGER	Taxidea taxus
M161	#WESTERN SPOTTED SKUNK	Spilogale gracilis
M162	#STRIPED SKUNK	Mephitis mephitis
M165	#MOUNTAIN LION	Felis concolor
M166	#BOBCAT	Felis rufus
M181	#MULE DEER	Odocoileus hemionus
R004	#WESTERN POND TURTLE	Clemmys marmorata
R022	#WESTERN FENCE LIZARD	Sceloporus occidentalis
R024	#SIDE-BLOTCHED LIZARD	Uta stansburiana
R029	#COAST HORNED LIZARD	Phrynosoma coronatum
R036	#WESTERN SKINK	Eumeces skiltonianus
R037	#GILBERT'S SKINK	Eumeces gilberti
R039	#WESTERN WHIPTAIL	Cnemidophorus tigris

Attachment 1B
General List of Wildlife Species With the Potential for Occurrence on the Santa Clara River: Freshwater-Emergent

The following information is the result of a database search of the California Statewide Wildlife Habitat Relationships System (CWHR). The purpose of the CWHR is to provide basic biological information to users about all terrestrial vertebrate species resident or regularly migrating to California based on known distribution of habitat types and habitat utilization by wildlife. The database search presented is based on a particular habitat selection criteria of habitat type and relative cover contained in the CWHR system. The CWHR database version is 1990, although the printout states 1989. All stages were used for each habitat type selected. No elements or habitat/element suitability levels were specified. The wildlife species list generated by the CWHR was then revised so that only species with the potential to occur in the area or habitats of the Santa Clara River are shown. The database search and wildlife list presented below is based on the selection criteria for all stages of freshwater emergent habitat as defined in the CWHR system.

CALIFORNIA DEPARTMENT OF FISH AND GAME WILDLIFE HABITAT RELATIONSHIP SYSTEM
PROGRAMMED BY IRENE TIMOSSI FOR PACIFIC GAS AND ELECTRIC COMPANY
Database Version: 08/08/89 10:52:35 11/19/95

SELECTION CRITERIA:

Habitats:

1	FRESH EMERGENT WETLAND	SHORT HERB	SPARSE	2-09% (1)
2	FRESH EMERGENT WETLAND	SHORT HERB	OPEN	10-39% (1)
3	FRESH EMERGENT WETLAND	SHORT HERB	MODRTE	40-59% (1)
4	FRESH EMERGENT WETLAND	SHORT HERB	DENSE	60-100% (1)
5	FRESH EMERGENT WETLAND	TALL HERB	SPARSE	2-09% (2S)
6	FRESH EMERGENT WETLAND	TALL HERB	OPEN	10-39% (2P)
7	FRESH EMERGENT WETLAND	TALL HERB	MODRTE	40-59% (2M)
8	FRESH EMERGENT WETLAND	TALL HERB	DENSE	60-100% (2D)

ID	SPECIES NAME	SCIENTIFIC NAME
A007	#CALIFORNIA NEWT	Taricha torosa
A032	#WESTERN TOAD	Bufo boreas
A039	#PACIFIC TREEFROG	Hlya regilla
A040	#RED-LEGGED FROG	Rana aurora

FRESH EMERGENT WETLAND (CONT.)

ID	SPECIES NAME	SCIENTIFIC NAME
A046	#BULLFROG	Rana catesbeiana
B006	#PIED-BILLED GREBE	Podilymbus podiceps
B009	#EARED GREBE	Podiceps nigricollis
B010	#WESTERN GREBE/CLARK'S GREBE	Aechmophorus occidentalis/Clarkii
B044	#DOUBLE-CRESTED CORMORANT	Phalacrocorax auritus
B049	#AMERICAN BITTERN	Botaurus lentiginosus
B051	#GREAT BLUE HERON	Ardea herodias
B052	#GREAT EGRET	Casmerodius albus
B053	#SNOWY EGRET	Egretta thula
B057	#CATTLE EGRET	Bubulcus ibis
B058	GREEN-BACKED HERON	Butorides striatus
B059	BLACK-CROWNED NIGHT HERON	Nycticorax nycticorax
B062	#WHITE-FACED IBIS	Plegadis chihi
B070	#GREATER WHITE-FRONTED GOOSE	Anser albifrons
B074	#BRANT	Branta bernicla
B075	#CANADA GOOSE	Branta canadensis
B076	#WOOD DUCK	Aix sponsa
B077	#GREEN-WINGED TEAL	Anas crecca
B079	#MALLARD	Anas platyrhynchos
B080	#NORTHERN PINTAIL	Anas acuta
B082	#BLUE-WINGED TEAL	Anas discors
B083	#CINNAMON TEAL	Anas cyanoptera
B084	#NORTHERN SHOVELER	Anas clypeata
B085	#GADWALL	Anas strepera
B086	#EURASIAN WIGEON	Anas penelope
B087	#AMERICAN WIGEON	Anas americana
B089	#CANVASBACK	Aythya valisineria
B090	#REDHEAD	Aythya americana
B091	#RING-NECKED DUCK	Aythya collaris
B094	#LESSER SCAUP	Aythya affinis
B103	#BUFFLEHEAD	Bucephala albeola
B104	#HOODED MERGANSER	Lophodytes cucullatus
B105	#COMMON MERGANSER	Mergus merganser
B107	#RUDDY DUCK	Oxyura jamaicensis
B110	#OSPREY	Pandion haliaetus
B111	#BLACK-SHOULDERED KITE	Elanus caeruleus
B113	#BALD EAGLE	Haliaeetus leucocephalus
B114	#NORTHERN HARRIER	Circus cyaneus

FRESH EMERGENT WETLAND (CONT.)

ID	SPECIES NAME	SCIENTIFIC NAME
B119	#RED-SHOULDERED HAWK	Buteo lineatus
B123	#RED-TAILED HAWK	Buteo jamaicensis
B124	#FERRUGINOUS HAWK	Buteo regalis
B125	#ROUGH-LEGGED HAWK	Buteo lagopus
B126	#GOLDEN EAGLE	Aquila chrysaetos
B127	#AMERICAN KESTREL	Falco sparverius
B128	#MERLIN	Falco columbarius
B129	#PEREGRINE FALCON	Falco peregrinus
B131	#PRAIRIE FALCON	Falco mexicanus
B145	#VIRGINIA RAIL	Rallus limicola
B146	#SORA	Porzana carolina
B148	#COMMON MOORHEN	Gallinula chloropus
B149	#AMERICAN COOT	Fulica americana
B151	#BLACK-BELLIED PLOVER	Pluvialis squatarola
B156	#SEMIPALMATED PLOVER	Charadrius semipalmatus
B158	#KILLDEER	Charadrius vociferus
B163	#BLACK-NECKED STILT	Himantopus mexicanus
B164	#AMERICAN AVOCET	Recurvirostra americana
B165	#GREATER YELLOWLEGS	Tringa melanoleuca
B166	#LESSER YELLOWLEGS	Tringa flavipes
B168	#WILLET	Catoptrophorus semipalmatus
B170	#SPOTTED SANDPIPER	Actitis macularia
B172	#WHIMBREL	Numenius phaeopus
B173	#LONG-BILLED CURLEW	Numenius americanus
B176	#MARBLED GODWIT	Limosa fedoa
B183	#WESTERN SANDPIPER	Calidris mauri
B185	#LEAST SANDPIPER	Calidris minutilla
B191	#DUNLIN	Calidris alpina
B196	#SHORT-BILLED DOWITCHER	Limnodromus griseus
B197	#LONG-BILLED DOWITCHER	Limnodromus scolopaceus
B199	#COMMON SNIPE	Gallinago gallinago
B211	#BONAPARTE'S GULL	Larus philadelphia
B214	#RING-BILLED GULL	Larus delawarensis
B215	#CALIFORNIA GULL	Larus californicus
B227	#CASPIAN TERN	Sterna caspia
B231	#COMMON TERN	Sterna hirundo
B233	#FORSTER'S TERN	Sterna forsteri
B235	#BLACK TERN	Chlidonias niger

FRESH EMERGENT WETLAND (CONT.)

ID	SPECIES NAME	SCIENTIFIC NAME
M142	#HOUSE MOUSE	Mus musculus
M146	#COYOTE	Canis latrans
M149	#GRAY FOX	Urocyon cinereoargenteus
M153	#RACCOON	Procyon lotor
M162	#STRIPED SKUNK	Mephitis mephitis
M166	#BOBCAT	Felis rufus
R004	#WESTERN POND TURTLE	Clemmys marmorata
R051	#RACER	Coluber constrictor
R058	#COMMON KINGSNAKE	Lampropeltis getulus
R061	#COMMON GARTER SNAKE	Thamnophis sirtalis
R063	#WESTERN AQUATIC GARTER SNAKE	Thamnophis couchi
R076	#WESTERN RATTLESNAKE	Crotalus viridis

ATTACHMENT 3

Revegetation Planning

Detailed Analysis of Site Conditions
- Laboratory Analysis of Soil Samples
- Description of Soils and Soil Moisture
- Discussion of Soil Problems and Need for Correction
- Depth to Groundwater and/or the Results of Piezometer Monitoring
- Evaluation of Rainfall Data. Effect on Plant Selection, Propagule Choice, Irrigation Requirements, etc.
- Anticipated Extent and Duration of Flooding/Inundation
- Analysis of Effect of Slope and Aspect on Plant Selection, and Planting Plan
- Availability of Water for Irrigation

Selection of Plant Materials
- Plant Species Selection (Plant Palette)
- Preferred Type of Planting Stock
- Amount of Each Type of Plant Material Required
- Recommended Source(s) of Plant Materials
- Localities for Collection of Plant Materials
- Lead Time Required for Procurement of Plant Materials
- Recommended Planting Time Period

Site Preparation Needs
- Grading and Drainage Needs
- Weed Control
- Removal of Invasive Non-native Plants
- Pest Control
- Tillage
- Soil Augmentation
- Top Soiling

Preliminary Planting Design and Layout
- Plant Mixes/Planting Associations
- Zones to be Planted (with appropriate mixes)
- Desired % Composition for Plant Species
- Plant Spacing and Planting Density
- Design Considerations (clustering, etc.)
- Seed Mix and Rate for Herbaceous Ground Cover

Plant Protection Measures
- Browse Protection
- Seed Protection
- Staking
- Sun Protection
- Insect Protection
- Weed Control
- Fungal Protection
- Wind Protection
- Erosion Control
- Vandalism Protection

Irrigation System Guidelines
- Plant Species/Propagule Water Requirements
- Preferred Type of Irrigation
- Irrigation Schedule
- Amount of Water to be Delivered

Methods and Procedures for Installation of Plant Materials
- Purchasing, Transportation, and Storage of Plant Materials
- Collection and Handling of On-site Material
- Layout (flagging) of Planting Locations
- Methods of Installation
- Schematic Drawings of Installation Procedures
- Application of Fertilizer in Planting Holes
- Watering Basins, etc.
- Mulching
- Timing and Coordination

Establishment Period Maintenance Planning
- Length of Establishment Period
- Control of Weed Competition
- Erosion Control
- Acceptable Mortality and Replacement of Plants
- Frequency and Amount of Irrigation
- Other Maintenance (fertilization, thinning of direct seed sites, etc.)
- Maintenance Schedule
- Strategy for Control of Vandalism
- Supplemental Planting
- Success Criteria/Performance Standards

Planning For Establishment Period Monitoring and Reporting
- Documentation Procedures During Installation
- Monitoring of Plant Survival, Growth, and Vigor
- Monitoring of Environmental Conditions
- Photodocumentation of Results
- Periodic Sampling of Conditions and Cover
- Monitoring of Wildlife Use

Preliminary Cost Analysis
- Labor and Equipment Needed for Site Preparation and Installation
- Materials Costs
- Establishment Period Maintenance Costs

ATTACHMENT 4

CALIFORNIA EXOTIC PEST PLANT COUNCIL

EXOTIC PEST PLANTS

OF GREATEST ECOLOGICAL CONCERN IN CALIFORNIA

September 1994

CalEPPC's 1994 list of exotic pest plants of greatest ecological concern in California reflects information derived from our members and many other sources. This list focuses on exotic plants that are serious problems **in wildlands** (e.g., natural areas that support native ecosystems, including national, state and local parklands, ecological reserves, wildlife areas, national forests, BLM lands etc.). Most plants that fall into one or more of the following categories have not been included: (1) found mainly or solely in disturbed areas, (2) those presently judged uncontrollable (e.g. Mediterranean annual grasses and filarees), (3) established only sparingly, or (4) confined to roadsides and agricultural fields.

Potential uses for this list include: (1) inform the public, (2) target species for control efforts, (3) alert restorationists to potential problem species, (4) aid to those who comment on environmental documents, and (5) solicit additional information on exotic plants with unknown or changing status.

Thanks to all those who commented on the 1994 draft list. The CalEPPC List will be updated regularly, based on new information. Send any comments, suggestions or new information to Ann Howald, CDFG, P.O. Box 47,, Yountville, CA, 94599, or to Jake Sigg, 338 Ortega Street, San Francisco, CA, 94122, or to Dr. John Randall, Exotic Species Program, TNC, 13501 Franklin Blvd., Galt, CA 95632.

The Review Committee for the 1994 list consisted of:

Dr. John Randall, Invasive Weed Specialist, The Nature Conservancy

Jake Sigg, Chairman, Invasive Exotics Committee, California Native Plant Society

Ann Howald, Plant Ecologist, California Department of Fish and Game

LIST A: **MOST INVASIVE WILDLAND PEST PLANTS (Aggressive pest plants that threaten native plants and natural habitats)**

List A-1: WIDESPREAD PEST PLANTS

List A-2: REGIONAL PEST PLANTS

List A-1 MOST INVASIVE WILDLAND PEST PLANTS: WIDESPREAD

Scientific Name	Common Name	Comments	Distribution*
Ammophila arenaria	European beach grass	Invades coastal dunes	SCo,CCo, NCo
Arundo donax	giant reed	Invades riparian areas	eSNF,CCo,SCo,SnGb,D,GV
Bromus tectorum	cheat grass	Invades sagebrush, pinyon-juniper wdlds, other desert shrub communities	GB,D
Carpobrotus edulis	freeway iceplant	Invades many coastal communities, esp. dunes	SCo,CCo,NCo
Centaurea solstitialis	yellow star thistle	Invades grasslands	CA-FP (rare in SoCal)
Cotoneaster (all species and hybrids)	cotoneaster	Invades many coastal communities	CCo,NCo,SnFrB
Cortaderia jubata	Andean pampas grass, jubatagrass	Invades coastal habitats/sandy sites	SCo,CCo,NCo,NCoRO
Cortaderia selloana	Pampas grass	Invades coastal dunes, coastal scrub, Monterey pine forest	SCo,CCo
Cynara cardunculus	artichoke thistle	Invades grasslands	CA-FP
Cytisus scoparius	Scotch broom	Invades coastal scrub, oak woodlands	NW,CaRF,SNF,GV,SCo,SnFrB
Cytisus striatus	Portuguese broom	Often confused w/ *C. scoparius*	SnFrB,SCo,PR
Foeniculum vulgare	wild fennel, anise	Invades grasslands; esp. SoCal, Santa Cruz Island; also on roadsides	CA-FP
Eucalyptus globulus	Tasmanian blue gum	Spreads in riparian areas, grasslands, dunes, moist slopes	NCoRO,GV,SnFrB,SCoRO,SCo, nChI

* CA=California, CA-FP=California Floristic Province, CaR=Cascade Ranges, CaRF=CR Foothills, CCo=Central Coast, ChI=Channel Islands, CW=Central Western California, D=Deserts, DMoj=Mojave Desert, GB=Great Basin, GV=Great Valley, KR=Klamath Ranges, MP=Modoc Plateau, NCo=North Coast, NCoRI=Inner NCo Ranges, NCoRO=Outer NCo Ranges, NW=Northwestern CA, PR=Peninsular Ranges, SCo=South Coast, SCoRI=Inner SCo Ranges, SCoRO=Outer SCo Ranges, ScV=Sacramento Valley, SnJV=San Joaquin Valley, SN=Sierra Nevada, SNE=East of SN, SNF=SN Foothills, SnFrB=San Francisco Bay Area, SnGb=San Gabriel Mtns, SW=Southwestern CA, Teh=Tehachapi Mtns, WTR=Western Transverse Ranges

Genista monspessulana (=*Cytisus monspessulanus*)	French broom	Invades coastal scrub, oak woodlands	NCoRO,NCoRI,SnFrB,SCoRO, sChI,WTR,PR
Hedera helix	English ivy	Spreads in riparian areas, oak woodlands	CA-FP
Pennisetum setaceum	fountain grass	Invades grasslands, desert canyons; also on roadsides	Deltaic GV,CCo,SCo,SnFrB
Rubus discolor (=*R. procerus*)	Himalayaberry, blackberry	Invades riparian areas, marshes, oak woodlands	CA-FP
Senecio mikanioides	German ivy	Invades coastal and riparian areas	SCo,CCo,NCo,SnFrB
Tamarix chinensis (and all other species except *T. aphylla*)	tamarisk, salt cedar	Invades desert washes, riparian areas	SCo,D,SnFrB,GV,sNCoR,sSNF, Teh,SCoRI,SNE,WTR
Ulex europaeus	gorse	Invades north and central coastal scrub	NCo,NCoRO,CaRF,n&cSNF,SnFrB

List A-2 MOST INVASIVE WILDLAND PEST PLANTS: REGIONAL

Scientific Name	Common Name	Comments	Distribution*
Aptenia cordifolia	red apple	Habitats?	CCo,SCo,sChI
Atriplex semibaccata	Australian saltbush	Invades coastal grasslands and scrub, and "high marsh" of coast salt marsh	CA (except CaR,c&sSN)
Cardaria draba	white-top, hoary cress	Invades riparian areas, marshes of central coast; also ag lands, disturbed areas	Problem only in CCo
Conicosia pugioniformis	narrow-leaved iceplant, roundleaf iceplant	Invades coastal dunes, sandy soils near coast	CCo
Elaeagnus angustifolia	Russian olive	Invades interior riparian areas	SnJV,SnFrB,SNE,DMoj
Ehrharta calycina	Veldt grass	Invades sandy soils, esp. dunes	CCo,SCoRO,WTR
Eichhornia crassipes	water hyacinth	Established in natural lakes & ponds?	GV,SnFrB,SCo,PR

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Euphorbia esula	leafy spurge	Invades rangelands	eKR,NCo,CaR,MP
Lupinus arboreus	bush lupine	Native to So/Central CA; invades No coast dunes	Problem only in NCo
Myoporum laetum	myoporum	Invades coastal riparian areas	Problem only in SCo
Vinca major	periwinkle	Invades riparian areas, oak woodlands	NCoRO,SnFrB,sSCoRO,SCo

LIST B: WILDLAND PEST PLANTS OF LESSER INVASIVENESS

Scientific Name	Common Name	Comments	Distribution*
Ageratina adenophora (=*Eupatorium adenophorum*)	eupatory	Invades coastal canyons, San Diego to Marin Co; San Gabriel Mtns	CCo,SnFrB,SCo,SCoRO
Ailanthus altissima	tree of heaven	Invades riparian areas	CA-FP
Bassia hyssopifolia	bassia	Invades alkaline habitats	CA (except NW,SNH)
Cardaria chalapense	lens-podded white-top	Invades wetlands of Central Valley	CA
Centaurea calcitrapa	purple star thistle	Invades grasslands	NW,sCaRF,SNF,GV,CW,SW
Cirsium arvense	Canada thistle	Especially troublesome in riparian areas; also in disturbed sites	CA-FP
Cirsium vulgare	bull thistle	Invades riparian areas, marshes, meadows; also in disturbed sites	CA-FP,GB
Digitalis purpurea	foxglove	Invades prairies, meadows; also in disturbed sites	NCo,NCoRO,SnFrB,SCoRO
Erechtites glomerata and *E. minima*	Australian fireweed	Invades coastal woodlands	NCo,NCoRO,CCo,SnFrB,SCoRO
Ficus carica	edible fig	Invades Central Valley riparian woodlands	GV

* CA=California, CA-FP=California Floristic Province, CaR=Cascade Ranges, CaRF=CR Foothills, CCo=Central Coast, ChI=Channel Islands, CW=Central Western California, D=Deserts, DMoJ=Mojave Desert, GB=Great Basin, GV=Great Valley, KR=Klamath Ranges, MP=Modoc Plateau, NCo=North Coast, NCoRI=Inner NCo Ranges, NCoRO=Outer NCo Ranges, NW=Northwestern CA, PR=Peninsular Ranges, SCo=South Coast, SCoRI=Inner SCo Ranges, SCoRO=Outer SCo Ranges, ScV=Sacramento Valley, SnJV=San Joaquin Valley, SN=Sierra Nevada, SNE=East of SN, SNF=SN Foothills, SnFrB=San Francisco Bay Area, SnGb=San Gabriel Mtns, SW=Southwestern CA, Teh=Tehachapi Mtns, WTR=Western Transverse Ranges

Lepidium latifolium	perennial pepperweed	Invades coastal and inland marshes; also in disturbed sites	CA (except KR,D)
Mentha pulegium	pennyroyal	Invades SF Bay area wetlands	NW,GV,CW,SCo
Phalaris aquatica	Harding grass	Invades coastal sites, esp. w/ moist soils	NW,cSNF,CCo,SCo
Piptatherum miliaceum	smilo grass	Aggressive in SoCal creeks and canyons	NCo,GV,CW,SCo
Ricinus communis	castor bean	Aggressive in SoCal coastal riparian habitats	GV,SCo,CCo
Robinia pseudoacacia	black locust	Spreads to riparian areas, canyons	CA-FP,GB
Senecio jacobaea	tansy ragwort	Invades grasslands; biological control is effective	NCo,wKR,s&wCaR,nSNF,nScV,SW
Spartium junceum	Spanish broom	Invades coastal scrub, oak woodland; also on roadcuts, disturbed sites	NCoRO,ScV,SnFrB,SCoRO,SCo
Verbascum thapsus	woolly mullein	Invades eCA meadows, sagebrush, pinyon-juniper woodlands	CA

RED ALERT: SPECIES WITH POTENTIAL TO SPREAD EXPLOSIVELY; INFESTATIONS CURRENTLY RESTRICTED IN SIZE

Scientific Name	Common Name	Comments	Distribution*
Alhagi pseudalhagi (=A. camelorum)	camel thorn	Noxious weed of arid areas; most infestations have been eradicated	GV,sSNE,D
Arctotheca calendula	capeweed	Seed-producing types are the problem; most are vegetative only	NCo,SnFrB
Crataegus monogyna	hawthorn	Recent invader	SnFrB (Crystal Springs reservoir)
Halogeton glomeratus	halogeton	Noxious weed of rangelands; report locations to CA Food & Ag; eradication program in place	GB

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Hydrilla verticillata	hydrilla	Noxious water weed; report locations to CA Food & Ag; eradication program in place	Found in Clear Lake (Lake Co) in 1994
Lythrum salicaria	purple loosestrife	Noxious weed of wetlands	sNCo,NCoRO,nSNF,ScV,SnFrB,nw MP
Retama monosperma (=Genista m.)	bridal broom	Could rival other brooms in invasiveness	San Diego Co.; Monterey?
Spartina alterniflora	saltwater cordgrass	Other locations?	North coast salt marshes

NEED MORE INFORMATION

Scientific Name	Common Name	Comments	Distribution*
Acacia baileyana	Cootamundra wattle	Wildland problem? Jepson reports as uncommon, roadsides, disturbed sites	SnFrB,SCoRO,WRT
Acacia decurrens	green wattle	Reports of wildland invasion unconfirmed	Disturbed coastal, urban areas
Acacia melanoxylon	black acacia	Threat to wildlands? Jepson reports as uncommon, disturbed areas	SnFrB,SCoRO,SCo,sChI
Amaranthus albus	tumbleweed	Serious natural areas weed?	CA
Brassica tournefortii		Threat to wildlands?	SW,D
Bromus madritensis ssp. rubens	red brome	Threatens desert shrub communities?	CA
Carduus acanthoides	giant plumeless thistle	Threatens wildlands?	NCoRI,nSN,SnFrB,nSCoRO,MP
Conium maculatum	poison hemlock	Threatens wildlands?	CA-FP
Coprosma repens	mirror plant	Threat to wildlands? Not in Jepson Manual	?
Cordyline australis	New Zealand cabbage tree	Infestation at Salt Point State Park; other problem areas?	?

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Echium candicans (=E. fastuosum)	pride of Madeira	Threatens wildlands?	CCo
Echium pininana	pride of Teneriffe	Threatens wildlands?	CCo
Ehrharta erecta		Threatens wildlands?	eSnFrB,nSCo (Santa Barbara, Ventura cos.)
Ilex aquifolium	English holly	Threat to North Coastal forests?	NCoRO,SnFrB
Mesembryanthemum crystallinum	crystalline iceplant	Threat to coastal bluffs, dunes, scrub and grasslands?	NCo,CCo,Sco,ChI
Mesembryanthemum nodiflorum	slender-leaved iceplant	Abundant on Channel Islands; invades wildlands?	SnFrB,SCo,ChI
Nerium oleander	oleander	Threatens wildlands? Not in Jepson Manual	Upper Sacramento River?
Nicotiana glauca	tree tobacco	Threat to coastal scrub, chaparral?	NCoRI,c&sSNF,GV,CW,SW,D
Parentucellia latifolia		Threat to grasslands?	Marin, Sonoma Cos.
Parentucellia viscosa		Threat to North Coast dune swales?	Humboldt Co.
Pennisetum clandestinum	Kikuyu grass	Invades wildlands in coastal areas?	NCo,CCo,SnFrB,SCo,nChI (Santa Cruz Island)
Phyla nodiflora (=Lippia nodiflora)	lippia	Invades vernal pools, wetlands? Some varieties are native.	NW (exceptKR,NCoRH),GV,CCo, SnFrB,SCo,PR,DSon
Pinus radiata	Monterey pine	Cultivars invading, spreading disease in native stands?	Problem in Monterey and Cambria forests?
Salsola soda	glasswort	Threat to salt marshes?	nCCo (San Francisco Bay)
Salvia aethiopsis	Mediterranean sage	Threat to wildlands?	MP
Senecio elegans	purple ragwort	Problem on North Coast dunes?	CCo,SnFrB,SCo
Silybum marianum	milk thistle	Interferes with restoration; problem in wildlands?	NCo,NCoR,GV,SnFrB,SCoR,SCo, ChI
Spartina densiflora	dense-flowered cordgrass	Invading coastal salt marshes?	NCo,CCo

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Tanacetum vulgare	tansy	Problem in wildlands? Jepson reports as uncommon, escape from cultivation in urban areas	NCo,NCoRO,CaRH,SCoRO
Watsonia bulbillifera		Problem in wildlands?	?

CONSIDERED BUT NOT LISTED

Scientific Name	Common Name	Comments
Albizia lophantha	plume acacia	Not invasive
Carduus pycnocephala	Italian thistle	Restricted to disturbed sites
Carpobrotus chilensis	sea fig	Not a threat to wildlands; doesn't outcompete natives
Centranthus ruber	red valerian	Not a threat to wildlands
Convolvulus arvensis	field bindweed	Restricted to disturbed sites; ag lands
Dipsacus spp.	fuller's teasel	Restricted to roadsides, disturbed sites
Medicago polymorpha	bur clover	Restricted to disturbed sites
Melilotus officinalis	sweet clover	Restricted to disturbed sites in CA
Oxalis pes-caprae	Bermuda buttercup	Restricted to disturbed sites
Raphanus sativus	wild radish	Restricted to disturbed sites; ag lands
Salsola tragus (=S. kali)	Russian thistle, tumbleweed	Restricted to disturbed sites
Xanthium spinosum	spiny cocklebur	Jepson and Munz identify as native
Zoysia cultivars	Amazoy and others	No evidence of wildland threat

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ATTACHMENT 5

Attachment 5

Giant Cane (*Arundo donax*) Control Program

(Modified from Jackson, N.E. et. al. *Arondo donax* Workshop Proceedings. Ontario, Califorina: TEAM ARUNDO and the California Exotic Pest Plant Council. 1994.)

How to Remove Giant Cane - The Menu[1]

I. Degree of Infestation

Map the distribution of giant cane on the Santa Clara River

II. Limited/Early Stages of Infestation

A. Spot applications following listed procedures:

1. Notification of neighbors

2a. Foliar application procedures:

a. Herbicide: Rodeo aquatic herbicide by hand, 11/2% v/v solution plus 1/2% v/v nonionic surfactant

b. Spraying crew: handgun or backpack

c. Monthly "summary of use" to Agriculture Commissioner

2b. Cut-stump application procedures:

a. Herbicide: Rodeo aquatic herbicide, 100% solution of herbicide applied to entire area of cut stump within 5 minutes of cutting stalk

b. Spraying crew: optimum crew consists of 1 cutter, 1 herbicide applicator, and 3 debris removers

c. Monthly "summary of use" to Agriculture Commissioner

3. Safety

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[1]Note: In terrestrial areas, Roundup herbicide may be used instead of Rodeo aquatic herbicide. The recommended rates for use are spot treatment at 2% volume per volume (v/v) and broadcast and aerial treatments at 5 quarts per acre.

a. Proper notifications

b. Avoid herbicide application to desirable plant materials

c. Follow chemical labeling and regulations

d. Proper training: hazardous materials training program

B. Monitoring

See section V

C. Repeat herbicide application(s) (if necessary)

1. Repeat applications as necessary following applications procedures

2. Optimum time for treatment of giant cane regrowth is at 5-7 feet in height

III. Severe Infestation of Pure Stands of Giant Cane

A. Foliar spot and aerial applications following listed procedures:

1. Notification of neighbors

2. Application procedures:

a. Herbicide: Rodeo aquatic herbicide by hand, see section IIA; by air, 7 1/2 pints Rodeo herbicide per acre plus 1/2% v/v nonionic surfactant in 10-15 gallons of spray solution per acre following Rodeo supplemental label only; notify Agriculture Commissioner as a courtesy

b. Spraying crews: ground applications by handgun or backpack; aerial applications by aerial service (i.e., Hummingbird helicopter)

c. Monthly "summary of use" to Agriculture Commissioner

3. Safety

a. Proper notifications

b. Avoid herbicide applications to desirable plant material

c. Follow chemical labeling and regulations

d. Proper training: hazardous materials training program

B1. Burning of Standing Giant Cane (natural or prescribed burn)

1. Permits required

a. Air Quality Management District

b. County Fire Department/California Department of Forestry (CDF)

2. Notification

a. CDF

b. Neighbors

c. City Fire Department

d. City Police Department

e. California Highway Patrol

f. County and City transportation departments

3. Safety

a. Adequate firebreaks by CDF crews

b. Avoid damage to desirable plant materials

c. Timing: monitoring and availability of CDF crews

4. Monitoring

See section V

5. Repeat herbicide application(s) (if necessary)

a. Repeat applications as necessary following applications procedures

b. Optimum time for treatment of giant cane regrowth is at 5-7 feet in height

B2. Cut, Stack, and Burn/Removal of Giant Cane from Site

1. Timing: cut stalks no earlier than 3 weeks after herbicide application

2. Manual labor

a. Volunteers

b. CDF crews

3. Heavy equipment

a. Necessary permits: 404 permit (USACE), Streambed Alteration Agreement (CDFG)

b. Acquisition of equipment

c. Manual labor assistance in moving and stacking giant cane.

4. Burning Stacked Giant Cane

a. Necessary permits: Air Quality Management District, CDFG

b. Notification: USFWS, CDF, neighbors

c. Safety: proper training, avoid burning near desirable plant materials, adequate firebreaks by CDF crews, timing—monitoring and availability of CDF crews

5. Monitoring

See section V

6. Repeat herbicide application(s) (if necessary)

a. Repeat applications as necessary following applications procedures

b. Optimum time for treatment of giant cane regrowth is at 5-7 feet in height

IV. Revegetation

A. Site analysis: soil and groundwater map

B. Site preparation

1. Removal of giant cane

2. Weed control

3. Soil tillage and structuring as per removal unit plan

4. Necessary permits: 404 permit (USACE)

C. Revegetation Processes

1. Natural processes

a. Seeds present in soil

b. Seeds brought in by natural means (i.e., floods and wind)

2. Introduction of native species appropriate to habitat

    a. Determine appropriate plants for habitat

    b. Seeding of gathered native plant seeds (collection of local seed material)

    c. Cuttings of native plants from the area

    d. Nursery stock

3. Irrigation

    a. None with sufficient water source

    b. Temporary: sprinklers or drip

4. Weed control

    a. None

    b. Straws and mulches

    c. Mowing (use of additional labor and/or equipment; hand equipment in small areas; heavy equipment in large areas; requires permits from USACE and CDFG)

    d. Herbicide treatment

        a. See section IIA

        b. Notification and authorization of California Department of Agriculture

5. Monitoring

    See Section V

V. Monitoring

A. Biologist

B. Inspect quarterly for first 5 years; inspect annually thereafter

C. Manual spot-treatment as necessary

1. Follow application procedures, section IIA

2. Cut and remove stalks no earlier than 3 weeks after treatment and leave to decay

VI. Optimum Timing for Processes

A. Foliar herbicide application: summer through fall

B. Cut-stump herbicide application: year-round

C. Cut/removal: year-round

D. Burning: fall through winter

E. Revegetation: winter through spring

Spraying Giant Cane - The Checklist

1. Notification of the California Department of Agriculture through the County Agriculture Commissioner

2. If a roadway is involved, authorization and aid in closure are necessary from:

   a. California Highway Patrol

   b. Caltrans

   c. City Police

   d. County Transportation

   e. City Transportation

3. Notify key agencies

   a. California Department of Fish and Game

   b. U.S. Fish and Wildlife Service

   c. U.S. Army Corps of Engineers

4. Public Relations

   a. Notify neighboring homeowners, schools, and businesses

   b. Public information office

   c. News media

   d. County Board of Supervisors