

Green Valley Alliance
A Program of Valley Vision / a Regional Action Partnership

Biological Resources and Conservation Needs in the Sacramento Region

Prepared by John Hopkins, Ph.D.
Institute for Ecological Health, Davis, CA.
2002

Table of Contents

Executive Summary	3
Current Status and Trends	4
Nature Before European Settlement - America's Serengeti	6
One Hundred and Fifty Years of Change	7
The Needs of Nature	8
Key Habitats and Their Needs	12
Needs of Some Key Groups of Animals	23
Current Protected Areas Managed for Biological Resources	28
Key Current Programs and Plans for Protecting and Restoring Biological Resources	34
Conclusion - Looking to the Future	40
Organizations and Projects Conserving Biological Resources in our Region	40
Other Organizations with a Major Focus on Biological Resources	41
Bibliography	42
Table 1 The region's habitat types	13
Table 2 The region's plant communities	14
Appendix	44
Table 3 Animal Species in the Sacramento Region Listed Under Federal or State Endangered Species Acts	
Table 4 Plants in Sacramento Region Listed Under Federal or State Endangered Species Laws	
Table 5 Animals Species of Special Concern in the Sacramento Region Listed	
Table 6 Plants Species of Concern Sacramento Region	

Executive Summary

The six county Sacramento Region encompasses the Valley and Foothills portions of El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba Counties. It possesses a great wealth of wildlife and natural habitat. However, there have been tremendous losses over the past 150 years, with some key habitats reduced to less than 10 percent of the pre-settlement level. Many species have already disappeared from our region and the list of endangered and very rare species is growing. Ecological processes, the key to long-term biological health, are severely disrupted in many locations.

There is increasing realization that the conservation and restoration of ecological health is an important component of regional sustainability, including protection of our quality of life and economic health. To ensure the Sacramento region will be ecologically healthy over the long term, we need very substantial increases in the amount of protected land. We also need extensive restoration of key habitats that have been almost wiped out. The restoration of stream and river corridors should be a very high priority wherever it is possible. This includes more natural stream flows, adequate riparian (riverside) vegetation, and re-connection of water ways with at least parts of their historic floodplains.

In total, there are eight components to the effective region conservation of biological resources and ecosystem functions in a region.

- " Conserve very large acreages of natural and agricultural lands.
- " Maintain connectivity between conserved lands, including altitudinal gradients and north-south linkages.
- " Ensure the long term viability of all native

species of plants and animals, including re-establishment of several species extirpated from the region.

- " Restore key habitats that have sustained massive losses, particularly riparian woodlands.
- " Restore habitat elements and structure, such as dense undergrowth in some riparian woodlands, to provide for species with very specific habitat needs.
- " Restore ecological processes such as periodic fires and floods where possible.
- " Maximize the compatibility of agriculture with those native wildlife species that can exist in or near farmland.
- " Provide urban wildlife areas to ensure closeness to nature in cities and suburbs.

The report outlines the biological needs for the different types of habitats and several key groups of animals. Understanding these needs will give the reader an appreciation of the actions necessary to ensure our region's ecological health.

Each type of habitat, such as an oak woodlands or a freshwater marsh, has a number of biological needs for its long term survival and health. These include elements of regional distribution and relationship to broader landscape patterns. They also include some ecological functions and processes and habitat structural components, such as some dead branches and down logs in an oak woodland.

Each animal species needs a particular habitat with the various structural components and ecological processes. For example, simply

ensuring the presence of riparian woodlands along various streams and rivers is not enough to ensure the presence of the various species of songbirds that use this type of habitat.

It is also very important for society to recognize the limits to our current biological knowledge and understanding. We do not know the distribution and relative abundance of many species, including many of the endangered and rare species. We do not know the relative biological values of many locations within our regions. Our knowledge of ecological process and needs is still quite rudimentary. So we cannot say “nature needs this much land”. While various agencies and organizations have identified important locations and even published maps, these must be considered as examples of key areas, rather than

comprehensive identification of conservation needs. At this time it is critically important to minimize further habitat losses outside current local government urban development boundaries in the region.

The report also lists the main areas in our region that are conserved and managed for their biological resources, and relevant programs of various agencies, including conservation planning projects of local governments. The Green Valley Alliance web site includes a map of these conservation areas. The Sacramento Area Council of Governments includes these areas and attribute data in its computerized mapping system. Current plans are to update this information every two years.

Current Status and Trends

Our region is part of the California Floristic Province - an area of exceptionally high biodiversity resulting from the Mediterranean climate, the variety of landforms, soils and physical conditions, and the mixing of northern and more tropical species. As a result of these factors the six county Sacramento Valley and Foothill region possesses a great wealth of native species and biological communities.

But the California Floristic Province is also one of the planet’s major hotspots of endangered species. This status reflects the impacts of 150 years of land use changes and rapid population growth since the discovery of gold. In our region only fragments of some key Valley Floor native habitats remain, while there is widespread degradation of habitat quality. Ecological processes that are essential for long-term biological health are severely disrupted (see following sections on pre-settlement condition and post settlement change.)

Sacramento Region Biological Resources

13 major wildlife habitats
33 major plant communities
11 amphibians
21 reptiles
50 mammals
202 birds
21 fish

18 endangered or threatened animals
15 endangered or threatened plants
and in addition
22 animal species of special concern
32 plant species of concern

Note: Birds do not include species that only visit during migration.

— **Over 95 percent of the historic riparian forests are gone**, and much of what remains is degraded and fragmented. Many species of riparian forest songbird have either totally disappeared from the region or are hanging on in tiny and very precarious populations. Within our region are extensive riparian woodlands in the Cosumnes River Preserve, and some good stands of trees along the lower Feather River. Elsewhere, these woodlands are limited to thin strips of trees along a variety of river and stream segments.

— **Over 90 percent of the historic marshes have been drained and converted to other uses.** Wintering geese, ducks and shorebirds still occur in large numbers, thanks to wildlife refuges, duck clubs and winter flooded rice fields. But skies are no longer darkened by flocks of waterfowl, a phenomenon that still occurred in the 1920's.

— **The historic waterways are much altered.** Dams regulate the flows down nearly all of the rivers and major streams. Many reaches are channelized. Rivers and streams have been separated from their historic floodplains by levees adjacent to the main stream courses, so that essential ecological and geomorphic processes have ceased. One consequence is that many native fish populations, both the anadromous salmon and steelhead trout and resident species, are a small fraction of their historic levels.

— **Many of the vernal pool grasslands and California prairie landscapes have disappeared**, with remnants often in a fragmented and degraded state. The Pronghorn, Tule Elk and Grizzly Bears have gone. A number of plant species are reduced to small remnant populations. But extensive vernal pool grassland landscapes remain in some portions of the region, particularly south-eastern Sacramento County, parts of western Placer County, and the Beale Air Force Base region of Yuba County. Expanses of grassland still stretch across other areas of the Valley edges and low foothills, providing important habitat for a variety of species. The

trend, however, is toward habitat fragmentation and conversion to higher value agricultural operations such as vineyards or to urbanization.

— **Irrigated farmland provides habitat for a variety of native animals**, but the biological value depends heavily on local farming practices. Intensive agriculture often uses practices that emphasize vegetation-free field borders and slough edges and consequently provides relatively low value habitat. Other farming techniques provide significant habitat. These techniques maintain vegetation around field edges, conserve riparian woodland strips and other scattered trees, allow for small patches and strips of fallow land, and keep crop stubble on fields into the winter. Winter-flooded rice fields provide a great deal of seasonal benefits. Ducks and geese utilize these fields. In addition, the over 300,000 shorebirds

Sierra Foothills Conservation Needs

From the Sierra Nevada Ecosystem Project, Final Report to Congress

"The oak woodland communities of the western Sierra Nevada Foothills are the most vulnerable of the widespread vegetation types." (*Summary, p.2*)

"Less than one percent of the native plant communities is in land formally allocated to biodiversity protection" (*Summary, p. 2*)

"Eighty five terrestrial vertebrate species require west slope foothill savanna, woodland, chaparral or riparian habitats to retain population viability; of these 14% are considered at risk. The number of species actually declining in the foothill zone is undoubtedly far greater because so much critical habitat has been converted" (*Summary, p. 5*)

"As most of the original riparian forest habitat in the Central Valley is gone, the remaining riparian habitat in the lower foothills becomes essential to a number of (bird) species with limited habitat and critically low population levels in the Sierra" (*Volume. II, p. 719*).

that winter in the Central Valley now rely heavily on flooded rice fields in mid-winter.

— **Several guilds of birds remain in significant numbers.** The Central Valley remains renowned for its wintering hawks, but breeding hawk populations have declined.

— **In the Sierra Foothill portion of the region,** widespread diminution of biological values are also occurring in areas of current urbanization and rural development. However, there are still significant areas of open countryside in El Dorado and Yuba counties that have large natural landscapes and very low road densities. These offer great opportunities for the long-term conservation of ecologically functional foothill landscapes with the mosaic of oak woodland, chaparral scrub and grassland habitats.

—

Future trends in both the Valley Floor and the Sierra Foothills depend on society's willingness to

embrace the fundamental importance of ecological health, to maintain and restore of ecological processes, to protect very large landscapes with their ranching and agricultural activities, and to conserve individual species of plants and animals. This will require re-thinking how human activities and nature fit together, seeking solutions that benefit people, wildlife and both natural and agricultural ecosystems. The inter-relationships between biological resources, farm and range management, urbanization, flood control and wildfire management are all critical to the long term ecological and human health of the region.

CalFed proposals provide a vivid example of what is possible. The CalFed process developed a wide range of conservation needs and specific actions in the Delta, along the waterways and in larger watershed areas. This includes many actions to restore more natural functioning of major rivers and streams, including levee setbacks, partial restoration of natural river meandering over time, widespread restoration of riparian woodland, and the return of overflow sinks for winter floodwaters.

Nature Before European Settlement - America's Serengeti

In 1850, the Sacramento Valley Floor was a natural landscape that would be unrecognizable to present day residents. There were three basic components. Free-flowing rivers, bordered by dense forests with huge sycamores, oaks and other trees, flowed down from the Sierra. In the Delta the Sacramento River entered a vast tule marsh with a network of narrow channels, and several Sinks on the Valley floor harbored extensive marshes. A wide prairie dominated by perennial grasses and with extensive vernal pools stretched to the edges of the Sierra Foothills and inner Coast Ranges.

This pre-settlement Central Valley was an extremely rich wildlife region and has been called "America's Serengeti." Huge flocks of geese, ducks and shorebirds wintered in the area. There

Central Valley Major Habitat Losses Since 1850	
— Valley riparian woodland	95%
— Valley marsh	90%
— Vernal pools	40%

were abundant Tule Elk, Pronghorn, Grizzly Bears, Salmon and Steelhead trout. Spring brought vast carpets of wildflowers to the grasslands.

Extensive riparian forests lined much of the river and stream courses away from the Delta. Along the lower Sacramento River the forests may have been four or five miles wide. In other areas they were narrower and in some places formed separated clumps of trees. The forests contained a variety of trees species, including valley oak, sycamore, cottonwood and willow, as well as shrubs and vines. Many of the trees were immense - oaks 27 feet in circumference and sycamores 75 to 100 feet high. They provided a home for a rich wealth of wildlife, including a large number of small bird species and birds of prey like the Cooper's Hawk.

The rivers were free flowing, often had extensive flooding in the winter and spring, and in some areas their courses moved to and fro (meandered) across their floodplains over periods of many years. These physical processes were crucial to the long-term structure and health of natural habitats - from nutrients in fresh sediment, to disturbance of existing vegetation and

opportunities for renewal. For example, cottonwood seeds only germinate in fresh sediment.

The Sierra foothill communities bore greater resemblance to their present state, albeit without buildings and roads and fewer grasslands than exist today. A biologically rich mosaic of oak woodlands, riparian woodlands along rivers and creeks, patches of chaparral scrub and grasslands dominated the landscape between the Valley floor and the mid-Sierra pine forests. The historic oak woodlands had many large trees, often with dead limbs, as well as dead trees and fallen logs - all providing critical habitat elements for many animals. In addition, riparian vegetation was much more extensive than at the present time. This provided for a huge array of plant and animal species. For example, over 330 native bird, mammals, reptiles and amphibians depend on oak woodlands at some stage of their life cycle. Wetlands and wet meadows, key communities for a variety of species and for ecosystem functions, have largely disappeared. In many areas Valley Oaks and Blue Oaks are not regenerating, raising the specter of the eventual loss of these species in many locales.

One Hundred and Fifty Years of Change

After the discovery of gold at Sutter's mill in Coloma, the region began a period of rapid change. Riparian forests quickly disappeared, first providing fuel for riverboats and towns, then giving way to dry-land farming on the rich bottomlands. A brief period of hydraulic mining flushed vast amounts of debris into the river, while digging for gold created extensive areas of tailings along lower reaches of the American and Yuba Rivers .

Huge herds of cattle and sheep moved across the grasslands and annual Mediterranean grasses largely replaced the native species; then disastrous floods and droughts took their toll on the cattle industry. Starting in the 1860's, dry-land grain farming spread across large areas of native habitat. By 1880, 75 percent of the Central Valley was improved farmland.

Before the end of the 19th century, agricultural levees started appearing as farmers drained

marshes. The Delta marsh gave way to leveed islands with agricultural fields, while the marshlands of the Sinks changed to cropland. Beginning in the 1890's, irrigation allowed a shift to dairy farming and to orchards, vineyards and vegetable crops. Private individuals constructed the initial irrigation canals, using local surface water supplies. Later, government canals provided large reservoirs and long-distance transportation by the State Water Project and the federal Central Valley Project. Many segments of the rivers and streams were rip-rapped and tightly constrained within levees, losing the connection to their floodplains and their ability to meander. Upstream, dams altered water flows and temperature, and also shut off much of the sources of fresh sediment.

The foothills were not immune to change. Gold rush mining had major impacts, especially from hydraulic mining that filled streams and rivers with vast quantities of debris. Across the state, one third of the oak woodlands have disappeared since the beginning of European settlement. In the foothills woodland and chaparral were cleared and converted to grasslands, as farming pushed ranchers out of the Valley floor. Additional areas gave way to orchards, many of which have now

been abandoned and given way to second growth oak woodland. In addition, a number of reservoirs such as Folsom Lake and Bullard's Bar inundated significant foothill wildlife areas.

Invasive, non-native (exotic) species have had huge impacts. The spread of livestock and very severe overgrazing in the nineteenth century caused a major conversion of the grassland herb layer -replacing native perennial grasses with Mediterranean grasses and introducing many non-native species of flowering plants. Additional invasive exotic species continue to degrade the landscape and threaten native species. For example, Bullfrogs eradicate native amphibians, Tamarisk and other plants choke out the native riparian vegetation, alien fish compete with native species, and Yellow Star Thistle degrades grasslands.

In the latter part of the 20th century the rapid spread of human habitation and road networks into the foothills created additional loss of native habitats and fragmentation of remaining wildlife areas. Between 1950 and 1996 the region's urbanized area grew from 80 to 395 square miles (51,000 and 252,000 acres respectively) removing large areas of natural habitat and irrigated farmland.

The Needs of Nature

Over the past few decades, biologists from a variety of disciplines have gained a degree of understanding of natural ecosystem functions and the needs of various species. However, our overall ecological level of knowledge and understanding is still low. The distribution and ecological needs of very few species are understood in some detail. But science provides a number of basic lessons that provide invaluable guideposts for regional conservation. To

understand the needs of nature it is necessary to consider a variety of biological issues.

" **Long term conservation of all native species**

This requires the maintenance or enhancement of healthy populations of all remaining native species of plants and animals, so that they have a very high likelihood of surviving into the indefinite

future. Some species extirpated from the region, such as a number of riparian songbirds, could return after restoration of suitable habitat. This fundamental biological need goes beyond Endangered Species Acts (ESAs) requirements that listed species not be jeopardized. It involves aiding legal recovery of listed species. It also involves enhancing populations of a variety of declining and now rare species that are not currently listed under ESAs.

Biologists recognize that meaningful conservation of a species is not achieved by having a small population in a little preserve. This is a last resort, when there are very few individuals left and the habitat is extremely limited. Rather, each species needs multiple populations across its geographic range and encompassing all the particular biological and physical conditions in which the species is found. This ensures that we conserve

all the genetic variety possessed by a species, an essential step for allowing future evolution and adaptation to changing conditions. It also requires that the species be part of fully functioning ecosystems, which requires large areas in many cases, as well as the maintenance of ecological processes.

Furthermore, maintaining and restoring the natural heritage of the region and ensuring that biological systems function properly requires conservation of very large numbers of many species. Examples are keystone species like Blue Oaks and the waterfowl that winter in the Central Valley. The nationwide Partners in Flight program has “keeping the common birds common” as one of its goals - that approach to all groups of animals and plants is essential for long term preservation of healthy ecosystems.

Key Requirements for the Conservation of Nature.

- Long term conservation of all native species.
- Conservation of all the different plant communities and biological habitats.
- Conservation of large areas, both of natural and agricultural landscapes.
- Maintenance of connectivity between biological areas, including connections along watercourses, altitudinal gradients, and north-south linkages.
- Conservation and restoration of habitat elements necessary for many species.
- Maintenance or restoration of key ecological functions and processes wherever possible.
- Integration of nature conservation into farmland and urbanized areas.
- Consideration of geographic context and impacts of landscape patterns.

“ Conservation of all the different plant communities and biological habitats.

Protecting all the various plant communities and different habitat types is another essential level of conservation. Again, conservation of postage stamp preserves is a zoo approach to Nature and does not do the job. Natural biological communities are intricate entities with complex and varying structures. Simply conserving a representative sample of the different communities and habitats does not effectively conserve Nature. For each community and habitat it is necessary to conserve many examples across their region of natural occurrence, to protect them within a larger natural landscape that has a mosaic of communities.

“ Conservation of large areas, both of natural and agricultural landscapes.

Large, undeveloped, landscapes of contiguous natural habitat or agricultural landscapes are a critical component for ensuring the long term

survival of functioning ecosystems. As well as providing space for viable populations of various species, and for allowing for interactions between different habitats, they allow for functioning ecosystem that are free from the negative “edge effects” of urbanization.

Edge effects are the impacts, positive or negative, that one habitat type has on an adjacent habitat. For example, urban cats and dogs will roam onto a neighboring natural area and harm small animals and birds, so disturbing the natural ecosystem. The distance that an edge effect impacts a natural area depends on the factor and the habitat. For example, Dutch scientists found that the noise from a busy road has negative effects on breeding grassland birds for a distance of up to a half mile.

The conservation of continuous natural and agricultural landscapes ranging from several thousands to tens of thousand acres remains very possible in many parts of our region, on both the Valley Floor and in the Sierra Foothills. This biological conservation need fits in very well with agricultural conservation needs. Large areas of cropland minimize the farm-city conflict that occurs at the urban fringe, while Foothill cattle ranchers need large tracts of range-land in order to be economically viable. The growing Cosumnes River Preserve, which includes extensive agricultural lands, is an excellent example.

Large landscapes with a the range of habitats and conditions allow a myriad of interactions to occur between different species and habitats. For example, a Foothill landscape may include blue oak woodlands, interior live oak stands on north facing slopes, patches of chaparral, grassland areas and oak savannah. Creeks may have rich riparian habitats, while small wetlands and springs, and maybe rock outcrops, may dot the landscape and provide additional variety. As well as the variation of habitat types, habitat condition will vary. For example, some patches will have experienced recent wildfires, others contain much

older vegetation - these different stages provide for different wildlife species.

Wherever possible, society should conserve entire watersheds or sub-watersheds. This approach is especially helpful for protection of water quality and the biology of streams and riparian areas. Protection of the myriad of small, ephemeral streamlets in the headwaters of a foothills stream is very important for avoiding erosion and pollutant runoff.

“ **Maintaining connectivity between biological areas, including connections along watercourses, altitudinal gradients, and north-south linkages.**

Connectivity is a key biological factor. Animals, and also the pollen and seeds of some plants need to be able to move from one location to another. Connectivity for small animals requires continuous suitable habitat that they can live in, since an individual will not travel large distances. Other animals, including some birds will move longer distances but only through suitable habitat. Many plant seeds are distributed by animals. Linkages reduce the likelihood of small populations of individual species becoming locally extinct. They also provide opportunities for recolonization if a local population does become extinct. River and stream corridors will provide linkages for riverine and riparian species, if habitat elements such as in-stream flow and native vegetation are still present. But upland species often need upland habitat as linkages. For example, Western Burrowing Owls will fly from location to location across a grassland landscape.

North-south linkages provide continuity along major habitat belts such as the foothill oak woodlands and Valley edge grasslands. When this linkage is broken by major cropland or urban development, such as in metropolitan Sacramento, society invites a range of long-term biological problems. Conservation of natural habitats along

altitudinal gradients from the Valley floor up into the Sierra conifer forests provides for seasonal movement of species, opportunities for interactions between different habitats and retains nature's ability to respond to future variations like climate change.

" **Restoration of key habitats.**

Several habitats are reduced to a tiny fraction of their pre-settlement extent. But it is possible to increase the amount of some habitats by restoration. Riparian woodlands and willow scrub are a critical element and we need as much restoration as possible along rivers and streams. A narrow band of trees along a stream or slough, say 100 - 300 feet on each side, provides for some ecological functions that improve the health of the waterways and provide habitat for some animal species. For example, several hawks nest in large trees. But much more extensive riparian areas are needed for some species to survive. One key example is the suite of small riparian songbirds that has been virtually extirpated from the Valley floor (See page 25). Currently, opportunities for this large scale restoration are limited to the Cosumnes River Preserve and the lower Feather River.

Wetland restoration projects are already a significant focus in the Central Valley and need to continue. Another possibility is restoration of native grasses to rangeland. This is being achieved in some locales by using cows as agents of restoration.

" **Restoration of habitat elements necessary for many species.**

Individual habitats and many structural complexities that are necessary for the survival of various animals and plants. Healthy oak woodlands, for example, have a generous supply of dead limbs, standing dead trees and downed

logs. These provide breeding habitat for cavity nesting birds and hiding places for various small mammals, salamanders and other vertebrates. They have the essential food resources for a variety of animals, including many invertebrates. They ensure that nutrient cycling, a fundamental ecological process, occurs. And large woody debris falling into streams provides a for variety of ecological needs. However, over the past 150 years much of this dead wood has been lost to firewood gleaning.

Another example is the presence of multiple vegetation layers, such as shrubs and annual plants in woodlands. These two are necessary for a variety of animal species. The absence of dense understory in riparian woodlands is a major cause of the loss of several songbirds.

A third example is the importance of variety in the condition of vegetation across a landscape. For example, research on small grassland birds in Mid-West prairies shows that different species utilize different vegetative conditions. Some need sparse, short grass, some denser and taller grasses, some a sprinkling of trees or shrubs. Another example is riparian woodland - some birds species use tall trees of their understory plants, but many others require low growing willow scrub.

" **Maintaining or restoring key ecological functions and processes wherever possible.**

A variety of ecological functions and processes are important for the overall biological health of a landscape and for long term survival of various species. River and stream systems provide an important example. High winter flows, spreading across the natural floodplain, movement of sediment down the watercourse, and meandering of the watercourse over time are all important ecological processes. They provide for the dynamic nature of the landscape, creating disturbances such as toppling of groups of trees that allow for new growth, and replenishing

nutrients in the floodplain. The CalFed Ecosystem Restoration Program Plan recognizes the importance of restoring these processes where possible in order to improve the biological health of both the Delta and the rivers and streams of the Central Valley.

Fire is another essential ecological process. Many California ecosystems are fire dependent, and need periodic burns to maintain their health. The seeds of some plants only germinate after fire. Twentieth century fire suppression has caused a variety of ecological problems, and increased the likelihood of very large, catastrophic, wildfires in many Foothill and Coast Range locales. Restoration of natural fire regimes, especially through the use of prescribed burns, is important for future ecological health and public safety. Yet there are serious impediments to this approach, from air quality concerns to past examples of prescribed burns getting out of control.

“ **Integration of nature conservation into farmland and urbanized areas.**

Wildlife friendly farming techniques can provide significant benefits for Nature (See **Cropland Ecosystems** on page 21.) The conservation or restoration of natural areas in the urbanized environment can also provide some benefits, particularly along river and stream corridors. In

addition providing natural areas in cities and suburbs improves the quality of life for local residents and helps increase local support for conserving the rural landscape (See **Urban and Suburban Habitats** on page 22.)

“ **Considering the issues of geographic context and impacts of landscape patterns**

The geographic context of a tract of wildlife habitat has a huge impact on its biological usefulness. For example, a 100 acre oak woodland wildlife preserve located in a large area of undeveloped oak woodland will provide home to a tremendous array of wildlife species. But if that same 100 acre preserve becomes surrounded by houses, it will no longer function as habitat for many oak woodland species. Similarly, a population of sandhill cranes that winters in row crop fields of southern Sacramento County and adjacent San Joaquin County will be severely impacted if a significant portion of the foraging area becomes vineyards or housing subdivisions (See Page 28.) Some species require multiple habitat types, and also there are various biological interactions between adjacent habitats. So the pattern of habitats across a large landscape has a significant impact on species and the biological condition of habitat.

Needs of Key Habitats in the Region

Our region has 13 major terrestrial habitat types that provide for a wide variety of native animals. (see Table 1 on page 13). Within these 13 habitat types there are 33 different plant communities (see Table 2 on pages 14-15.) There are also the various aquatic habitats - rivers, streams and sloughs, lakes and ponds. Each of these habitats has conservation, restoration and management

requirements that follow from current conditions and trends and the Needs of Nature outlined in the preceding section.

Riparian Woodlands

Riparian Woodland is a critical habitat for over 225 vertebrate species in California. In addition,

Table 1. Major Wildlife Habitats of the Sacramento Region

Habitat	Example characteristic animals	Subregional location
Blue Oak Woodland	Mountain Lion, Arboreal Salamander, Ringneck Snake, Acorn Woodpecker	Sierra Foothills, Inner Coast Range, edges of the Central Valley
Valley Oak Woodland	Western Gray Squirrel, Western Whiptail, Bullock's Oriole	Central Valley and Sierra Foothills
Blue Oak-Foothill Pine	Pinyon Mouse, Ensatina, Western Fence Lizard, Oak Titmouse	Sierra Foothills and Inner Coast Range
Valley Riparian Woodland	Ringtail, California Slender Salamander, Swainson's Hawk, Blue Grosbeak.	Central Valley
Foothill Riparian Woodland	Ringtail, California Newt, Yellow-breasted Chat.	Sierra Foothills
Montane Hardwood	Douglas' Squirrel, California Newt, California Whipsnake, Black-throated Grey Warbler	Sierra Foothills, north facing slopes
Ponderosa Pine	Western Gray Squirrel, Ensatina, Mountain Chickadee	Sierra Foothills, north facing slopes
Sierra Mixed Conifer	Long-eared Chipmunk, California Slender Salamander, Western Tanager	Sierra Foothills, north facing slopes
Mixed Chaparral	California Pocket Mouse, California Newt, Coachwhip, California Thrasher	Sierra Foothills and Inner Coast Range
Annual Grassland	Badger, Coast Horned Lizard, Ferruginous Hawk	Sierra Foothills, Inner Coast Range, edges of the Central Valley
Perennial Grassland	Fringe-Tailed Bat, Common Garter Snake, Grasshopper Sparrow	Very occasional- Sierra Foothills, Inner Coast Range, edges of the Central Valley
Vernal Pool Grassland	Western Spadefoot, California Tiger Salamander, Vernal Pool Fairy Shrimp	Central Valley
Freshwater Marsh	Muskrat, Giant Garter Snake, Snow Goose	Central Valley
Rivers and Streams	River Otter, Coho salmon, Red-Legged Frog, Western Aquatic Garter Snake, Dipper	Throughout
Lakes	Bald Eagle, Western Grebe	Throughout
Pasture	Red fox, Tricolored Blackbird	Central Valley
Field Crops	California Vole, Pacific Treefrog, Common King Snake, Swainson's Hawk	Central Valley

Note: Habitat classification from the Wildlife Habitat Relations system, California Department of Fish and Game, with the addition of Vernal Pool Grasslands and separating Valley and Foothill Riparian Woodland

Table 2. Plant Communities of the Sacramento Region

Community	Some Characteristic plant species	Subregion location
Valley Sink Scrub	Iodine Bush	Valley floor, west of the Sacramento River
Northern Mixed Chaparral	Chamise, species of ceanothus and manzanita.	Sierra Foothills and Inner Coast Range.
Gabbroic Northern Mixed Chaparral	Pine Hill Ceanothus, Pine Hill Flannelbush, Whiteleaf Manzanita	El Dorado County foothills
Chamise Chaparral	Chamise	Sierra Foothills and Inner Coast Range
Serpentine Chaparral	Chamise, Foothill Pine, Leather Oak	Sierra Foothills and Inner Coast Range
Scrub Oak Chaparral	Scrub Oak, Ceanothus species	Sierra Foothills and Inner Coast Range
Interior Live Oak Chaparral	Interior Live Oak, Scrub Oak, ceanothus species.	Sierra Foothills
Serpentine Bunchgrass	California Melic, Nodding Needle Grass, Serpentine Reed Grass	Inner Coast Ranges. Sierra Foothills
Valley Needlegrass Grassland	Purple Needlegrass	Sacramento Valley and low Foothills
Valley Wildrye Grassland	Creeping Wildrye	Sacramento Valley and Surrounding Foothills
Non Native Grassland	Introduced Annual Grasses	Sacramento Valley and Surrounding Foothills
Wildflower Field	California Poppy, Purple Owl's Clover, Tidy Tips.	Sacramento Valley and Surrounding Foothills
Northern Hardpan Vernal Pool (high terrace pools)	Downingias, Naverretias, Limnanthus species.	Sacramento Valley
Northern Claypan Vernal Pool (low terrace pools)	Downingias, Naverretias, Meadow Foam	Sacramento Valley
Northern Basalt Flow Vernal Pool	Common Blennosperma, Fremont's Lasthenia, Toothed Downingia	Sierra Foothills
Northern Volcanic Mudflow Vernal Pool	Douglas's Meadow foam , Goldfields, Navarretia	Sierra Foothill (some Valley sites)
Freshwater seep	Sedges and grasses	Grassland areas in valley and Foothill
Coastal and Valley Freshwater Marsh	Tule, Woolly Sedge	Delta zone, Sacramento Valley
Vernal Marsh	Rushes, Downingias	Sacramento Valley

/ continued

Plant Communities of the Sacramento Region, continued

Community	Some Characteristic plant species	Subregion location
Vernal Marsh	Rushes, Downingias	Sacramento Valley
Great Valley Cottonwood Riparian Forest	Cottonwood, willows	Sacramento Valley
Great Valley Mixed Riparian Forest	Box Elder, Cottonwood, Western Sycamore, California Black Walnut	Sacramento Valley
Great Valley Oak Riparian Forest	Valley Oak	Sacramento Valley
Mulefat Scrub	Mulefat	Sierra Foothills and Inner Coast Range
Great Valley Willow Scrub	Shrubby species of willow	Sacramento Valley and lowest foothills
Buttonbush scrub	Buttonbush	Sacramento Valley
Elderberry savanna	Elderberry	Sacramento Valley
Valley Oak Woodland	Valley Oak	Sacramento Valley
Blue Oak Woodland	Blue Oak, also other oaks, Foothill Pine	Sierra Foothills, Inner Coast Range
Interior Live Oak Woodland	Interior Live Oak, California Bay, California Buckeye.	Sierra Foothills
Open Foothill Pine Woodland	Foothill Pine, Blue Oak, ceanothus species	Sierra Foothills, Inner Coast Range
Serpentine Foothill Pine - Chaparral Woodland	Foothill Pine, Leather Oak, Chamise, Whiteleaf Manzanita .	Serpentine areas in the Sierra Foothills, Inner Coast Range
Non Serpentine Foothill Pine -Chaparral Woodland	Foothill Pine, ceanothus and manzanita species.	Sierra Foothills, Inner Coast Range, near transition to conifers
Canyon Live Oak Forest	Canyon Live Oak	Sierra Foothills, Inner Coast Range
Black Oak Forest	Black Oak, Ponderosa Pine	Sierra Foothills
Westside Ponderosa Pine Forest	Ponderosa Pine, Deer Brush	Sierra Foothills
Sierran Mixed Conifer Forest	Incense Cedar, Douglas-Fir, Mountain Dogwood	Sierra Foothills

Note: This table uses the Holland (1986) community system. There is now a more thorough, though more complex, system developed by Sawyer and Keeler-Wolf (1995).

of natural vegetation along waterways provide very effective control of run-off pollution and so improve water quality. And riparian woodland and forest provides other functions necessary for the ecological health of waterways - including shading and provision of nutrient to the aquatic ecosystems.

Habitat restoration is an essential need. We have lost over 95 percent of the prehistoric riparian woodland in the Valley, and Foothill woodlands have been either converted to other uses or degraded. The rivers and streams have also been altered drastically and their ecological functioning much reduced.

There are ongoing restoration projects in some areas, such as the Cosumnes River Preserve, but more are needed. There are also some encouraging region-wide projects, including the restoration plans of the CalFed Bay Delta Program and an Interagency flood management and ecosystem restoration planning process.

Key Needs for Riparian Woodlands

- Restore native riparian woodland along many rivers, streams and sloughs.
- Provide areas with riparian woodland blocks over 1000 feet in width.
- Restore dense understory of native shrubs and vines.
- Provide areas of willow scrub (early succession) habitat.
- Conserve, and where possible restore, more natural stream behavior - including meandering over time and natural flood regimes.
- Couple ecosystem restoration programs to improvements in flood control systems such as levee setbacks.
- Maintain adjacent natural or agricultural uplands.

Along most of our rivers, streams and sloughs it is possible to protect or restore at least a narrow strip of woodland comprised of cottonwoods, California sycamores, valley oaks and other suitable native species. But we also need wider riparian woodlands, where possible 1,000 feet or more in width. Establishment of large trees is only part of the needed restoration. Once trees were established and forming a canopy, planting of native shrubs and vines will allow development of a dense understory. The combination of wider woodlands and the understory will provide suitable habitat for a suit of riparian songbirds that were once common to our region (see **Songbirds** on Page 25.) Several of these songbirds nest in willow scrub, an early succession vegetative community that develops after floods remove existing vegetation. The overall riparian mix for our region should include willow scrub in appropriate areas.

A natural riparian woodland is a very dynamic ecosystem, changing continuously as periodic floods remove some vegetation and so allowing new growth to occur. Also in many valleys, streams and rivers naturally meander to and fro across their floodplain over a period of many years. These channel changes remove and create riparian woodland. These important ecological processes are currently very limited in many of our waterways, because of upstream dams and channelized watercourses that are tightly hemmed in by levees. However, restoration of riparian areas by increasing the size of active floodplains will be possible in some areas as society re-thinks effective approaches to flood management. There is growing realization that set back of levees to provide a floodplain area reduces flood risks, as well as assisting aquifer recharge. In many areas, the restoration of riparian woodland will be possible in the lands between watercourses and the set back levees. These set backs would also allow for some channel meander in places.

Riparian woodlands do not exist in biological isolation. The links to both aquatic and upland habitats are important for many species. In the

foothills, various natural upland habitats have many connections to the riparian/aquatic areas as a variety of species can use the habitat mosaic. Thus Morning Doves and other upland birds travel to the riparian/aquatic areas to drink. While farmland does limit the biological usefulness of riparian woodland, particularly where it encourages the Brown-headed Cowbird, a nest parasite, it is still far preferable to urban development. For example, the Swainson's Hawk and several other raptors nest in tall trees of Valley riparian areas and forage in nearby crop fields. Neighboring urban areas, by contrast, provide little or no foraging habitat and are often a reservoir of cats and other threats to small native vertebrates.

Oak and Oak-Pine Woodlands

The blue oak woodlands, and related communities such as blue oak-foothill pine are an extremely important habitat in the Foothills, stretching down to the edges of the Valley Floor. In moister sites, such as north facing slopes there are tracts of live oak woodland (see Table 2 on page 15 for a chart of various woodland communities.) They provide habitat for a wide array of wildlife species. For example, the woodlands are an important habitat for seven of the region's ten native amphibian species, 26 of the 50 mammal species. A wide variety of birds rely on oak woodlands for at least a part of their life cycle.

Our oak woodlands have been greatly modified since European settlement. The valley oak woodland is virtually eradicated, leaving an urgent need for restoration at some appropriate sites. Oak savannah, scattered oaks in grassland settings, is also greatly reduced and in particular need of protection.

Many of our blue oak woodlands now have varying degrees of development, especially ranchette and large lot subdivisions. Even five to

Key Needs for Oak Woodlands

- Maintain extensive tracts of blue and live oak woodlands that are essentially free from human developments.
- Restore valley oak woodland at various sites on both the Central Valley floor and in moist foothill areas.
- Maintain woodlands at different degrees of canopy cover, from shaded woodlands to savannah with scattered trees.
- Maintain connections between oak woodlands and other habitats, such as grasslands, chaparral and riparian.
- Maintain Valley-mid Sierra and north-south connectivity.
- Allow establishment of large, old trees, dead branches, snags and fallen logs in areas away from development.
- In some areas maintain brushy undergrowth.
- Re-establish historic fire regimes where possible.
- Research barriers to oak regeneration under various ecological conditions.

20 acre developed lots greatly alter the biology of oak woodlands, as shown by the shift to urban-friendly bird species and loss of neotropical migrant songbirds.

Conservation of the remaining large tracts of undeveloped woodland, and of large habitat mosaics that have both woodlands and other types of vegetation, must be a very high regional priority. Only these areas can provide for the full extent of oak woodland ecosystems. And restoration of habitat elements such as various types of dead wood is essential for the health of many animal populations. Conservation of remaining large trees and recruitment of additional old oak trees over time is another key action.

Larger scale connectivity is also important - both along the west-east altitudinal gradient up the Foothills and north-south - to allow movement of species over time. This requires maintaining the very few linkages left in the foothill I-80 and Hwy-50 corridors.

Restoration of ecological processes is also an important need. Historically there were frequent fires in many oak woodlands. These reduced the extent of underbrush and did not destroy larger trees. The infrequent fires resulting from fire suppression can be much hotter and kill oak trees that would survive the frequent cooler fires.

Also oak trees are not regenerating in many areas. The causes of this are complex, not well understood, and may vary with location. Further research into regeneration problems, leading to extensive restoration projects, is necessary.

Freshwater Marsh

We have lost nearly all of our extensive wetlands over the past 150 years. Wetlands are a highly productive ecosystem and provide habitat for a variety of animal species, including fish. In the winter they are especially important for waterfowl, shorebirds and wading birds of the Pacific Flyway. They also provide a very effective natural flood control system and filter pollutants.

Key Needs for Freshwater Marsh

- Preserve remaining marsh areas.
- Restore marshlands in strategic locations in the Delta, Valley sinks, By-passes and near waterways, using historic marsh areas.
- Protect uplands around marshes.
- Couple ecosystem restoration programs to improvements in flood control systems such as levee setbacks.

The federal government has a no-net-loss of wetlands policy, while the state has a policy to increase the total wetlands acres. Restoration of freshwater marshes in key locales is a critical biological need. CalFed has set a number of targets for the North Delta subregion, much of which lies in southern Yolo and southwestern Sacramento Counties, and calls for increases in various upstream zones such as the Yolo Basin and the Feather River / Sutter Basin.

Rivers, Streams and Sloughs

The maintenance or restoration of natural ecological processes is a critical need for the health of the region's rivers and streams. A natural streamflow pattern, winter flood events, linkage of waterways to at least a portion of their historic floodplains, and supply of sediment are all critical processes. Riparian vegetation, wetlands and linkages to upland habitats are essential biological features. Many of the processes, as well as the riparian and wetland areas, have vanished or barely exist in most of the region's waterways. CalFed's Ecological Management Zone Visions outlines

Key Needs of Rivers, Streams and Sloughs

- Restoration of active floodplains and opportunities for meandering through features such as levee set-backs.
- Wherever possible, conservation and restoration of natural streamflow patterns.
- Restoration of sediment supply needed for fish spawning.
- Conservation and restoration of riparian vegetation and wetlands.
- Protection of linkages to natural and agricultural habitats.

possibilities for restoration in a range of river segments.

Conservation of native fish species and protection of aquatic invertebrates (a critical but often overlooked group of species) involves all the these restoration features. Active floodplains provide nutrients and are important for various species such as the split tail. Riparian vegetation provides for parts of the life cycles of many aquatic invertebrates, shading and nutrient supply, and effective control of run-off pollution. Upland habitat connections are necessary for species that utilize both aquatic or riparian and upland habitats.

Opportunities for river and stream meandering are important for the health of neighboring riparian ecosystems. They also produce special aquatic features such as oxbows - short segments of river left behind by historic channel changes. The supply of gravel for fish spawning is also important and much of this is buried by fine sediment.

Because of important interactions between different habitat types, protected areas around rivers and streams should not be narrow. Connections to upland habitat, whether natural or agricultural, are important for many species and the health of the aquatic ecosystems.

Vernal Pool Grasslands

One of the most remarkable ecosystems in California is the vernal pool grassland. Here ephemeral pools, underlain by highly impermeable soils, fill up with water when the first winter rains arrive. As the rainy season ends in the spring the pools slowly dry up, often with spectacular displays of low-growing native wildflowers that form rings around the edges of the pools.

There are 69 plant species that are endemic to California's vernal pools, that is they occur

Key Needs of Vernal Pool Grasslands

- Conservation of the remaining large vernal pool grassland landscapes.
- Conservation of additional core vernal pool areas and vernal pools with extremely rare species.
- Wherever possible, maintain effective biological linkages between vernal pool areas.

nowhere else. The list of small invertebrates that live in these pools keeps growing as biologists discover and describe new species. Waterfowl use the pools in late winter, feeding on an important high protein diet before migrating northward to breed.

Historically, major vernal pool grasslands occurred down the east side of the Central Valley, from Butte to Fresno counties. According to the U.S. Environmental Protection Agency, only 25 percent of the historic vernal pools remain, a large portion of the vernal pool grasslands having been converted to irrigated agriculture and, increasingly, to urban development. Most of the remaining pools are in fragmented and degraded habitats, including disturbance or fragmentation of the hydrological system so essential for proper vernal pool functioning.

In our region there are important vernal pool landscapes in south-east Sacramento County, west Placer County and south-east Yuba County. Conservation of vernal pool landscapes is important in all these subregions, as different vernal pool areas have different features, such as pool type, soils and landform that result in differing plants and animals. The Nature Conservancy has protected a couple of large vernal pool areas in Sacramento County and the Sacramento Valley Open Space Conservancy is developing a vernal pool preserve system in a key area in the same county. But several essential opportunities remain to conserve large landscapes that include entire stream drainages. These would

conserve the all important vernal pool hydrological system as well as a range of other ecological functions. There are also small areas that are important to protect because of the presence of extremely rare species such as the Sacramento Orcutt Grass. Preserves in urban or urbanizing areas should be as large as possible, maintain the original hydrology by protecting entire drainage areas (sub watersheds), and be buffered from impacts such as urban runoff.

Grasslands and Oak Savannah

There are also extensive grassland areas without vernal pools along the Valley edges and up into the Foothills. Some areas have scattered oaks and are considered oak savannah and tend to be located near the junctions with oak woodland areas. This is a very under-appreciated habitat type, perhaps because of the dead appearance in summer and early fall and the loss of native perennial grasses in the nineteenth century.

Key Needs of Grasslands and Savannah

- Protect remaining large grassland areas.
- Manage grazing regimes for ecological health and long-term economic viability of ranches.
- Restore native perennial grasses, ground squirrels and other native species where possible.
- Assure regeneration of oaks in savannah areas.

Grassland ecosystems are home to a range of animal species. At the national scale, grassland birds are the fastest declining group of birds. Our grasslands are important to various raptors, and provide hunting grounds for wintering birds of

prey such as the Ferruginous Hawk. Where there are scattered oak trees or savannah additional animal species appear. Grasslands are home for a variety of mammals and reptiles. The conservation of large areas is important to conserve ecosystem function and provide for populations of the various animals. Management changes, such as allowing ground squirrels to occupy additional areas, would increase the biological productivity a great deal.

Chaparral

This characteristic California community is home to a wide array of plant and animal species and have very important biological roles. Sometime the vegetation is pure Chamise, while in other locales manzanitas or ceanothus species dominate. In many areas they are part of the larger habitat mosaic of scrub, woodland and grassland and a number of species utilize multiple habitat types or the edges between different communities. Birds such as the Sage Sparrow are dependent on chaparral.

There are still large landscapes left in the Foothills and Inner Coast Range that include chaparral in the mosaic of habitat types and sometimes have large chaparral areas. In addition, particular soil types give rise to several specialized plant communities where chaparral plants dominate. These include serpentine and gabbro soils.

Key Needs of Chaparral

- Protect remaining large landscapes with chaparral areas, including mosaics of different habitats.
- Conserve areas with special soil types or rare plants.
- Where possible, reintroduce natural fire regimes.

Chaparral is a fire dependent ecosystem and periodic burns are important for its ecological health. Fire is necessary for the seeds of various chaparral plants to germinate, while some shrubs sprout new growth after burning. While fire suppression reduces the fire frequency, the result can be rare, extremely hot fires that are very hard to control and can quickly engulf very large areas. A return to more historic fire frequencies would benefit both the biological and human communities

Specialized Plant Communities

The region has a number of specialized plant communities, characterized by particular soil conditions and plant species adapted to these conditions. Three of these are alkali sink, gabbro and serpentine communities. An individual area may be small and bordered by development or intensive agriculture. Consequently in several cases the only possible conservation outcome is establishment of small preserves that are isolated from other natural habitats.

Key Needs of Specialized Plant Communities

- Protect areas with rare and endangered plants as specialized preserves.
- Where possible, maintain specialized patches as part of larger natural landscapes.

The Valley Floor has patches of alkali soils where several unique plant species grow. In our region the most significant is an alkali sink region southeast of Woodland in Yolo County. There are five rare plants species that grow here.

Gabbro soils are found near Highway 50 corridor in the foothills of El Dorado County, extending

from Cameron Park north to Salmon Falls. They overlay a geological formation of gabbroic rock that is high in magnesium and iron. This area has a unique flora. Eight rare plants include five listed as threatened or endangered by the U.S. Fish and Wildlife Service. Currently there are five, rare plant preserves here and additional conservation opportunities are extremely limited because of recent development. The Service's recovery plan for this group of plants calls for 5,000 acres of protected land.

Both the Sierra Foothills and Inner Coast range have patches of serpentine soils that have high magnesium and low calcium levels and also contain heavy metals such as nickel and cobalt. These are difficult growing conditions, but 215 specialized California plants are only found on these soils. Other more wide ranging plants such as Chamise, manzanitas, Leather Oak, and Foothill Pine can grow under these conditions, but Blue Oaks and many other species fare poorly. Many of these serpentine patches are located in relatively unfragmented landscapes and so can be conserved as part of larger natural landscapes.

Cropland Ecosystems

Valley floor areas dominated by irrigated row crops can serve as habitat for a variety of wildlife species, and are extremely important for some birds. However their biological usefulness depends on individual farming practices. Farmers who keep strips of habitat along field edges, banks of streams and sloughs and patches of poor soils provide significant habitat value. But farms where the soil is kept bare around field edges and along waterways have far less biological value.

These field edges can be weedy areas, causing problems for neighboring crop acres. But with proper management their dominant vegetation is native grasses, shrubs and trees, providing a home for a variety of wildlife species and also beneficial

insects that aid pest control. In addition, small

Key Needs of Cropland Wildlife

- Maintain or restore trees and shrubs along streams and sloughs.
- Plant low-management native grasses or shrubs around field edges and in patches of poor soils.
- Provide small wetlands around tailwater ponds.
- Delay mowing of hay and winter grains until ground nesting birds have finished breeding.
- Plant native trees to provide long-term, replacement of large trees along streams and roadways.
- Maintain field crop industry and provide greater economic incentives for farm wildlife habitat.
- Maintain large landscapes in agricultural production.

wetlands around the edges of tailwater ponds, changes in practices such as delaying mowing of hay until after spring nesting and other techniques provide significant benefits. These are outlined in various publications by the Yolo County Resource Conservation District, California Department of Fish and Game and others (see **Wildlife and Farming** section in the Bibliography.)

In Yolo and Sacramento County the Swainson's Hawk (a state threatened species) benefits from suitable row crops and the conservation of large trees. So do several other raptors such as the White Tailed Kite.

The Common Kingsnake and other vertebrates will do well in strips of native vegetation. Riparian woodlands along streams and sloughs provide habitat for a wide variety of wildlife species. Pasturelands provide foraging habitat for the rare Tricolored Blackbird.

Another popular management tool is winter flooding of rice fields, which also helps to break down the crop stubble. This provides excellent habitat for waterfowl and shorebirds.

A key impediment to more widespread adoption of these wildlife friendly farming practices is lack of funding. Taking acres out of profitable crop production, and putting time and money into establishment of native vegetation, is a luxury most farmers cannot afford. Currently the federal government provides funding through several U.S. Department of Agriculture Programs, but per acre benefits are usually too low and application processes can be far too convoluted. Additional funding, and simple application procedures are an urgent need for our region. The new Farm Bill, signed into law in May 2002, may provide additional funding to promote these agricultural practices.

Conversion of row crops to orchards or vineyards takes away much of this wildlife value, especially the foraging habitat for birds like the Swainson's Hawk. Unfortunately, row crops often provide too little farm income and are even grown at a loss in some years. Vineyards in particular provide higher value crops, although cyclical oversupply problems will emerge, as has happened through over-planting of almond orchards. Absent effective changes in prices paid to farmers, societal payments for provision of wildlife habitat could play a meaningful role in maintaining the region's field crop industry.

Urban and Suburban Habitats

Cities and suburbs can easily provide habitat for little more than non-native House Sparrows, Starlings and Rock Doves (pigeons). Even very low density suburban areas easily lose much of their native wildlife value, due to habitat degradation and fragmentation, deleterious impacts of the human presence and loss of key

features such as patches of wetlands. For example, oak woodlands within low density development attract Starlings, which successfully compete against native birds for nesting in oak trees cavities.

However, it is possible to provide significant biological values even in dense urban areas. Provision of habitat corridors along streams and rivers in particular can provide benefits to a variety of wildlife species and help improve water quality and the ecological health of our waterways. In addition, with careful planning patches of wetlands,

woodlands and vernal pool grasslands can co-exist with neighboring urban development (see **Nature in Urbanized Areas** section in the Bibliography.) Stormwater detention basins can also function as wildlife areas. While many of the long-term biological values may be absent, such areas still have merit. Most especially these provide nearby nature and educational opportunities for city dwellers - an essential action for improving city quality of life and building greater support for nature conservation.

Needs of Some Key Groups of Animals

Here is an overview of key biological needs of some of our region’s species. Much of the focus is on birds for several reasons. More is known about birds than many other animals. They are more visible than mammals, reptiles, amphibians or many rare plants so gain more public attention. And the health of native bird populations provides a good indicator of the overall biological health of our region.

Raptors

Hawks and owls occupy an important ecological niche and keep down levels of small rodents and large insects. Some farmers recognize these important ecological services and put up owl boxes and hawk perches to aid the predators. Our region provides breeding and wintering habitat for over a dozen species of hawks and eagles, as well as several owls. The Valley floor and low grasslands are nationally renowned wintering grounds for several hawk species. A prime example is the Scott Road Raptor Area - the land between Highway 50 and Rancho Murietta in Sacramento County. Here the grasslands and oak savannah provide very important habitat, especially for wintering raptors.

Raptors need appropriate foraging habitat and, if

Perennial grassland	Highest
Alfalfa	>
Fallow fields	*
Dryland pasture	*
Beets	*
Tomatoes	*
Weedy /ruderal field	*
Irrigated pasture	*
Shrubs	*
Grains	*
Other row crops	?
Orchard/vineyard	Lowest

[Riparian Habitat Conservation Plan. RH]V (2000)]

Nesting and Foraging Needs of Some Key Raptors and Owls

Burrowing Owl	Nests in ground squirrel burrows	Grassy and sparse vegetation areas.
Cooper's Hawk	Nest trees	Riparian woodland, patchy oak woodland.
Ferruginous Hawk	(Winter only)	Very large grassland areas.
Golden Eagle	Cliffs or trees	Expansive grassland, oak savannah and patchy oak woodland.
Northern Harrier	Ground nesting	Wetlands, pasture, row crops,, grasslands.
Prairie Falcon	(Winter only)	Grasslands, oak savannah.
Red-Shouldered Hawk	Large tree	Riparian and oak woodland, developed areas with large trees and small foraging patches.
Red-Tailed Hawk	Large trees	Wide range of rural habitats.
Rough-Legged Hawk	(Winter only)	Open country, particularly low foothill grasslands.
Swainson's Hawk	Large trees (Summer only)	Expansive row crop areas, pasture.
White-Tailed Kite	Large trees	Row crop landscape with natural vegetation strips along edges.

breeding here, nest sites. Most species need expansive habitat areas away from human developments, although a few can adapt to significant urbanization. Different raptors forage in different conditions. Some need grasslands, some oak woodlands, some riparian woodlands. Several raptors do well in field crop areas of the Valley floor. Most nest in trees, but the Northern Harrier and the Short Eared Owl are ground-nesters and their breeding success is dependent on mowing times, while the Burrowing Owl nests underground.

Populations of many of our hawks and owls are severely reduced and several continue to decline. For example, the Swainson's Hawk is a state-listed threatened species dependent on extensive field crop landscapes in Sacramento, Yolo and San Joaquin Counties in particular. In early European settlement times the Cooper's Hawk was considered the most common California hawk and utilized the extensive riparian woodlands. But loss of over 90 percent of this habitat greatly reduced populations of this species. The Western

Burrowing Owl is in serious decline across California.

Shorebirds

Thirty-three species of shorebirds, totaling over 300,000 individuals, occur in the Central Valley, most in winter and during migration. They include the Greater Yellowlegs, the Least Sandpiper, and the Long-Billed Dowitcher. These birds feed in shallow waters, probing the ground for invertebrates. Different species favor different water depths, depending on the lengths of their legs and bills. Winter-flooded rice fields and managed wetlands are especially important habitat. The rice industry in north-west Sacramento, western Placer, Sutter and Yuba Counties plays a vital role in maintaining this large shorebird population, as well as various waterfowl species that utilize the flooded rice fields. Conservation of these rice growing areas and maintenance of the economic viability of rice

farming are both crucial needs for shorebird populations. The new Vic Fazio Wildlife Area in the Yolo Bypass also attracts large numbers of shorebirds.

Songbirds

A great variety of small songbirds utilize our region. Many are summer visitors, coming here to breed and heading south in the fall. Some are year-round residents, a few winter visitors and some just pass through the area during migration.

Each songbird species has its specific habitat requirements for nesting, for feeding and for cover. An individual species may use several different habitat types for these different functions, or even over the course of the day as it forages. Riparian and oak woodlands are particularly rich in songbirds. But breeding songbirds are currently very rare in the region's riparian woodlands since the virtually eradication the lush forests and woodlands that lined many Central Valley rivers. Most remaining riparian woodlands provide trees, especially cottonwoods and Valley Oak, but not the dense shrubs that many riparian woodland song birds use for nesting, nor the willow scrub and young willows used by other species. Furthermore, Brown-headed Cowbirds are serious nest parasites for many of these birds. The absence of very wide riparian woodland habitats results in there being no interior habitat free of cowbirds.

Another factor for many songbird species is negative impacts from neighboring human habitations. Primary factors are domestic cats, certain animal species that thrive around the built environment, and lack of larger predators such as coyotes and bobcats. Cats kill many millions of songbirds every year. In the U.S., several human-friendly birds out compete native songbirds. For example, the European Starling takes over oak tree cavities used as nest sites by Western Bluebirds and other small songbirds. Some smaller predators like racoons and opossums

thrive around human communities and in the absence of the larger predators. All these factors mean that the built environment is not a friendly place for many songbirds.

Riparian Woodland Songbirds

Many riparian songbirds have stopped breeding in our region, or are extremely rare, mainly because of habitat loss.

Key Needs

- Extensive riparian habitat.
- Willow scrub habitat .
- Dense understory vegetation.
- Low level of cowbird parasitism.

Species and Seasons

- *Year-round Residents:*
Song Sparrow, Bewick's Wren, Spotted Towhee.
- *Summer Visitors (breeding)*
Black-headed Grosbeak, Bullock's Oriole, Yellow-breasted Chat, Blue Grosbeak, House Wren.
- *Winter Visitors*
Hermit Thrush, Lincoln's Sparrow, Fox Sparrow, Ruby-crowned Kinglet.
- *Spring / Fall Migrants*
Wilson's Warbler, Warbling Vireo, Cassin's Vireo, Swainson's Thrush, Western Tanager.
- *No Longer Breed in Region*
Yellow Warbler, Willow Flycatcher, Bell's Vireo, Yellow-billed Cuckoo.

Long term conservation and restoration of songbird populations requires actions to counter these damaging trends. Extensive restoration of riparian woodland is a key step. This must include re-establishment of natural ecosystem functions, natural disturbance and plant succession including generation of willow scrub, and areas of dense undergrowth. Riparian areas need to be wide, not just a very narrow strip of trees along a river or stream. In oak woodlands, the continued development of larger, old trees with dead branches, and the presence of dead trees and

downed logs, is critical to songbirds and many other woodland animals. Conservation of grasslands, chaparral and croplands is important to the protection of other songbird species.

Waterfowl

Our Central Valley is the major wintering ground for the Pacific Flyway ducks, geese and swans, which breed in the northern plains states, Canada and Alaska. They utilize wetland habitats on the Valley floor and the geese also feed in fields. Early accounts tell of the sky darkening from huge flocks of waterfowl but their numbers are now

Some Key Needs of Waterfowl

- Winter wetlands with open water areas (including managed wetlands and winter-flooded rice fields).
- Upland habitat for foraging geese.
- Vernal pool grasslands for high-protein late winter diet.

greatly reduced. Most of the remaining wetlands are not natural habitats, but lands specifically managed for waterfowl, many owned by duck clubs. Winter flooded rice fields provide very important habitat. Both the Natomas Basin and the Sutter Basin are important areas for wintering waterfowl, while wetland restoration projects in places like the Yolo Bypass and the Stone Lakes National Wildlife Refuge will provide additional habitat. Recently biologists have found that vernal pools play an important role in waterfowl breeding. The birds use a high protein diet provided by vernal pool invertebrates before flying north in late winter. In turn, as protein levels in their diet increase, the number of eggs laid increases.

Amphibians

Amphibians, including frogs and salamanders, play many important roles in natural ecosystems. As well as being key components of food webs - eating invertebrates and in turn being eaten by herons and other predators - they serve as warning signs for ecological degradation. Currently there is a major global decline in many amphibian species. This is not well understood, and various factors come into play. Our region possesses 10 native and one introduced amphibian species, the Bullfrog, whose presence is likely one of the reasons for the decline of some native amphibians.

Key Needs of Some Area Amphibians

Arboreal Salamander	Oak woodlands with rocks and fallen logs.
California Slender Salamander	Riparian and oak woodlands with downed logs and leaf litter.
California Red-Legged frog	Foothill streams and riparian habitat. Some stock ponds.
California Tiger Salamander	Vernal pools plus grassy uplands with rodent holes.
Foothill Yellow-Legged Frog	Foothill streams with riffle areas
Western spadefoot	Vernal pool grasslands.

Habitat features are key. Most amphibians need a particular type of aquatic habitat for breeding and one or more types of upland habitat for other seasons. While some are closely associated with streams, ponds or vernal pools, others like the Arboreal and California Slender Salamanders are found in woodlands away from water bodies. They aestivate (the summer version of hibernation) in upland holes or under logs during the annual dry period.

Reptiles

Snakes, lizards and turtles are another important element of the natural environment - our region has 7 different lizards and 10 snakes, as well as pond turtles. Most of these are found in woodland, grassland and scrubland habitats of the Foothills and Inner Coast Range.

Key Needs of Some Area Reptiles	
Coachwhip shrub	Grasslands and open habitat.
Coast horned lizard	Annual grasslands and chamise chaparral with no nearby urban development.
Giant Garter Snake	Slow moving waterways, wetlands and flooded rice fields, plus adjacent uplands for winter dormancy.

Some species have lost a great deal of their historic habitat. For example, the Coast Horned Lizard has disappeared from historic sites in over a third of its range and remaining populations are fragmented. This species utilizes a variety of habitats across our region, including annual grassland, chamise chaparral and clearings in riparian woodlands. As well as requiring particular conditions, the Coast Horned Lizard needs relatively low impacts from neighboring landscapes, such as urban development.

The grasslands along the eastern edge of the Valley and the low Sierra foothills are important habitat for several other reptiles, including the Western Whiptail, Ringneck Snake, Coachwhip, and Long Nosed Snake. Several garter snakes utilize riparian and wetland habitat. The Giant Garter Snake (a federal and state Threatened species) receives particular attention because of its legal status. This snake uses slow moving waterways, wetlands and rice fields and winters in

upland holes. Historically the Natomas Basin has been an extremely important area for this snake.

Invertebrates

Very few invertebrates get the attention of the public, policy-makers or even environmental interest groups. Vernal pool species such as the Vernal Pool Tadpole Shrimp (federal Endangered) and Vernal Pool Fairy Shrimp (federal Threatened) are an exception because of the highly visible conflict between conservation of vernal pool grasslands and alternate land uses in many Central Valley locations.

In nature, invertebrates are of even greater importance to the health and sustainability of our ecosystems than vertebrates. Here are a few examples of the roles of invertebrates. Various species are crucial to nutrient cycling. The vernal pool invertebrates serve as an important protein source for waterfowl in late winter. Aquatic invertebrates in streams and rivers are essential food for fish and other vertebrates. Many birds have diets that are completely or partially insects and other invertebrates. Various insects are essential pollinators of many plants, while other, predatory, insects control herbivorous insects on both natural vegetation and crops.

Land management methods often pay little attention to the needs of invertebrates. Because of the problems that some agricultural pest species pose, and concerns about other species such as mosquitos, there has been a strong focus on elimination through pesticide applications, often to the detriment of neighboring natural areas and to insect eating animals. This is changing through adoption of approaches like Integrated Pest Management, where farmers and landowners utilize a variety of methods to minimize pests and reduce use of pesticides, as well as the spread of organic farming.

Landscape Implications of a Individual Species' Needs - the Greater Sandhill Crane Example

The Greater Sandhill Crane is a state Threatened species and has become a well-known symbol of bird life in our region. It is a good example of how the critical needs of a single rare species depend on a relatively small subregion and particular habitat characteristics, and these needs in turn require particular attention to land use.

In mid winter, about half of the Pacific Flyway Greater Sandhill Cranes use agricultural lands around in northern San Joaquin and South-western Sacramento Counties. The important habitat encompasses Delta lands north of Highway 12 to the middle of the Stone Lakes National Wildlife Refuge in Sacramento County, as well as a swath of lands in a wide belt along the lower Cosumnes River - roughly the land between Elk Grove and Galt. Crowding of these wintering birds poses threats from diseases and other factors, so it is important to conserve sufficient foraging and roosting habitat in the right areas.

Absent the vast historic Central Valley wetlands, the cranes need a particular mix of agricultural

lands. They feed in grain fields for carbohydrates (waste grains and corn) and in field edges, pasturelands and alfalfa for protein (invertebrates). They roost in shallow-water wetlands. Expansion of vineyards and urbanization has removed much of the crane's habitat. Protection of extensive tracts of the remaining foraging and roosting habitat will be necessary to conserve this Greater Sandhill Crane population. A key factor is the economic viability of farmers growing corn, barley and other grains. Also restoration of additional large, shallow seasonal wetland areas across the habitat area is important, to avoid overcrowded roost sites. Ideally, each roost site should have adequate suitable foraging habitat within one to two miles.

Land uses beneficial to the cranes also benefit an array of other Valley floor species that are in serious decline. Parts of this territory, such as Badger Creek, are very important habitat for the Giant Garter Snake (state and federal Threatened). Much of it is critical nesting and foraging habitat for the Swainson's Hawk (state Threatened), and other hawks utilize the area for both breeding and wintering. The Tricolored Blackbird, a California endemic species that is probably in serious decline, has a number of breeding colonies in the area .

Current Protected Areas Managed for Biological Resources

Our region only has a small amount of land where biological values are well protected. As of 1999, we considered approximately 56,000 acres of permanently protected land in the region to be managed for conservation of biological diversity plus a 42,000 acre State Recreation Area that is managed more for passive recreation

Sacramento County has 35,000 of these acres.

There are several large tracts that extend into Butte, Lake, Nevada and San Joaquin Counties, all of which are outside our region. In these cases we only consider those portions of the land that are in our six-county region in our acreage and on the map.

The primary owners of these lands are the California Department of Fish and Game, The

Major Areas Managed or Partly Managed for Biological Resources			
Name	Ownership Type	Major Habitats	Location (county)
Auburn State Rec Area	CoE/CP&R Riverine	Oak woodland, chaparral	Placer & El Dorado
Butte Sink WMA	Private / easements	Marsh	Sutter & Butte
Cache Creek MA	BLM	Chaparral, oak woodland	Yolo, Lake
Cosumnes River Preserve	Agencies, TNC etc	Several	Sacramento & San Joaquin
Daugherty Hill Wildlife Area	DFG	Blue oak, foothill pine	Yuba
Feather River Wildlife Area	DFG	Riparian woodland	Sutter, Yuba
Fremont Weir Wildlife Area	DFG	Riparian woodland	Yolo
Graylodge WMA	DFG	Marsh, cottonwoods	Sutter and Butte
Gabbro Soils Preserves	Agencies (several)	Chaparral	El Dorado
Sac. Vernal Pool Preserve	SVOSC	Vernal pool grasslands	Sacramento
Spenceville WMA	DFG	Oak woodlands, grasslands	Yuba, Nevada
Stones Lakes NWR	USFWS	Wetlands, pasture, riparian	Sacramento
Sutter NWR	USFWS	Marsh, uplands	Sutter
Vic Fazio Yolo Wildlife Area	Agencies	Marsh	Yolo
Yolo Basin lands	TNC	Marsh, grasslands, other	Yolo

BLM = Bureau of Land Management (US); CoE= U.S. Army Corps of Engineers; CP&R = California Department of Parks and Recreation; DFG = California Department of Fish and Game; MA = Management Area; NWR = National Wildlife Refuge; R = Reserve; Sac = Sacramento; SVOSC = Sacramento Valley Open Space Conservancy; UC = University of California; USFWS = U.S. Fish and Wildlife Service; WMA = Wildlife Management Area.

Nature Conservancy, the U.S. Bureau of Land Management (BLM) and the U.S. Fish and Wildlife Service. The BLM, which sells or exchange lands, has active programs of protecting riparian habitat along the South Fork of the American River and the Cosumnes River. It also has a large and growing tract of natural land around the head of the Capay Valley - the Cache Creek Management Unit that is an effective biodiversity area managed in cooperation with Fish and Game. Long term conservation and management of these BLM lands is very secure at this time.

Auburn State Recreation Area (El Dorado and Placer Counties)

This 42,000 acre expanse of chaparral, oak and pine woodland, includes 40 miles of steep river canyon on the North and Middle forks of the American River. The recreation focus is hiking and equestrian, activities that are compatible with a high level of biological conservation.

Butte Sink Wetlands (Sutter and Butte Counties)

This 18,000 acre management area at the extreme north-west corner of our region lies along the Sacramento River and is often flooded during high run-off periods. The U.S. Fish and Wildlife Service holds permanent conservation easements on 11,000 acres of private lands, requiring owners to maintain marsh and other habitat. In addition, there is a 733 acre National Wildlife Refuge. Much of the acreage is outside our region, in Butte County.

Cache Creek Management Area (Yolo and Lake Counties)

This comprises about 50,000 acres of public lands around the head of the Capay Valley. It is managed jointly by the Bureau of Land Management and the California Department of Fish and Game. It possesses a wide variety of Inner Coast range habitats. About half the area is chaparral, including patches of serpentine chaparral, the rest a mix of grasslands and oak woodlands. It encompasses 35 miles of Cache Creek, as well as several smaller perennial streams. As a result of this mix of habitats and large size the area is home to a great wealth of wildlife. The BLM is actively purchasing additional lands to expand this area.

Cosumnes River Preserve (Sacramento and San Joaquin Counties)

This steadily growing protected area is the crown jewel of our region. Several agencies and organizations have worked together for many years to buy a mix of land in fee title or

conservation easements on private farmland. The partners are the Nature Conservancy of California, the California Department of Fish and Game, the federal Bureau of Land Management, California Department of Water Resources, Ducks Unlimited, Inc., Sacramento County Department of Regional Parks Open Space and Recreation, and the state Wildlife Conservation Board. As of February 2001, a total of 16,420 acres were protected in Sacramento County, as well as additional acres in San Joaquin County. These include a wide strip of land along the lower Cosumnes River between Hwy 99 and Interstate 5, as well as the Howard Ranch at the south-east corner of Sacramento County.

The area includes riparian oak woodlands, riparian cottonwood forests, seasonal wetlands, rice fields and other habitat. The valley oak woodland is the largest remaining stand of this species in California. A levee break during the 1997 floods resulted in the germination of Cottonwood seeds on fresh silt and a former field is now a young cottonwood forest.

Riparian songbirds like the Blue Grosbeak and the Common Yellowthroat, which no longer breed at most historic sites in the Central Valley, continue to nest at the Cosumnes River Preserve. The mix of riparian, wetland and upland habitats provide for a wide range of species, including the Greater Sandhill Crane and the Swainson's Hawk.

The Howard Ranch property has extensive vernal pool grasslands and blue oak woodlands. The Nature Conservancy has placed a permanent conservation easement on this property and plans to sell it to a cattle rancher.

Daugherty Hill Wildlife Area (Yuba County)

This 2,520 acre Fish and Game wildlife area protects oak woodland and foothill pine in the

Yuba County foothills, north of Highway 20.

Feather River Wildlife Management Area (Sutter and Yuba Counties)

This string of four separate California Department of Fish and Game preserves plus the Bobelaine Audubon Reserve extends along both banks of the lower Feather River, where the river forms a boundary between Yuba and Sutter County. The preserves encompass a total of 2,300 acres of riparian vegetation, valley oaks and cottonwoods that provide an important breeding and migratory area for many songbirds.

The Riparian Bird Conservation Plan prepared by the Riparian Habitat Joint Venture identifies the Lower Feather River as a key location for re-establishing breeding populations of several bird species that have nearly vanished from the Central Valley including the Yellow-Billed Cuckoo.

The Lower Feather River is also identified by the CalFed Bay-Delta Program as an important restoration area to improve spawning populations of the Spring and Fall runs of Chinook Salmon and also Steelhead trout. In addition, it can provide better habitat for several other native fish species, including the White and Green Sturgeons, Lamprey and American Shad. Effective restoration will require preservation and expansion of the River's meander belts and natural floodplain where flood processes may occur.

Fremont Weir Wildlife Area (Yolo County)

This is a small, 210 acre, Fish and Game wildlife area of mature riparian woodland along the Sacramento River, that provides habitat for a wide variety of riparian wildlife species.

Gabbro Soils Rare Plant Preserves (El Dorado County)

A preserve system of five areas ranging from 60 acres to over 3,000 acres has been proposed to protect eight rare plant species found in the Northern Gabbroic Mixed Chaparral plant community. The total acreage proposed for the preserve is about 5,000 acres. Approximately 1,700 acres are currently in protected status. The American River Conservancy has been working with the El Dorado Irrigation District, El Dorado County, California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Bureau of Land Management, and the National Fish and Wildlife Foundation to complete the acquisitions necessary to create the preserve.

Graylodge Wildlife Management Area (Sutter and Butte Counties)

This 9,167 acre area is one of the premier sites for wintering ducks and snow geese in the Central Valley. It is owned and managed by the California Department of Fish and Game. A small portion of this area is in Sutter County, and therefore within our region. But the vast majority of Graylodge is in Butte County. This managed landscape provides a mix of marsh and shallow open water during the winter. There are also many clumps of cottonwood trees. During the winter the northern harrier is especially abundant. Various shorebirds, marsh, woodland and water birds also use the site.

Lower Sherman Island (Sacramento County)

This 3,115 acre Delta Island at the confluence of the Sacramento and San Joaquin Rivers is a Fish

and Game wildlife area comprised of marsh and some riparian woodland.

Natomas Basin Conservancy Lands (Sacramento and Sutter Counties)

The Conservancy is protecting lands under the Natomas Basin Habitat Conservation Plan (see page 36.) As of May 2002, 2089 acres were protected. About half of this acreage is rice fields, a quarter managed marsh and a quarter uplands. Most of the protected parcels are in the Sutter County portion of the Basin. The long term goal is to convert some of these rice fields to permanent wetland habitat.

Sacramento Vernal Pool Preserve (Sacramento County)

The Sacramento Valley Open Space Conservancy is acquiring key vernal pool grassland acreage within the Sacramento County Urban Services Boundary. This is a potential 3,000 preserve, which would play a critical role in protecting a variety of rare animals and plants that utilize the vernal pool grasslands.

Sierra Foothill Research and Extension Center (Yuba County)

This is a 5,700 acre annual grassland and oak woodland area adjacent to the Yuba River. It belongs to the University of California and is a research and Extension Center of the University's Division of Agriculture and Natural Resources. Its main function is to provide for a wide range of university research projects addressing oak woodland ecology and management, range

management and other issues. Conservation of the biological resources is one necessary component of this research station.

Spenceville Wildlife Management Area (Yuba and Nevada Counties)

This is an 11,488 acre tract of oak woodland and grassland habitat in the low foothills straddling the Yuba-Nevada County line. Several streams traverse the area and provide riparian habitat. There are also a number of springs in the area, providing a specialized biological community. With this mix of habitats, large acreage, and very few roads, the area provides high quality habitat for a wide range of animal species. It is one of the very few large areas of publicly owned, accessible, foothill woodland and grassland areas in the entire Sierra Nevada western foothills.

Stone Lakes National Wildlife Refuge (Sacramento County)

This new National Wildlife Refuge borders Interstate 5 immediately south of the City of Sacramento. Currently the land within the authorized acquisition borders belongs to a variety of ownerships, including the U.S. Fish and Wildlife Service, the County of Sacramento and private individuals. The publicly owned portion is managed as wetland, grassland and riparian habitat. A major habitat restoration program is under way. As of May 2002 there are 4,066 acres protected with the refuge boundary. Some of these lands are owned by the Service, some are private lands with conservation easements, and some are lands belonging to other agencies and managed under cooperative agreements. Additional lands or easements within the authorized boundary will be purchased as willing sellers and available funds permit, to create an 18,212 acre conservation area.

Sutter National Wildlife Refuge and Wildlife Area (Sutter County)

The 3,766 acre U.S. Fish and Wildlife Service refuge is largely within the Sutter Bypass, a conduit for excess Sacramento River water during high flow periods. The California Department of Fish and Game has an additional 3,204 acres in the Tisdale Bypass, which connects to the National Wildlife Refuge. These areas are managed for wintering waterfowl.

Vic Fazio Yolo Bypass Wildlife Area (Yolo County)

This 3,700 acre area in the Yolo Bypass is the largest wetlands restoration site west of the Mississippi. It was created by a partnership between several agencies and non-profit organizations and dedicated in 1997. The area attracts a variety of waterfowl and shorebirds during the winter. It remains part of the floodway that is the Yolo Bypass, so can disappear under water, sometimes for many weeks, after prolonged heavy storms of rapid snowmelt. High quality wetlands and riparian woodland is developing thanks to active restoration efforts. In 2001, The Nature Conservancy received funding from the Wildlife Conservation Board to purchase about 12,000 acres of land in the Yolo Bypass, immediately south of the Vic Fazio Yolo Bypass Wildlife Area. The land will eventually transfer to the Department of Fish and Game.

Conservation (Mitigation) Banks

There are a number of these protected areas in our area. Mitigation banks began as tracts of land for creation of vernal pools or marsh. Developers can buy credits at these banks to mitigate for destruction of these wetlands on their properties, so fulfilling part of the federal and state no-net-

loss of wetlands requirements. Over the years these banks have expanded to include preservation as well as creation or restoration of wetlands and to function under endangered species laws. Currently the U.S. Fish and Wildlife Service calls all the banks conservation banks. Several banks in our region are managed by private companies.

The biological value of these banks varies and there can be pitfalls. Many banks are rather small areas surrounded by unprotected lands. If those surrounding lands are developed, or otherwise undergo major changes, the banks could become postage stamp preserves existing in a sea of incompatible habitat. In addition, individual banks can have very large catchment areas, often more than a county. Over-reliance on these banks, rather than a landscape-scale conservation approach, could result in conservation of some species being limited to very small areas.

Individual Farms and Ranches Conserving Biological Resources

In addition to these permanently protected areas, there are a growing number of private farms and ranches that practice various types of wildlife friendly farming as part of their stewardship of the land. In some cases these efforts are coupled with establishment of conservation easements.

These approaches are extremely important and if widely adopted, will provide very great benefits to a variety of wildlife and plant species in both the Valley and the Foothills. Many are promoted by the Yolo County Resource Conservation District and highlighted at Hedgerow Farms north of Winters. They are outlined in the **Cropland Ecosystems** section on Page 21. Some landowners manage significant acreages for wildlife. An example is the Lower Cottonwood Slough Preserve near Woodland. Ducks

Unlimited, California Department of Fish and Game and the U.S. Fish and Wildlife Service and the U.S.D.A. Natural Resources Conservation

Service all have programs to aid landowners wishing to carry out biological conservation projects.

Key Current Programs and Plans for Protecting and Restoring Biological Resources

There are a growing variety of programs and planning efforts with the focus on biological resources. They range from county or subcounty plans to mitigate for development impacts to the wide ranging restoration proposals of CalFed to bird conservation plans developed for various habitats. Some of these approaches remain controversial and have been subject to lawsuits.

CalFed Bay Delta Program

The mission of the CalFed Bay Delta program is to develop a long-term comprehensive plan that will restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system.

The ecological quality component includes detailed analysis and goals both for the Delta itself and for the Sacramento and San Joaquin River systems. Since our aquatic and riparian ecosystems are so degraded, the focus has to be on restoration. A detailed Ecosystem Restoration Program Plan provides visions for individual ecological management zones. Several of these zones are wholly or partly in our region - the Delta (much of the North Delta unit), much of the Sacramento River zone, the Feather River / Sutter Basin zone, the American River Basin zone, the Yolo Basin zone, and part of the Eastside Delta Tributaries zone.

The Restoration Program Plan provides an overview and a vision for each of the zones. The vision includes ecological processes, habitats, and actions to reduce or eliminate ecological stresses. For example, the basic vision for the Feather River is to enhance natural spawning populations of Spring- and Fall-run Chinook salmon and Steelhead. This will require adaptive management to reactivate or maintaining the ecological processes that create and sustain anadromous fish habitat. The latter includes floodplain and flood processes, a natural streamflow and improved riparian vegetation in the lower river that will also benefit riparian wildlife. Each of these zone plans includes restoration targets and programmatic actions. These address specific river flow needs: expansion of stream meander belts, supply of coarse sediment for fish spawning beds, restoration of natural floodplain and flood processes, goals for seasonal wetland, aquatic and riverine habitats and various other actions.

In theory there is a large supply of state and federal funding to implement the CalFed restoration program. However, CalFed is a part of the state debate over water supply and allocation - a very contentious arena. In addition, agricultural groups are concerned about the possible extent of conversion of agricultural lands to wildlife habitat. CalFed implementation requires annual funding through the state budget and Congressional appropriations, and the money is often quite controversial.

Habitat Conservation Planning (HCPs and NCCPs)

Habitat Conservation Plans (HCPs) are a mitigation and conservation planning tool authorized under Section 10 (a) of the Federal Endangered Species Act (FESA). Congress created Section 10(a) in 1982, when FESA's total prohibition of take of endangered species was preventing development at San Bruno Mountain in California. The lead entity proposing an HCP submits a plan to the U.S. Fish and Wildlife Service. Plan approval provides a permit for incidental take of the FESA species covered by the plan, within the plan area. The box the adjacent column gives lists the key legal requirements for HCPs and the analogous California permit system under section 2081(b) of the California Endangered Species Act (CESA).

Early HCPs were small scale, applying to individual development projects and a single species. In recent years HCPs have shifted to multi-species and multi-habitats over large areas. County-level plans are becoming the norm in California, which has 85 percent of the nation's HCPs. These HCPs address species protected under federal and state endangered species laws, candidate species, additional species for which mitigation is required under the California Environmental Quality Act (CEQA) and a number of species that are fully protected under California law, meaning that no individuals may be taken. The result is a plan that may address 30 to 50 or more species.

A related process is Natural Communities Conservation Planning (NCCP) under state law. An NCCP is a voluntary process focused on conservation of natural communities. An NCCP can provide a regional approach to overall biological needs. We are now seeing a trend to developing a combined HCP/NCCP for a given area, with several of the conservation planning efforts in our region converting from HCPs to HCP/NCCPs.

Conservation Plans - Legal Basis

HCPs authorized under section 10(a) of the Federal Endangered Species Act (FESA). Allows authorization of incidental take upon approval of a conservation plan that includes, for the species covered:

- take is incidental; **
- impacts of take minimized and mitigated to maximum extent practicable;
- adequate funding for the plan;
- taking will not appreciably reduce the likelihood of survival and recovery.

State permits under Section 2081 (b) of California Endangered Species Act (CESA) have similar requirements. The differences with FESA are:

- requirement for full minimizing & mitigating of impacts roughly proportional to impacts of authorized take;
- permit won't jeopardize continued existence of the species.

NCCPs authorized under SB 107, California's Natural Community Planning Act.

- identify and provide for the regional or area wide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth
- provide comprehensive management and conservation of natural communities and multiple wildlife species

**** Incidental Take.** This means that the take is incidental to the purpose of the project, not that the magnitude of the take is necessarily incidental to the species..

Early NCCPs all took place in south west California under a state law that provided little guidance. SB107, a new NCCP law that spells out specific planning requirements, was signed by the governor in the winter of 2002. See the Fall 2002 issue of *Linkages*, the periodical of the Institute for Ecological Health, for more information on SB107 planning requirements.

Plans are usually developed by consultants hired by the lead entity or project proponent. Effective planning utilizes a steering committee that comprises the various interests or stakeholders and

additional entities such as a technical advisory committee, biological and economic subcommittees, and an independent scientific panel.

There has been a long learning curve regarding how to develop a good HCP. Early HCPs were extremely flawed, and both the scientific and environmental communities have serious problems with the HCP process and quality of existing plans. There have been a number of scientific critiques of these conservation planning methods (see bibliography, **Conservation Planning** section.) On the other hand, the U.S. Fish and Wildlife Service, biologists and environmentalists are learning from experience and the Service updates its expectations. Additional requirements are occurring as a result of lawsuits challenging the adequacy of approved HCPs.

Here are several Conservation Plans in our area that are in various stages of development.

Natomas Basin

The Natomas Basin is a 53,000 acre area including portions of Sacramento City and County and Sutter County. The City of Sacramento developed an HCP to mitigate for development of its portion of the Basin and obtained permits. The primary focus of this HCP is on the Giant Garter Snake and the Swainson's Hawk, although it also covers additional species. It assumes a Basin wide breakdown of 17,500 acres of development, mitigation protection of 8,750 acres (a 0.5:1 ratio) and about 27,000 acres remaining in agriculture but not protected through conservation plans. A Natomas Basin Conservancy is charged with carrying out the mitigation requirements and has protected a number of isolated parcels (See page 32.)

The City obtained incidental take permits in 1997, but the federal permit was successfully challenged in Federal Court and ruled invalid. A major issue

is that the plan assumed participation of all three local government jurisdictions - the City and County of Sacramento and Sutter County. Currently the City of Sacramento is working to revise the HCP and prepare environmental review documents. A temporary settlement agreement allows some development to precede, in exchange for conservation of some critical habitat areas in the Sacramento County portion of the Basin.

Placer County

The County is beginning a conservation planning process as an outcome of the Placer Legacy Program. It has started phase I of an HCP/NCCP, which addresses the foothill and Valley floor lands of Western Placer County. This process uses a Biological Working Group comprised of various stakeholder interests, and an independent scientific advisory panel. Phase I will provide for conservation of streams and riparian areas, vernal pools, grasslands and oak woodlands.

South Sacramento County

This HCP addresses the impacts of future development within a portion of the Sacramento County Urban Services Boundary (USB) adopted in the 1993 General Plan - lands south of Hwy 50 and east of I-5, which include extensive tracts of vernal pool grasslands and many occurrences of listed and rare species. This plan too has been under preparation for several years. It will cover about 50 species and their habitats, allow for about 50,000 acres of development within the USB and conserve about 50,000 acres of land, mostly outside the USB, in still rural portions of the County. The focus is on establishment of large preserves and use of permanent conservation easements on large tracts of private grazing and farm land. This process involves a steering committee with several representatives of the environmental and development communities, biological and economic subcommittees, a technical advisory

committee and a scientific review committee. It holds the promise of developing a scientifically highly credible conservation plan

Yolo County

The County, together with the Cities of Davis, West Sacramento, Winters and Woodland has been preparing this HCP for several years and is now converting the project to an HCP/NCCP. The HCP function will mitigate for 11,000 acres of development within the current General Plan boundaries of the four cities, plus up to 1,000 acres of agriculture facilities in unincorporated (County) lands. The basic approach is permanent conservation of one acre of land for every acre lost to development. Most of this will be agricultural land that provides foraging and some nesting habitat for covered bird species. There are higher ratios for natural habitats, and specific requirements for conservation of area specific species, such as alkali sink and vernal pool plants. There is a strong focus on protection of key Swainson's Hawk foraging and nesting areas. NCCP function will require additional, still undefined, measures and address conservation of the full range of habitats and critical species in the entire county. You will find a January 2001 draft HCP at www.yolocounty.org/HCP/TOC.pdf

El Dorado County

The County is considering development of a conservation plan for the western 1/3rd of the county, covering the foothills, once it has settled on revisions for its General Plan.

North Delta National Wildlife Refuge Proposal (Yolo and Solano Counties)

The U.S. Fish and Wildlife Service has proposed a new National Wildlife Refuge in the Yolo Bypass, south of the I-80 causeway. This started as a small project, but many area farmers with land in the Bypass expressed interest and the size of the proposed refuge grew. The service's preferred alternative, released in December 1999 plan, encompasses 47,500 acres with acquisition of 65 to 75 percent of this land in fee title. This is all floodway land and the goal is to have a mix of open water, seasonal wetlands, grasslands and croplands. Local governments expressed major concerns about the proposed Refuge however and the project is currently under negotiation.

Placer Legacy Program

This is a unique county-wide program for the conservation of various open space resources - agricultural lands, biologically significant lands, and lands that can provide for significant community needs. It is based on the 1994 County General Plan update that contained policies which includes detailed policies and programs for conservation of open space resources. Here are some of the key habitat, wildlife and open space policies of that General Plan:

- 6.C.1 The County shall identify and protect significant ecological resource areas and other unique wildlife habitats critical to protecting and sustaining wildlife populations. [Specifically identified resources included "large areas of non-fragmented natural habitat, including Blue Oak Woodlands, Valley Foothill Riparian, Vernal Pool Habitat.".]
- 6.C.7 The County shall support the maintenance of suitable habitats for all indigenous species of wildlife, without preference to

game or non-game species, through maintenance of habitat diversity.

6.C.8. The County shall support the preservation or reestablishment of fisheries in the rivers and streams within the county, wherever possible.

6.E.1 The County shall support the preservation and enhancement of natural land forms, natural vegetation and natural resources as open space to the maximum extent feasible. The County shall permanently protect, as open space, areas of natural resource value, including wetlands preserves, riparian corridors, woodlands and floodplains.

6.E.3 The County shall support the maintenance of open space and natural areas that are interconnected and of sufficient size to protect biodiversity, accommodate wildlife movement, and sustain ecosystems.

There were also a variety of Implementation Program Items in the General Plan, including:

6.11 The County shall encourage a cooperative effort to develop, adopt, and implement a comprehensive habitat management plan to address the long-term preservation and maintenance of sufficient natural habitat to support the diversity of plants and wildlife species currently represented in Placer County indefinitely.

In the late 1990's, the County started work on an ambitious Placer Legacy Open Space and Agricultural Conservation Program to implement the requirements of the General Plan. This began with citizen outreach and formation of a multi-stakeholder steering committee to guide the process. Separate subcommittees dealt with different open space aspects, one addressing biological issues. This subcommittee worked with a conservation planning consultant and an

academic conservation biologist, who developed information and ideas for conservation of biological resources. In addition there were meetings with interested groups, such as environmental organizations. The outcomes included generalized proposals for the conservation of biological resources in the County. These were included in an overall Placer Legacy implementation program adopted by the County Board of Supervisors in the Summer of 2000. Here is a summary of the Biological Resource Objectives adopted by the Board.

- Work with landowners to conserve and improve creeks and riparian zones through streambed improvement, re-vegetation, and where appropriate, widening the vegetated zone within the natural flood plain, increasing the retention of surface water run off.
- Protect existing high quality riparian areas and help prevent degradation from urban encroachment in rural residential and suburban areas.
- Work to preserve large core areas of vernal pools which are relatively undisturbed and help protect small pool complexes, especially the rare varieties, to maintain biological diversity.
- Work to protect large areas of oak woodlands and groves with special values. In rural residential areas, protect oak woodlands by educating land owners, local conservation activities and current land use policies.
- Protect grasslands as important components of vernal pools and oak woodland conservation and as areas with both habitat and agricultural values.
- Coordinate with other agencies to protect Sierra Nevada resources, and watch for opportunities to swap lands of particularly high biological values as a means of protection.

This local government approach is able to address important habitats like oak woodlands, grasslands and riparian zones that have little federal or state regulatory protection because they lack endangered animal species. It recognizes stream environments provide a great opportunity to conserve biodiversity and that habitat like grasslands also have very significant biological values. Key issues like ecological functions and processes are all addressed in the overall Placer Legacy plan.

This is a remarkable achievement. At this time it remains to be seen how successful implementation will be - both in terms of obtaining adequate funding and providing effective long-term protection for the various habitats, species and ecological processes. In addition to the broad biological goals of the overall Placer Legacy program, the County decided to pursue a second effort - an NCCP for those species that require permits from wildlife agencies to allow incidental take (see Page 35.)

Public-Private Partnerships and Agency Landowner Assistance for Habitat Conservation

There are a variety of these partnerships and programs that help habitat conservation in our region. These include Joint Venture projects that are major partnerships between federal and state agencies and private organizations, and projects by state Fish and Game, the U.S. Fish and Wildlife Service and the Natural Resources Conservation Service to aid individual landowners.

The focus of the *Central Valley Habitat Joint Venture* is to increase waterfowl populations in the Central Valley. It is part of the North American Waterfowl Management Plan created by a 1986 agreement between the United States and Mexico. The Central Valley Habitat Joint Venture has a set of habitat-related goals to achieve these

ends, including enhancing 291,555 acres of wetland habitats, enhancing waterfowl habitat on 443,000 acres of agricultural lands and on 291,555 acres of public and private lands; achieving in perpetuity protection of 80,000 acres of existing wetlands. Projects for private landowners include state Fish and Game wetlands easements and waterfowl habitat improvement incentives. The U.S. Fish and Wildlife Service purchases wetlands easements and the U.S. Department of Agriculture assist farmers to protect wetlands through the Wetlands Reserve Program.

The *California Partners in Flight* program focuses on halting the decline of migratory birds. In 1994 it formed the Riparian Habitat Joint Venture, with a goal of conserving and restoring riparian habitat through a coordinated statewide effort. Its goals include doubling the acreage of effective riparian habitat and restoring degraded riparian habitat.

The state *Wildlife Conservation Board* and the *U.S. Fish and Wildlife Service* also purchase key wildlife habitats from willing sellers and provide funding to enhance habitat for other wildlife programs such as endangered species protection.

The *Natural Resources Conservation Service*, a component of the U.S. Department of Agriculture, has various programs to aid farmers wishing to carry out conservation projects, including a Riparian Buffers initiative and the Conservation Reserve Program.



Conclusion - Looking Ahead

There are a wide variety of programs and projects in the Sacramento region that focus on the conservation of biological resources. Additional activities, such as conservation of farm and range lands, provide biological conservation as a secondary function or a by-products. The list of protected areas is growing, and we hope to see extensive additions in the periodic update of Open Space geographic information by the Sacramento Area Council of Governments.

In addition, habitat and ecosystem restoration projects by CalFed, some flood control agencies, The Nature Conservation, the California Department of Fish and Game, and others hold great promise for the future. Restoration is a critical component in a region that has lost so much important habitat and where many of the

remaining habitat areas lack the structural complexity and ecological processes necessary for their long term health.

In the years ahead the sum of these activities can ensure that we maintain all the existing native species and even bring back some of those that have disappeared from the region. The geographic requirements are very considerable if we are to protect populations of the various rare or declining species, restore rare and degraded habitats, preserve functioning ecosystems and restoring ecosystems processes. We need a major focus on maintaining the remaining natural and agricultural landscapes, coupled with re-connecting various waterways to their floodplains, restoring riparian areas, and regaining stream-course ecological processes.

Organizations and Projects Conserving Biological Resources in our Region

American River Conservancy	www.arconservancy.org
Cache Creek Conservancy	www.cachecreekconservancy.org
California Department of Fish and Game	www.dfg.ca.gov/dfghome.html
Central Valley Habitat Joint Venture	ceres.ca.gov/wetlands/geo_info/central_valley_habitat.html
Cosumnes River Project	www.cosumnes.org/project.htm
Ducks Unlimited	www.caldu.org
Natomas Basin Conservancy	www.natomasbasin.org
The Nature Conservancy	www.tnc.org/california

Biological Resources and Conservation Needs in the Sacramento Region

Placer Land Trust	www.pltpnc.org
Sacramento Valley Open Space Conservancy	www.svossc.org
U.S. Fish and Wildlife Service	sacramento.fws.gov . Also: www.r1.fws.gov
Yolo Basin Foundation	www.yolobasin.org
Yolo Land Trust (primary focus is conservation of agriculture)	www.dcn.davis.ca.us/go/yololand

Additional Planning and Restoration Projects

CalFed Bay Delta Program	calfed.ca.gov
California Partners in Flight	www.prbo.org
Placer Legacy & HCP/NCCP	www.placer.ca.gov/planning/legacy
Sacramento and San Joaquin River Basins Comprehensive Study (Flood Management and Ecosystem Restoration)	www.compstudy.org
South Sacramento County HCP	
Yolo County HCP/NCCP	www.yolocounty.org/HCP/TOC.pdf
Yolo County Resource Conservation District	www.yolorcd.ca.gov/home.html

Other Organizations with a Major Focus on Biological Resources

Audubon California	www.audubon-ca.org
California Native Plant Society	www.cnps.org/index.htm
California Oak Foundation	www.californiaoaks.org
Friends of Swainson's Hawk	www.swainsonshawk.org
Institute for Ecological Health	http://thecity.sfsu.edu/users/IEH

Bibliography

General Reading

Bakker, E (1971) *An Island Called California : an Introduction to its Natural Communities*. University of California Press, Berkeley, CA.

Jensen DB, Torn MS and Harte J (1993) *In Our Own Hands : a Strategy for Conserving California's Biological Diversity*. University of California Press, Berkeley, CA.

Schoenherr AA (1992) *A Natural History of California*. University of California Press, Berkeley, CA.

Historic Conditions and Post Settlement Change

Dennis, NB and Marcus ML (1983) *Status and Trends of California Wetlands*. ESA/Madrone Environmental Science Associates, Novato, CA.

Thelander CG and M Crabtree. 1994. *Life on the Edge: a Guide to California's Endangered Natural Resources: Wildlife*. Biosystems Books, Santa Cruz, CA.

Thompson, K (1977) *Riparian Forests of the Sacramento Valley, California*. In. Sands, A (ed) *Riparian Forests in California: Their Ecology and Conservation*. Division of Agricultural Sciences, University of California, Berkeley, CA.

Conservation Planning

Beatley, T. (1994) *Habitat Conservation Planning : Endangered Species and Urban Growth*. University of Texas Press, Austin, TX.

Jasny, M. (1997) *Leap of Faith : Southern California's Experiment in Natural Community Conservation Planning*. Natural Resources Defense Council. New York. NY

Kareiva et.al. (1999) *Using Science in Habitat Conservation Plans*. National Center for Ecological Analysis and Synthesis, University of California, Santa Barbara, CA.

Noss R, O'Connell, M and Murphy D. (1997) *The Science of Conservation Planning : Habitat Conservation Planning under the Endangered Species Act*. Island Press, Covello, CA.

U.S. Fish and Wildlife Service and National Marine Fisheries Service (1996). *Habitat Conservation Planning Handbook*. Washington, DC. [latest addendum to the Handbook is the five point policy - Federal Register, 6/1/2000 pages 35242 -35257.]

See also issues of *Linkages* in 1997 and 2002 that focus on Conservation Planning. *Linkages* is the periodical of the Institute for Ecological Health, Davis. CA.

Ecology, Ecological Processes, and Conservation

Field, CB (1999) *Confronting Climate Change in California : Ecological Impacts on the Golden State*. Union of Concerned Scientists and the Ecological Society of America. Cambridge, MA and Washington, DC (available at www.ucsusa.org)

Fiedler, PL and Subodh, KJ (eds) (1992) *Conservation Biology : The Theory and Practice of Nature Conservation, Preservation and Management*. Chapman and Hall, New York, NY.

Formann, TT (1995) *Land Mosaics : The Ecology of Landscapes and Regions*. Cambridge University Press, England.

Mount JF (1995) *California Rivers and Streams : The Conflict Between Fluvial Process and Land Use*. University of California Press, Berkeley, CA.

Pickett, STA, Ostfeld RS, Shachak, M and Likens, GE (eds) (1997) *The Ecological Basis of Conservation : Heterogeneity, Ecosystems and Biodiversity*. Chapman and Hall, New York, NY

Schwartz, MW (ed) (1997) *Conservation in Highly Fragmented Landscapes*. Chapman and Hall, New York, NY.

Nature in Urbanized Areas

Beissinger SR and Osborne DR (1982) *Effects of Urbanization on Avian Community Organization*. Condor. 84:75-83.

Fleming, R and Hopkins, JD *Ecological Planning and Urban Village Design* (2000).. Community Design and Planning Services, University of California, Davis and the Institute for Ecological Health, Davis.

Rottenborn SC (1999) *Predicting the Impacts of Urbanization on Riparian Bird Communities*. Biological Conservation. 88:289-299.

Needs of Nature, Conservation and Restoration

CalFed Bay-Delta Program (2000) *Ecosystem Restoration Program Plan Volume I: Ecological Attributes of the San Francisco Bay-Delta Watershed*. Final Programmatic EIS/EIR Technical Appendix. Sacramento CA.

CalFed Bay-Delta Program (2000) *Ecosystem Restoration Program Plan Volume II: Ecological Management Zone Visions* Final Programmatic EIS/EIR Technical Appendix. Sacramento CA.

CalFed Bay-Delta Program (2000) *Multi-Species Conservation Strategy* Final Programmatic EIS/EIR Technical Appendix. Sacramento CA.

California Partners in Flight (2000) *The Draft Coastal Scrub and Chaparral Bird Conservation Plan : a Strategy for Protecting and Managing Coastal Scrub and Chaparral Habitats and Associated Birds in California* (J. Lovio, lead author). Version 1.0. Point Reyes Bird Observatory. www.prbo.org/CPIF/Consplan/html

California Partners in Flight (2000) *The Draft Grassland Bird Conservation Plan : a Strategy for Protecting and Managing Grassland Habitats and Associated Birds in California* (B. Allen, lead author). Version 1.0 Point Reyes Bird Observatory. www.prbo.org/CPIF/Consplan/html

Biological Resources and Conservation Needs in the Sacramento Region

California Partners in Flight (2000) *The Draft Oak Woodland Conservation Plan : a Strategy for Protecting and Managing Oak Woodland Habitats and Associated Birds in California* (S. Zack, lead author). Version 1.0 Point Reyes Bird Observatory. www.prbo.org/CPIF/Consplan/html

Fleming R and Hopkins JD (2000) *Ecological Planning and Urban Village Design* Community Design and Planning Services, University of California, Davis and the Institute for Ecological Health, Davis.

Noss RF and Cooperrider AY (1994) *Saving Nature's Legacy : Protecting and Restoring Biodiversity*. Island Press, Covello, CA.

Riparian Habitat Joint Venture (2000) *The Riparian Bird Conservation Plan : a Strategy for Reversing the Decline of Riparian Associated Birds in California*. Version 1.0 California Partners in Flight www.prbo.org/CPIF/Riparian/Riparian.html

Sierra Nevada Ecosystem Project: Final Report to Congress. (1996) Three Volumes. University of California, Centers for Water and Wildland Resources

Wildlife and Farming

California Department of Fish and Game. *Habitat Conservation and Management) Programs and Incentives for Private Landowners* www.dfg.ca.gov/habitats/private.html

Heasley, PA. (1994). *Options for Wetland Conservation: a Guide for California Landowners*. California State Coastal Conservancy, Oakland, CA.

Clark, J and Rollins, G. (1996). *Farming for wildlife : voluntary practices for attracting wildlife to your farm*. California Department of Fish and Game, Sacramento, CA.

Hopkins, JD (1999) *The Potential of Fallow Land Patches to Provide Wildlife Habitat in California's Central Valley Agro-Ecosystem*. Centers for Water and Wildland Resources, University of California (available through the Institute for Ecological Health, Davis)

Robins, P. (ed.) (1999) *Bring farm edges back to life!* Third edition. Yolo County Resource Conservation District. Woodland, CA.

Appendix

Animal and Plants Species Listed Under Federal and State Endangered Species Laws and Species of Concern

Table 3. Animal Species in the Sacramento Region Listed Under Federal or State Endangered Species Acts

Common Name	Fed	State	ElDo	Plac	Sact	Sutt	Yolo	Yuba
Crustaceans								
Conservancy Fairy Shrimp	E	-	-	-	-	-	-	Y
Vernal Pool Fairy Shrimp	T	-	-	Y	Y	Y	-	Y
Vernal Pool Tadpole Shrimp	E	-	-	Y	Y	Y	Y	Y
Beetles								
Valley Elderberry Long-horn Beetle (VELB)	T	-	Y	Y	Y	Y	Y	Y
Fish								
Sacramento Splittail	T	-	-	-	Y	Y	Y	-
Central Valley Spring-run Chinook salmon	T	T	-	Y	-	Y	-	Y
Sacramento Winter-run Chinook salmon	E	E	-	Y	-	Y	-	Y
Central Valley Steelhead	T	-	-	Y	-	Y	-	Y
Amphibians								
California Red-legged Frog	T	-	Y	-	-	-	-	-
Reptiles								
Giant Garter Snake	T	T	-	-	Y	Y	Y	-
Birds								
Aleutian Canada Goose	T	-	-	-	-	Y	-	-
California Black Rail	T	-	-	Y	-	-	-	-
Bald Eagle	T	E	Y	Y	Y	-	-	Y
American Peregrine Falcon	T	E	-	-	Y	-	Y	-
Swainson's Hawk	-	T	-	Y	Y	Y	Y	Y
Bank Swallow	-	T	Y	Y	Y	Y	Y	Y
Mountain Plover	(T)	-	-	-	-	-	Y	-

Status: Fed (federal) E= endangered, T=threatened. Listing under federal Endangered Species Act
(T) = proposed threatened.

State E= endangered, T=threatened. Listing under state Endangered Species Act

Counties: Sac=Sacramento, ElDo = El Dorado, Plac=Placer, Sutt=Sutter.

Occurrences according to Natural Diversity Data Base, California Department of Fish and Game, April 1999 update

Table 4. Plants in Sacramento Region Listed Under Federal or State Endangered Species Laws

Name	Fed	State	EIDo	Plac	Sact	Sutt	Yolo	Yuba
Antioch Dunes Evening Primrose (<i>Oenothera deltoides ssp howellii</i>)	E	E	-	-	Y	-	-	-
Boggs Lake Hedge-hyssop (<i>Gratiola heterosepala</i>)	-	E	-	Y	Y	-	-	-
Crampton’s Tuctoria (<i>Tuctoria mucronata</i>)	E	E	-	-	-	-	Y	-
El Dorado Bedstraw (<i>Galium Californicum ssp sierrae</i>)	E	R	Y	-	-	-	-	-
Hartweg’s Golden Sunburst (<i>Pseudobahia bahiifolia</i>)	E	E	-	-	-	Y	-	Y
Ione Buckwheat (<i>Eriogonum apricum v. Aprcium</i>)	E	E	-	-	Y	-	-	-
Layne’s Ragwort (<i>Senecio layneae</i>)	T	R	Y	-	-	-	-	-
Mason’s Lilaeopsis (<i>Lipaeopsis masonii</i>)	S	R	-	-	Y	-	-	-
Palmate-bracted Bird’s Beak (<i>Cordylanthus palmatus</i>)	E	E	-	-	-	-	Y	-
Pine Hill Ceanothus (<i>Ceanothus roderickii</i>)	E	R	Y	-	-	-	-	-
Pine Hill Flannelbush (<i>Fremontodendron decumbens</i>)	E	R	Y	-	-	-	-	-
Sacramento Orcutt Grass (<i>Orcuttia viscida</i>)	E	E	-	-	Y	-	-	-
Slender Orcutt Grass (<i>Orcuttia tenuis</i>)	T	E	-	-	Y	-	-	-
Soft Birds’s Beak (<i>Cordylanthus mollis ssp mollis</i>)	E	R	-	-	Y	-	-	-
Stebbins’s Morning-glory (<i>Calystegia stebbinsii</i>)	T	R	Y	-	-	-	-	-

Status: Fed (federal) E= endangered, T=threatened, listed under the Federal Endangered Species Act, S = species of concern

State E= endangered, T=threatened, listed under the California Endangered Species.
R= rare. Listed under the California Native Plant Protection Act

Counties: Sact=Sacramento, EIDo = El Dorado, Plac=Placer, Sutt=Sutter.

Occurrences according to Natural Diversity Data Base, California Department of Fish and Game.

Table 5. Animals Species of Special Concern in the Sacramento Region

Common Name	Fed	DFG	EIDo	Plac	Sact	Sutt	Yolo	Yuba
Beetles								
Rickseckers Water Scavenger Beetle	S	-	-	-	Y	-	-	-
Sacramento Anthicid Beetle	S	-	-	-	Y	-	-	-
Amphibians								
Foothill Yellow-legged Frog	C	-	Y	Y	-	-	-	-
California Tiger Salamander	C	SC	-	-	Y	Y	Y	-
Western Spadefoot	C	SC	-	-	Y	-	Y	-
Reptiles								
Southwestern Pond Turtle	S	SC	-	-	-	Y	Y	-
Northwestern Pond Turtle	S	SC	Y	Y	Y	Y	Y	Y
California Horned Lizard	S	-	Y	Y	-	-	-	-
Fish								
Fall / Late Fall Chinook Salmon	C	-	-	Y	Y	Y	Y	Y
Green sturgeon	S	-	-	-	Y	Y	Y	Y
Birds								
Ferruginous Hawk	-	SC	-	Y	Y	-	-	-
Cooper's Hawk	-	SC	-	Y	-	-	-	-
Sharp-shinned Hawk	-	SC	-	-	Y	-	-	-
Prairie Falcon	-	SC	-	-	-	-	Y	-
Merlin	-	SC	-	-	Y	-	-	-
Northern Harrier	-	SC	Y	Y	Y	Y	Y	Y
Tricolored Blackbird	S	SC	Y	Y	Y	Y	Y	Y
Golden Eagle	-	SC	Y	-	Y	-	-	-
Osprey	-	SC	Y	Y	-	-	-	-
Western Burrowing Owl	S	SC	-	-	Y	Y	Y	-
Short-eared Owl	-	SC	-	-	Y	-	Y	-
Long-eared Owl	-	SC	-	-	Y	-	-	-
Loggerhead shrike	-	SC	-	-	Y	-	Y	-
Black Swift	-	SC	-	Y	-	-	-	-
Yellow-breasted Chat	-	SC	-	Y	Y	-	-	-
Grasshopper Sparrow	-	SC	-	Y	-	-	-	-

Table 5. Animal Species of Special Concern, continued

Common Name	Fed	DFG	EIDo	Plac	Sact	Sutt	Yolo	Yuba
Birds, continued								
White-faced Ibis	S	SC	-	-	-	-	Y	-
Double-Crested Cormorant (rookery)	-	SC	-	-	-	Y	-	-
Mammals								
Marysville California Kanagroo Rat	S	SC	-	-	-	Y	-	-
San Joaquin Pocket Mouse	S	-	-	-	-	Y	-	-
American Badger	-	SC	-	-	Y	-	-	-

Status: Fed (federal) C = candidate for Endangered Species Act listing
 S = species of concern
 State SC= Department of Fish and Game Species of Concern

Counties: Sact=Sacramento, EIDo = El Dorado, Plac=Placer, Sutt=Sutter.

Occurrences according to Natural Diversity Data Base, California Department of Fish and Game.

Table 6. Plants Species of Concern Sacramento Region

Name	Fed	CNPS	EIDo	Placer	Sact	Sutter	Yolo	Yuba
Adobe-lily (<i>Fritillaria pluriflora</i>)	-	1B	-	-	-	-	Y	-
Ahart's Dwarf Rush (<i>Juncus leiospermus var ahartii</i>)	S	1B	-	Y	-	-	-	-
Alkali Milk-vetch (<i>Astragalus tener var tener</i>)	-	1B	-	-	-	-	Y	-
American Manna Grass (<i>Glyceria grandis</i>)	-	2	-	Y	-	-	-	-
Big-scale balsamroot (<i>Balsamorhiza macrolepis var macrolepis</i>)	-	1B	Y	Y	-	-	-	-
Bisbee Peak Rush-rose (<i>Helianthemum suffrutescens</i>)	-	3	Y	-	Y	-	-	-
Blue skullcap (<i>Scutellaria lateroflora</i>)	-	2	-	-	Y	-	-	-
Brittlescale (<i>Atriplex depressa</i>)	-	1B	-	-	-	-	Y	-
Colusa Layia (<i>Layia septentrionalis</i>)	-	1B	-	-	-	Y	-	-
Delta Mudwort (<i>Limosella subulata</i>)	-	2	-	-	Y	-	-	-
Delta Tule Pea (<i>Lathrus jepsonii var jepsonii</i>)	S	1B	-	-	Y	-	-	-
Drymaria-like Western Flax (<i>Herperolimon drymaroides</i>)	-	1B	-	-	-	-	Y	-
Dwarf downingia (<i>Downingia pusilla</i>)	-	2	-	Y	Y	-	-	-
El Dorado County Mule Ears (<i>Wyethia reticulata</i>)	-	1B	Y	-	-	-	-	-
Ferris's Milk-vetch (<i>Astragalus tener var ferrisiae</i>)	S	1B	-	-	-	-	Y	-
Heartscale (<i>Atriplex cordulata</i>)	-	1B	-	-	-	-	Y	-
Hispid Bird's Beak (<i>Cordylanthus mollis var macrolepis</i>)	S	1B	-	Y	-	-	-	-
Jepson's Milk-vetch (<i>Astragalus rattanii var jepsonii</i>)	-	1B	-	-	-	-	Y	-
Legenere (<i>Legenere limosa</i>)	S	1B	-	Y	Y	-	-	-
Nissenan Manzanits (<i>Arctostaphylos nissenana</i>)	S	1B	Y	-	-	-	-	-
Northern California Black walnut (<i>Juglans hindsii</i>)	S	1B	-	-	Y	-	-	-
Parry's Horkelia (<i>Horkelia parryi</i>)	-	1B	Y	-	-	-	-	-
Pincushion Navarretia (<i>Navarretia myersii var myersii</i>)	-	1B	-	-	Y	-	-	-
Red Bluff Dwarf Rush (<i>Juncus leiospermus var leiospermus</i>)	-	1B	-	Y	-	-	-	-
Red Hills Soaproot (<i>Chlorogalum grandiflorum</i>)	S	1B	-	Y	-	-	-	-
Rose-mallow (<i>Hibiscus lasiocarpus</i>)	-	2	-	-	Y	Y	Y	-
San Francisco Campion (<i>Silene verecunda ssp verecunda</i>)	S	1B	-	-	-	Y	-	-
San Joaquin Saltbush (<i>Atriplex joaquiniana</i>)	S	1B	-	-	Y	-	Y	-
Sanford's arrowroot (<i>Sagittaria sanfordii</i>)	S	1B	-	Y	Y	-	-	-
Snow Mountain Buckwheat (<i>Erigonum nervulosum</i>)	-	1B	-	-	-	-	Y	-
Stinkbells (<i>Fritillaria agrestis</i>)	-	4	-	Y	Y	-	-	-
Suisun Marsh Aster (<i>Aster lentus</i>)	S	1B	-	-	Y	-	-	-

Table 6, Plant Species of Concern, continued

Status: Fed (federal) S = species of concern

CNPS California Native Plant Society

- 1B - Plants rare, threatened or endangered in California or elsewhere
- 2 - Plants rare, threatened or endangered in California but more common elsewhere
- 3 - Plants about which we need more information - a review list
- 4 - Plants of limited distribution - a watch list

Counties: Sact = Sacramento, Eldo = El Dorado, Plac = Placer, Sutt = Sutter

Occurrences according to the Natural Diversity Data Base, California Department of Fish and Game

Contact Information

Green Valley Alliance

**www.greenvalleyalliance.org
Valley Vision, 1321 Garden Highway, Suite 110, Sacramento CA 95833**

Institute for Ecological Health

**ieh@mother.com
409 Jardin Place, Davis CA 95616**