

## Chapter 5. Planned Refuge Management and Programs

### Overview of Refuge Management Goals, Objectives, and Strategies

One of the most important parts of the CCP process is the development and refinement of the refuge vision and goals. This section contains the primary goals that will define the management direction of the Refuge for the next 15 years. In addition, as part of the CCP each refuge is expected to develop objectives and strategies that, together, will help achieve the goals. *Goals* are broad statements of the desired future conditions for refuge resources. Refuge goals may or may not be feasible within the 15-year time frame of the CCP.

Whenever possible, *objectives* are quantified statements of a standard to be achieved or work to be accomplished. They should be specific, measurable, achievable, results-oriented, and time-fixed, and should be feasible within the 15-year lifespan of the CCP. *Strategies* are specific actions, tools, or techniques that contribute toward accomplishing the objective. In some cases, strategies describe specific projects in enough detail to assess funding and staffing needs.

The four goals of the Sacramento River Refuge are outlined below to provide a context for the proposed management direction.

#### Goal 1: Wildlife and Habitat Goal

Contribute to the recovery of endangered and threatened species and provide a natural diversity and abundance of migratory birds and anadromous fish through the restoration and management of viable riparian habitats along the Sacramento River using the principles of landscape ecology.

#### Goal 2: Visitor Services Goal

Encourage visitors of all ages and abilities to enjoy wildlife-dependent recreational and educational opportunities and experience, appreciate, and understand the Refuge history, riparian ecosystem, fish, and wildlife.

**Goal 3: Partnership Goal**

Promote partnerships to preserve, restore, and enhance a diverse, healthy and productive riparian ecosystem in which the Sacramento River Refuge plays a key role.

**Goal 4: Resource Protection Goal**

Adequately protect all natural and cultural resources, staff and visitors, equipment, facilities, and other property on the Refuge from those of malicious intent, in an effective and professional manner.

**Organization**

Each objective and each strategy are given a unique numeric code for easy reference. Objectives have a two-digit code (e.g., 1.1, 1.2, 2.1, 2.2). The first digit corresponds to the goal to which the objective applies. The second digit is sequential. Similarly, each strategy has a three-digit code (e.g., 1.1.1, 1.1.2, 2.1.1, 2.1.2). The first and second digits refer to the appropriate goal and objective, respectively. The third is sequential. Strategies are sometimes grouped by subtopic.

**Refuge Management Goals, Objectives, and Strategies**

*Goal 1: Wildlife and Habitat*

*Contribute to the recovery of endangered and threatened species and provide a natural diversity and abundance of migratory birds and anadromous fish through the restoration and management of riparian habitats along the Sacramento River using the principles of landscape ecology.*

**Overview of Landscape Ecology Approach**

The Improvement Act requires the maintenance of the Refuge System's biological integrity, diversity, and environmental health. This is best achieved by applying the principles of landscape ecology to refuge management.

Landscape ecology is a sub-discipline of ecology, which focuses on spatial relationships and interactions between patterns and processes. This emerging science integrates hydrology, geology, geomorphology, soil science, vegetation science, wildlife science, economics, sociology, law, engineering and land use planning to conserve, enhance, restore and protect the sustainability of ecosystems on the land. Landscape ecology encompasses natural, physical, biological, and human-

influenced features and processes that shape the environment. Over time, natural patterns of climate, hydrology, geology, soils, vegetation, and wildlife resulted in a rich natural diversity. Human cultural practices associated with modern civilization have greatly altered natural physical processes, resulting in declining biological diversity. The lower Sacramento River is an example of this, where the natural hydrograph of the river has been greatly modified by Shasta Dam and numerous flood control levee and bank revetment projects, native vegetation has been cleared, and local topography has been leveled (Buer et al. 1989; Moyle 2002; Small et al. 2000). This has necessitated riparian restoration through revegetation (Alpert et al. 1999; Griggs 1993a, b; Griggs and Peterson 1997, Peterson 2002). Restoring populations of indigenous plant and animal species requires investigation of broad scale natural processes, such as hydrology, geology, soils, and local plant ecotypes and their application to restoration sites (Jackson et al. 1995; Silveira et al. 2003; Pickett et al. 1992).

Existing and future habitat restoration fulfills the Service's congressional mandate to preserve, restore, and enhance riparian habitat for threatened and endangered species, songbirds, waterfowl, other migratory birds, anadromous fish, resident riparian wildlife, and plants. Native indigenous plants and rare natural communities have benefited from the increase in acreage of scrub, forest, woodland, savannah, grassland, and wetland communities throughout the Sacramento River Refuge. Habitat restoration has promoted greater species diversity, provided a buffer from adjacent land uses, and increased natural communities.

The success of habitat restoration has been monitored in several ways by several different researchers on the Refuge. PRBO has been monitoring riparian restoration sites on the Sacramento River (including sites on the Refuge) since 1993. This monitoring has shown that riparian bird diversity increased significantly over time as the restoration matured. Furthermore, bird diversity approached what was observed in remnant riparian areas along the river when restoration sites were greater than five years old (Small et al. 2000). This intensive monitoring has also helped modify the way our restoration sites are planted.

Small et al. (2003) also reports that monitoring has demonstrated that by planting an understory component at the restoration sites, the total number of species has more than

doubled. A more diverse bird community, however, may not necessarily equate to a healthy one in terms of recruitment and survival. Measuring nest success at restored and remnant forest sites showed that for lazuli bunting and spotted towhee success was similar, and for black-headed grosbeak success was higher on the restored plots. These results are evidence that the restoration is working well for birds.

River Partners (2004) determined elderberry shrubs planted in riparian restoration sites on the Refuge successfully increased habitat for valley elderberry longhorn beetle habitat, especially at sites that are adjacent to established elderberry shrubs. Stillwater Sciences (2003) has demonstrated that there is more bat activity over older restoration sites than younger sites and the most bat activity on the river is at the densest forest with the largest number of trees. Restoration has also contributed to the complexity of the aquatic environment by providing cover, food, and other habitat components for fish.

Physical and biological processes affect the distribution, abundance, and structure of riparian vegetation over time. Vegetation refers to the species of plants, their frequency, density, and spatial distribution in a specific area and time. Habitat refers to the components of vegetation and other landscape characteristics which are used by wildlife and plants. These landscape characteristics include gravel, specific soil textures, soil chemistry, moisture, minerals and nutrients, slope aspect, aridity/humidity, radiation, current velocity, temperature, etc. Riparian vegetation and habitat are constantly changing in distribution and abundance due to river meandering caused by flooding, erosion, and deposition. Erosion and deposition provide an open substrate upon which seeds and acorns can germinate and become established. Characteristics of vegetation, such as canopy cover, species frequency, and density, influence the distribution of plants which grow under the tree canopy. These vegetation characteristics also influence the distribution of wildlife. Conversely, animals, especially plant-eating and seed-eating mammals and certain insects, affect plant growth and survival.

Plants and wildlife occupy various stages of plant succession (e.g., wildflowers in early forest succession, closed canopy valley oaks in late forest succession resting), which characterize habitats, for specific activities (e.g., feeding, nesting) during specific periods of their life history (e.g., courtship, breeding, nesting, fledging, migration). Some late successional stages are

dominated by undesirable plant species. For these reasons, vegetation must be managed to restore habitat to an earlier successional stage that is occupied and used by a diversity of native, indigenous species. Desirable late successional stages composed of indigenous plants used by native fish and wildlife can be restored through active refuge management.

The principles of landscape ecology (Strategy 1.1.1) will help the Refuge achieve the following objectives and strategies for the wildlife and habitat goal.

Objective 1.1: Riparian Vegetation and Habitat

Prepare and implement site assessment and restoration plans to restore an additional 3,255 acres of riparian vegetation and habitats (Great Valley willow scrub, Great Valley cottonwood forest, Great Valley mixed riparian forest, Great Valley valley oak riparian forest, Valley oak savannah, elderberry savanna, and grassland, herbland, and wetland), as well as maintain existing and newly restored riparian habitats for riparian-dependent species by 2015.

*Rationale:* Riparian forests and other riparian plant communities of California's Great Central Valley provide habitat for a diversity of resident and migratory terrestrial and aquatic wildlife, including rare and endangered species (Gaines 1974, 1977; Moyle 2002; Riparian Habitat Joint Venture 2004; Roberts et al. 1977; Small et al. 2000) The Partners in Flight North American Landbird Conservation Plan (Rich et. al 2004), and the California Partners in Flight/Riparian Habitat Joint Venture Riparian Bird Conservation Plan (2004), and the Southern Pacific Coast Regional Shorebird Plan (2003) identify focal species and habitat conservation and restoration needs for Central Valley birds.

Wetlands and riparian forests once covered about 5 million acres of the Central Valley before intensive settlement began in the late 1800's. Flood-control and subsequent conversion of natural wetlands to agricultural production have reduced these habitats to less than one-tenth their former extent (Dahl 1990). CDFG considers Great Valley willow scrub, Great Valley cottonwood forest, Great Valley mixed riparian forest, Great Valley oak riparian forest, Valley oak and elderberry savannas, and many grassland and freshwater wetland vegetation types to be rare plant communities (Holland 1986; Holland and Roye 1989). Less than 2 percent of the pre-1850 acreage of riparian forest remain, with virtually all of the Valley oak forest type gone (Bay Institute 1998). Out of 418,916 hectares of potential riparian

habitat in the Central Valley of California, only 51,927 hectares is currently forested (RHJV 2004). In addition, less than 1 percent of California's original grasslands remain (Huenneke, 1989).

Few sites on the Refuge offer conditions for successful passive restoration because of the altered hydrograph, existing weed community, and lack of native seed sources. At most sites, natural recruitment would likely include many nonnative plant species of lower habitat value for target wildlife species. As a result, modern agricultural techniques are used for restoration on Sacramento River Refuge.

Riparian restoration and management are necessary to expand and provide habitat for species associated with the Sacramento River. Opportunities for willow scrub, cottonwood, mixed riparian, Valley oak riparian forest, and associated grassland and herbland habitats exist at the mid-elevation floodplain of the Sacramento River. Opportunities exist for valley oak woodland and savanna, and associated grassland habitats, at the high-elevation floodplain of the Sacramento River. Table 9 lists the acres proposed for restoration on each Refuge unit.

*Riparian Vegetation and Habitat Strategies:*

1.1.1: Develop a site assessment and restoration plan for each of the restoration sites on the additional 3,255 acres of riparian habitat. Each plan will identify the site characteristics using the principles of landscape ecology (bullets listed below) and determine the site-specific restoration criteria (species composition, etc.).

The first step for each site assessment is planning, during which time site-specific data and information (e.g., background studies on hydrology, geomorphology, soils, vegetation, wildlife, cultural resources) is collected and a detailed restoration design is developed. The restoration design includes species to be planted, plant densities, frequencies, and plant and vegetation patterns. The overall pattern will be a mosaic of riparian communities including freshwater wetland, grassland, herbland, savannah, scrubland, and forest vegetation. This information is included in a unit plan, which is developed for each restoration site. Site planning can take up to 2 years to complete.

**Table 9. Anticipated Restoration and Public Use Matrix.**

Unit Name	Total Acres <sup>1</sup>	Acres Riparian Habitat <sup>2</sup>		Permitted Public Use <sup>4</sup>			Public Access/Facilities					Anticipated Year Open to Public	
		Existing Riparian	Future (active ag) or Current Restoration <sup>3</sup>	Big 5 <sup>5</sup>	Big 6 <sup>6</sup>	Sanctuary <sup>7</sup>	Walking Trail	Portable Toilet	Info Sign / Brochures	Parking Area <sup>8</sup>	Boat Access Only		Primitive Boat Launch
Blackberry Island	52	52		●							●		2005
La Barranca	1066	368	193		●						●		2005
			505		●						●		2009
Todd Island	185	185			●						●		2005
Mooney	342	342			● <sup>9</sup>						● <sup>9</sup>		2005
Ohm	757	519				●							Closed
		111				● <sup>10</sup>							Closed
		62			● <sup>9</sup>								2005
		65			●						●		2005
Flynn	630	573		●							●		2005
		57			●						●		2005
Heron Island	126	126			●						●		2005
Rio Vista	1149	231		●			●	●	●	●			2005
		577			●		●		●		●		2005
		341				●							Closed
Foster Island	174	174			●					●		2005	
McIntosh Landing North	63	57				●							Closed
		6			●						●		2005
McIntosh Landing South	67	40	27			●							Closed
Pine Creek	564	336		●			●	●	●	●			2005
			228		●				●	●			2006
Capay	666	91			●		●		●	●			2005
			575			●		●	●	●			2009
Phelan Island	308	308			●						●		2005
Jacinto	69	59			●						●		2005
			10			●					●		2010
Dead Man's Reach	637	66			●						●		2005
			571		●						●		2009
North Ord	29	29				●							Closed
Ord Bend	111	111		●			●	●	●	●			2005
South Ord	122	122			●						●		2005
Llano Seco Riparian Sanctuary	751	364	387			●							Closed
Llano Seco Island I	56	56			●						●		2005
Llano Seco Island II	99	99			●						●		2005
Hartley Island	487		67			●							Closed
		183	237		●						●		2010
Sul Norte	590	389			●		●						2005
			157		●								2006
		44		●			●	●	●	●			2005
Codora	399		245	●			●	●	●	●			2010
		126	28	●			●	●	●	●			2010
Packer	404	393		●			●	●	●	●		●	2005
		11			●						●		2005
Head Lama	177	76			●						●		2006
		101				●							Closed
Drumheller Slough	224	15	209		●				●	●			2008/9

<sup>1</sup>Total acreages include all acres within original acquisition boundary, including those that have eroded. <sup>2</sup>See habitat maps for further details, includes accreted acres. <sup>3</sup>Closed to the public until management is complete. <sup>4</sup>Permitted Public Use applies to areas above ordinary high water mark. <sup>5</sup>Big 5 includes fishing, wildlife observation, photography, interpretation, and environmental education. <sup>6</sup>Big 6 includes hunting, fishing, wildlife observation, photography, interpretation, and environmental education. <sup>7</sup>Sanctuary denotes areas closed to all public use. <sup>8</sup>Units with parking areas also have river access, except for the Ord Bend Unit. <sup>9</sup>Area closed to waterfowl hunting, open to other hunting and Big 6 uses. <sup>10</sup>Area of disputed ownership.

To develop site-specific restoration criteria, the following principles of landscape ecology are used:

- **Partnerships:** Use expertise, knowledge, and information from various partners and cooperators to implement ecological restoration (Griggs 1993a; Efseaff et al. 2003; Golet et al. 2003; Silveira et al. 2003).
- **Hydrology:** Use California Department of Water Resources (Northern District, Red Bluff) and other sources of information (Ayers Associates 1997, Ayers Associates 2001a, 2001b, 2002; Leopold and Maddock 1953; O'Neil et al. 1997; Silveira et al. 2003; U.S. Army Corps of Engineers 1995) to identify and describe the hydrology of the river reach that each restoration site occupies. Through partnerships with The Nature Conservancy (TNC) and River Partners, implement hydrological modeling for specific reaches of the river to provide quality riparian habitat and maintain the integrity of the flood control system. Coordinate activities with the State Reclamation Board.
- **Geology:** Use California Department of Water Resources (Northern District, Red Bluff) geological information, including historic and predicted channel meander data and other sources of geological information, to select appropriate restoration locations (California Department of Water Resources, Northern District 1980, 1984; California Department of Water Resources 1994; California Division of Mines and Geology 1977; Harwood and Helley 1982; Helley and Harwood 1985; Jennings and Strand 1960; Saucedo and Wagner 1992; Silveira et al. 2003; Strand 1962).
- **Soils:** Use the most recent soil survey information from the Natural Resources Conservation Service to determine appropriate plant community attributions for restoration (Arroues 1982; Begg 1968; Bureau of Soils 1913; Burkett et al. in prep; Gowans 1967; Holmes et al. 1915; Jenny 1941; Silveira et al. 2003; Watson et al. 1929). Through partnerships with TNC and River Partners, dig soil pits and auger soil cores to determine the distribution of soil texture at each restoration site.
- **Vegetation (Plant Community):** Locate remnant stands and patches of vegetation and determine soil-topography-hydrology associations (Silveira et al. 2003) to determine appropriate plant communities. Use the resulting soil-topography polygons to construct potential natural vegetation maps (Griggs et al. 1992) and restoration design and layout.
- **Plant Materials:** Through partnerships with TNC and River Partners, collect local plant ecotypes for use at restoration sites (Clausen et al. 1948; Keeley 1993; Longcore et al. 2000; Rice and Knapp 2000; Montalvo and Ellstrand 2000; Silveira et al. 2003).

- Conduct baseline monitoring and surveys of sites to be restored, as well as nearby reference sites that are on similar soils containing remnant natural vegetation (Burkett in prep; Oswald and Ahart 1994). Identify native plant and wildlife through surveys (Silveira et al. 2003, Small et al. 2000). Describe vegetation with measures of species composition, distribution, configuration, frequency, density, age, and structure.
- Conduct a literature review, a records search for historic documents, maps, and air photography, and interviews with individuals with knowledge of pre-agriculture/flood control state of the restoration site (Silveira et al. 2003).
- Conduct research investigations through partnerships to expand knowledge of various scale factors which influence riparian ecosystem health. Research is used to modify and adapt riparian habitat restoration and management based on the best and most complete quantitative information (Golet et al. 2003).



**Plants for Riparian Restoration**

*Photo by Joe Silveira*

The site-specific restoration plans will be written according to the results of the site assessments which determine the type of restoration that can be accomplished at each site. The two sub-strategies described below provide additional components that will be included in the restoration plan for mid- and high-elevation riparian, freshwater wetlands, and threatened and endangered species.

Sub-strategy 1: Restore mid- and high-elevation floodplain riparian vegetation and habitat, which includes, but is not limited to, Great Valley willow scrub, Great Valley cottonwood forest, Great Valley mixed riparian forest, Great Valley valley oak riparian forest, Valley oak woodland, Valley oak and Elderberry savanna, and various herbaceous vegetation types and Great Valley freshwater wetlands.

- Determine the spatial distribution and size of various mid- and high-elevation floodplain riparian vegetation types and wetland channels and basins to be restored by using the principles of landscape ecology.
- Restore mid- and high-elevation floodplain riparian vegetation types and habitat and implement restoration of freshwater wetlands. Besides revegetation, restoration includes reconstruction of topographic features, such as channels, oxbows, and basins.
- Conduct and evaluate results of annual vegetation surveys of restored riparian habitats for three-to-five years to assess restoration success and incorporate adaptive management strategies to improve restoration success and efficiency.
- Conduct and evaluate long-term vegetation surveys of restored riparian habitats to monitor riparian restoration success and vegetation succession patterns of various mid- and high-elevation floodplain riparian vegetation types. Include nearby reference sites of the various natural riparian vegetation to compare canopy cover, species composition, and frequency and density of plants.
- Manage vegetation for a variety of successional stages; identify vegetation thresholds for desired successional stages, species composition, population levels of native species, and control of exotic species that trigger management response (i.e., grazing, burning, herbicides, and other mechanical methods).
- Conduct and evaluate the results of prescribed fire research in various mid-and high-elevation floodplain riparian vegetation and habitat types.
- Conduct and evaluate prescribed grazing research in various mid-and high-elevation floodplain riparian vegetation and habitat types.

Sub-strategy 2: Ensure that the following threatened and endangered species habitat requirements are incorporated into the restoration plan, as appropriate.

- Restore mid-elevation riparian habitats, especially willow scrub vegetation, to partially fulfill needs to reintroduce the least Bell's vireo to the middle Sacramento River.
- Implement restoration of mixed riparian forest, valley oak woodland, valley oak savanna, and elderberry savanna to provide mature elderberry shrubs, which are the host plant for valley elderberry longhorn beetle.

- Conduct feasibility studies, associated hydrologic investigations, and NEPA documentation to remove privately constructed levees and other bank stabilization features on Refuge land to allow natural erosion and restoration of bank nesting habitat for bank swallows.
- Chinook salmon, Sacramento River winter-run ESU (Anadromous Fisheries and Native Fisheries Objective 1.7).
- Chinook salmon, Central Valley spring-run ESU (Objective 1.7).
- Steelhead, Central Valley spring-run ESU (Objective 1.7).
- Chinook salmon, Central Valley fall-run and late-fall-run ESU (Objective 1.7).
- Restore breeding, roosting and foraging habitat for the American bald eagle along the middle Sacramento River through restoration of mid- and high-elevation riparian forests. Provide and maintain late successional stage vegetation with large trees, such as valley oak, western sycamore, and Fremont's cottonwood.
- Restore freshwater wetlands to provide slow, stable, and relatively warm water habitat (e.g. backwater sloughs, seasonal wetlands and irrigation and drainage ditches) for giant garter snake.
- Maintain areas and protect slough and canal banks for GGS hibernation areas.
- Implement best management practices as outlined in the Section 7 for operation and maintenance when working around GGS habitat.
- Restore mid- and high-elevation floodplain vegetation, especially mature cottonwood and mixed-riparian forests, with closed canopy forests and in close proximity to early successional habitats for western yellow-billed cuckoo.
- Restore mid-elevation riparian breeding habitats, especially dense willow scrub vegetation for the willow flycatcher.
- Restore mid- and high-elevation riparian forests, especially those with large trees, such as valley oak, western sycamore, and Fremont's cottonwood for the Swainson's hawk.

1.1.2: Maintain cooperative land management agreements (CLMA) to administer the agricultural and restoration programs on Refuge lands.

- Use the expertise of the local agricultural industry to manage orchards and contribute to the local economy until restoration planning is completed and funding is secured.
- Work with partners to develop ecologically sound restoration methods.
- Implement integrated pest management practices for nonnative weed control as site preparation prior to restoration.

1.1.3: Maintain, monitor and evaluate existing restoration sites to provide high quality fish and wildlife habitat. Evaluate past and present restoration techniques and results to build upon the knowledge available for future restoration efforts.

- Identify habitat needs for the preservation and restoration of riparian habitat for threatened and endangered species, migratory birds, anadromous fish, and resident riparian wildlife and plants.
- Monitor habitat restoration efforts and document fish and wildlife response for future restoration planning.
- Implement adaptive management techniques according to monitoring results and cause and effect relationships.

1.1.4: Continue exploring potential habitat restoration sites and implementing restoration techniques using landscape ecology along the Sacramento River Refuge.

- Implement riparian restoration on Refuge units described in the 2002 Environmental Assessment for Proposed Restoration Activities on the Sacramento River National Wildlife Refuge (Ryan, Ohm, Haleakala, Pine Creek, Capay - Kaiser, Phelan Island, Deadman's Reach-Koehnen, Hartley Island, and Drumheller Slough-Stone units).
- Conduct feasibility studies with regulatory agencies and community stakeholders to investigate riparian restoration opportunities on the Sacramento River Refuge (La Barranca, Rio Vista, Llano Seco Riparian Sanctuary and PCGID/PID Pumping Plant, and M&T Pumping Plant Facility).
- Apply for restoration funding through Federal, State, and local conservation grant initiatives.
- Continue to work with willing sellers on acquisition of critical floodplain properties within the Sacramento River Refuge approved boundaries.

Objective 1.2: Floodplain and River Processes

Promote recruitment of fish and wildlife habitat by investigating riverbank stabilization, Refuge levees, and floodplain topography for best management options. During this investigation, the Refuge will consider impacts on public safety, agriculture, and water conveyance. This investigation will be conducted on 11 Refuge units (La Barranca, Ohm, Flynn, Rio Vista, McIntosh Landing South, Pine Creek, Capay, Deadman's Reach, Llano Seco Riparian Sanctuary, Sul Norte, and Drumheller Slough) and a written report will be created by 2015.

In the event that a bank stabilization, topographic or re-vegetation restoration project is identified that directly effects the management of the refuge or adjacent landowners, the refuge will work with government agencies and stakeholders to initiate the first steps in addressing these issues. The first step would be to conduct a feasibility study which identifies the problem and those that may be affected; this may involve forming a technical advisory committee of stakeholders and independent experts, development of a range of possible alternatives, preliminary analysis of those alternatives. The final product of the feasibility study will include a report of the findings and recommendations for further analysis under the National Environmental Policy Act (NEPA). Examples of feasibility studies conducted on refuge projects either completed or ongoing include: La Barranca Ecosystem Restoration Flood Reduction Project, Rio Vista Ecosystem Restoration Flood Reduction Project, M&T Pumping Plant Protection Project, and the Llano Seco Riparian Sanctuary Restoration and PCGID/PID Pumping Plant Protection Project.

Once the findings of the feasibility study are complete, the refuge and stakeholders must conduct further analysis under NEPA to refine and analyze the alternatives and potential impacts. Depending on the scope of work and context and intensity of the proposed project, this analysis will either be completed by the refuge staff or private contractors. The NEPA analysis may involve a categorical exclusion, an Environmental Assessment, Finding of No Significant Impact, or an Environmental Impact Statement.

Depending on the outcome of the analysis of the proposed action alternative, funding for and implementation of the project may proceed. A project proposal, developed from the analysis, will be submitted to appropriate funding sources by the refuge, a conservation agency, the lead government agency, or other project proponents. Regardless of who may be the grant applicant, continued coordination with adjacent landowners and other stakeholders will be required.

*Rationale:* Migratory birds and native anadromous fish, especially Sacramento River Chinook salmon, have adapted to the natural process of erosion and deposition along the middle Sacramento River. The meandering processes along this stretch of the river create conditions that allow natural recruitment and succession of riparian vegetation and habitats to occur. Migratory birds and anadromous fish will respond positively to the resulting habitat features.

Loss of riparian habitat, levee construction, and bank protection have physically altered fish and wildlife habitat. This has resulted in negative affects to spawning and rearing habitats for Chinook salmon, steelhead, and other native fishes (NOAA-NMFS 1997; USFWS 2000). This has also resulted in declines in nesting and feeding habitats for breeding migratory and resident birds (Riparian Habitat Joint Venture 2004; Small et al. 1999, 2000). To address these problems in part, and where appropriate, the Refuge proposes to modify or remove existing privately-constructed levees and restore floodplain topography within Refuge boundaries. This will restore and also provide for long-term maintenance of physical processes and conditions for erosion, over-bank flooding, sediment deposition on the floodplain, and recruitment of LWD. LWD also traps sediments, including spawning gravel and fish carcasses, the primary source for MDN (USFWS 2000). These natural processes will enhance, restore, and maintain floodplain habitats for salmonids, other native fish (NOAA-NMFS 1997; USFWS 2000), and migratory landbirds and waterbirds, including species that breed, migrate and winter along the middle Sacramento River (Riparian Habitat Joint Venture 2004; Small et al. 1999, 2000)

As the Refuge and its partners restore riparian habitat and agricultural operations cease, the need for flood protection of these properties is reduced. Restoring floodplain hydrology (topography) on Refuge lands may also reduce flooding on neighboring agricultural operations. Floodplain hydrology is restored by removing or breaching levees and/or riprap (bank

revetment) that were constructed by the previous owners to protect agriculture. It is also restored through swale construction that recreates natural topography and allows Refuge lands to convey floodwaters and provide off-channel water storage during high water events as the Sacramento River overtops the its banks and spills into the floodplains.

At the same time, bank protection remains an ongoing aspect of the Sacramento River Flood Control Project and water diversion facilities. The Service recognizes the need to protect the integrity of the system of levees, weirs, water diversion facilities and overflow areas that facilitates public safety and agricultural operations.

Habitat protection programs may have minimal influence on the merits or direction of bank stabilization projects. The issues of concern to the Refuge are the retention of existing riparian vegetation, protection of spawning and rearing habitat for anadromous fish, and maintenance of habitat for the threatened valley elderberry longhorn beetle and migratory birds.

*Floodplain and River Processes Strategies:*

- 1.2.1: Modify privately constructed levees, restore or enhance topographic features, and other bank stabilization features on Refuge land if supported by feasibility studies, associated hydrologic investigations, and NEPA documentation.
- 1.2.2: Coordinate with the FWS-Ecological Services, U.S. Army Corps of Engineers, NOAA-Fisheries, State Reclamation Board, CDFG, irrigation districts, and affected groups about Refuge projects on a continual basis.
- 1.2.3: Work with Federal, State, county, levee and irrigation districts to investigate best management practices for habitat, water diversion, and flood management projects through technical studies and agency coordination.
- 1.2.4: Continue to protect and manage Refuge lands within the 100-year floodplain. This will facilitate natural geomorphic and hydrologic processes that create and maintain habitat features to which migratory birds and anadromous fish have adapted.

### Objective 1.3: Threatened & Endangered Species

Evaluate the response of Federal and State threatened and endangered species to habitat restoration projects. Implement eight surveys by 2005 (least Bell's vireo, valley elderberry longhorn beetle, bald eagle, giant garter snake, bank swallow, western yellow-billed cuckoo, willow flycatcher, and Swainson's hawk) and four additional surveys by 2015 (winter-run Chinook salmon, spring-run Chinook salmon, fall-run and late-fall run Chinook salmon, and Central Valley ESU steelhead).

*Rationale:* Federally listed threatened and endangered species and candidate species are trust responsibilities under the jurisdiction of the Service. Threatened and endangered species and those proposed for Federal listing, are likely to become extinct due to environmental factors. State threatened and endangered species have been identified as Birds of Conservation Concern by the Service, and are trust responsibilities of the Service under the Migratory Bird Treaty Act. Populations are in decline due, in part, to habitat degradation and destruction. Monitoring is necessary to determine population distribution, abundance, and survival of species and identify habitat use and restoration and management needs.

### Threatened & Endangered Species Strategies

#### 1.3.1: Least Bell's vireo

- Cooperate with PRBO or other partners to conduct point-count and demographic surveys for the species.

#### 1.3.2: Valley elderberry longhorn beetle (VELB)

- Conduct VELB monitoring to assess distribution, abundance, and habitat use. Coordinate activities with the Fish and Wildlife Service/Sacramento Field Office.
- Support VELB research by cooperators on the Refuge.

#### 1.3.3: Chinook salmon, Sacramento River winter-run ESU (Anadromous Fisheries and Native Fisheries Objective 1.7).

#### 1.3.4: Chinook salmon, Central Valley spring-run ESU (Objective 1.7).

#### 1.3.5: Steelhead, Central Valley spring-run ESU (Objective 1.7).

#### 1.3.6: Chinook salmon, Central Valley fall-run and late-fall-run ESU (Objective 1.7).

1.3.7: American bald eagle

- Identify locations where eagles are observed during proposed routine main channel surveys (Also strategies 1.4.4 and 1.5.3). Document refuge habitat use.

1.3.8: Giant garter snake (GGS)

- Conduct GGS surveys prior to habitat work, where hibernation areas may be disturbed.

1.3.9: Bank swallow

- Conduct an annual bank swallow survey in coordination with CDFG or other partners to monitor breeding colonies, habitat use on the Refuge, and population trends.
- Monitor Refuge restoration and management activities at bank swallow colonies to reduce disturbance.
- Monitor public use activities at bank swallow colonies and restrict use, if necessary, to reduce disturbance.

1.3.10: Western yellow-billed cuckoo

- Conduct periodic surveys at three-year intervals for western yellow-billed cuckoos at the Refuge to document their distribution, abundance, and habitat use. Coordinate surveys with other Service offices, CDFG, U.S. Geological Survey, and PRBO.

1.3.11: Willow flycatcher

- Cooperate with PRBO or other partners to conduct point-count and demographic surveys for the species.

1.3.12: Swainson's hawk

- Identify locations where Swainson's hawks are observed during proposed routine main channel surveys.
- Document Refuge habitat use for adaptive management purposes.

Objective 1.4: Migratory and Resident Landbirds

Enhance, restore and monitor breeding migratory and resident landbird populations to source population levels (40 percent recruitment) through habitat restoration on 3,255 acres by 2015. Source populations are those where recruitment (annual increase) is high enough to replace the local breeding population with a surplus, which can repopulate other areas. Source populations recruit at levels above 35 percent for most species.

*Rationale:* Migratory birds are trust species under the jurisdiction of the Service. Sacramento River Refuge was established under the authority of the Endangered Species Act for birds, such as the least Bell's vireo. Executive Order 13186 directs Federal agencies to ensure that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as the Partners in Flight Riparian Bird Conservation Plan (Riparian Habitat Joint Venture 2004). The Refuge provides summer breeding, migration, and wintering habitat for migratory landbirds. Migratory landbird populations are in decline, due in part to habitat degradation and destruction, increased nest depredation and nest parasitism. Landbird monitoring is necessary to determine population status, assess population trends, determine causes for poor productivity, identify solutions, determine habitat restoration needs, and assess restoration success.



**Yellow Warbler**

*Photo by Steve Emmons*

*Breeding Migratory and Resident Landbird Strategies*

1.4.1: Implement restoration of mid- and high-elevation riparian vegetation and habitats. Use principles outlined in the California Partners in Flight/Riparian Habitat Joint Venture Riparian Bird Conservation Plan (2004), including habitat features that cover all of the 14 riparian bird focal species (Figure 4).

- 1.4.2: Coordinate with FWS Office of Migratory Bird Management, California Partners in Flight, the Riparian Habitat Joint Venture, PRBO, and other partners to periodically monitor the productivity of riparian focal species on restored and native riparian acres to evaluate and adapt restoration design and management to enhance conditions of focal species as needed.
- 1.4.3: Annually evaluate species diversity and abundance of breeding birds on acreage under active and planned restoration and adapt restoration design and management to enhance conditions of focal species as needed
- 1.4.4: Conduct Sacramento River main channel, fixed-route surveys for nesting osprey and other visible nesting species (e.g., kingfisher burrows). These cooperative Refuge surveys are conducted seasonally, four times a year, from Red Bluff to Colusa, and record all wildlife observed from the survey vessel (Also strategies 1.3.7 and 1.6.1).

Objective 1.5: Winter Migratory Landbirds

Implement monitoring surveys for wintering migratory landbird populations on up to 8,000 acres of riparian habitat on the Refuge by 2010.

*Rationale:* Migratory birds are Federal trust species under the jurisdiction of the Service. Migratory landbird populations are in decline, due in part to habitat degradation and destruction, increased nest depredation and nest parasitism. Landbird monitoring is necessary to determine population status, assess population trends, determine causes for poor productivity, identify solutions, determine habitat restoration needs, and assess restoration success. Sacramento River Refuge provides winter habitat for migratory landbirds.

Winter Migratory Landbirds Strategies

- 1.5.1: Coordinate with PRBO and other partners to conduct and evaluate winter landbird surveys.
- 1.5.2: Annually evaluate the use of various habitat types by wintering birds and adapt the restoration design and management to enhance use.

1.5.3: Conduct Sacramento River main channel, fixed-route surveys for wintering birds. These cooperative Refuge surveys are conducted seasonally, four times a year, from Red Bluff to Colusa, and record all wildlife observed from the survey vessel (Also strategies 1.3.7 and 1.6.1).

Objective 1.6: Waterfowl and other Waterbirds

Implement monitoring surveys for wintering and breeding waterfowl and shorebird populations and colonial nesting waterbirds on all main channel and floodplain wetland habitat on the Refuge. Survey, locate and map three egret, heron, and cormorant rookeries by 2008 and conduct five surveys by 2010.

*Rationale:* Migratory birds are Federal trust species under the jurisdiction of the Service. Many species of migratory and resident birds depend on wetlands for breeding and winter habitat. Freshwater wetlands have declined by 95 percent in the Central Valley. The North American Waterfowl Management Plan and the Central Valley Habitat Joint Venture Implementation Plan address population and habitat objectives for healthy waterfowl and shorebird populations. Sacramento River Refuge provides breeding and wintering habitat for waterfowl and other waterbirds. Population monitoring is necessary to determine population status, assess trends, and identify habitat use and restoration and management needs.



**American wigeon**  
*Photo by Steve Emmons*

Waterfowl and other Waterbirds Strategies:

- 1.6.1: Conduct Sacramento River main channel, fixed-route surveys for waterfowl and other waterbirds. These cooperative Refuge surveys with TNC, CDFG, PRBO, and River Partners are conducted seasonally, four times a year, from Red Bluff to Colusa, and record all wildlife observed from the survey vessel (Also strategies 1.4.4 and 1.5.3).
- 1.6.2: Coordinate with FWS Office of Migratory Bird Management to conduct and report Sacramento River waterfowl populations during the midwinter waterfowl survey.
- 1.6.3: Conduct and evaluate the results of the annual colonial waterbird surveys to estimate breeding colony sizes and productivity.
- 1.6.4: Survey, locate, map and protect egret, heron and cormorant rookeries.

Objective 1.7: Anadromous Fisheries and Native Fisheries

Provide high quality habitat for native anadromous fish by enhancing and restoring 33.5 miles of shaded riverine aquatic (SRA) habitat for temperature control and future sources of large woody debris (LWD) by 2015. Where appropriate, enhance or restore floodplain topography and connectivity with the river at 11 units (La Barranca, Ohm, Flynn, Rio Vista, McIntosh Landing South, Pine Creek, Capay, Deadman's Reach, Llano Seco Riparian Sanctuary, Sul Norte, and Drumheller Slough) of the Refuge by 2015.

*Rationale:* The Service and the Refuge System each identify anadromous fish conservation in their mission statements. The Sacramento River is the only river in western North America which supports four distinct salmon runs making Chinook salmon and Central Valley steelhead important ecological, recreational, and commercial fisheries. Components of high quality habitat include mature riparian forests, SRA, LWD, floodplain connectivity (NOAA-NMFS) 1997; USFWS 2000) and restored or enhanced sloughs and oxbow wetlands. SRA habitat moderates water temperatures for immature salmonids and creates habitat for terrestrial and aquatic insects, which are a food source for salmonids and other native fishes (NOAA-NMFS 1997). LWD provides food substrate and escape cover for immature salmonids (USFWS 2000). It also traps spawning gravel, creating redd (nest) habitat for fall-run Chinook salmon

that spawn in the middle Sacramento River (USFWS 2000). LWD also creates plunge pool topography on the downstream side, which provides important microhabitat features that regulate temperatures, prey distribution, and cover. LWD traps anadromous fish carcasses, the source of marine-derived nitrogen (MDN) (USFWS 2000). MDN is important for maintaining the productivity of river systems, which continually drain nutrients downstream. An intact floodplain is important to immature salmonids and other native fishes that escape from large predatory fish in shallow waters. When inundated, the relatively warmer waters of the floodplain become very productive and produce an abundance of prey.

*Anadromous Fisheries and Native Fisheries Strategies:*

- 1.7.1: Implement restoration of mid- and high-elevation riparian forest to create 14,500 linear feet of SRA by 2015.
- 1.7.2: Restore mid- and high- elevation riparian forest to create a source of LWD.
- 1.7.3: Conduct feasibility studies, associated hydrologic investigations, and NEPA documentation to remove privately constructed levees on Refuge land. This, along with topographic restoration, will ensure floodplain connectivity with the main channel. Enhance 3,084 acres of floodplain connectivity at La Barranca by 2015. Enhance floodplain topography on additional 889 acres by 2015.
- 1.7.4: Ensure recruitment of spawning gravel necessary for creating redd habitat for fall-run Chinook salmon by conducting feasibility studies, associated hydrologic investigations, and NEPA documentation to remove privately-constructed levees or other bank stabilization features on Refuge land.
- 1.7.5: Enhance and restore slough and oxbow wetlands for Sacramento splittail and other native fishes that require a warmer temperature and slow moving water. Enhancement and restoration may include the removal of non-native fishes.
- 1.7.6: Coordinate research investigations and monitoring at the Refuge which focuses on population demographics, habitat use and requirements, and health of anadromous and other native fishes. Coordinate with CDFG fishery

investigations (Lower Stony Creek Fish Monitoring; Redd Surveys), USFWS–Red Bluff Fish and Wildlife Office population surveys (escape/passage at Red Bluff Diversion Dam), USFWS–California/Nevada Fish Health Center disease investigations and monitoring, NOAA–Fisheries investigations and universities conducting salmonid research (University of California, Davis; California State University, Chico) and research regarding other anadromous and native fish species.

Objective 1.8: Native Plant Species

On up to 9,000 acres of the Refuge, locate and map six populations of rare and important native plants by 2005 and 24 populations by 2010; maintain and enhance native plant populations through restoration and conservation of 3,225 acres; and restore two native wildflower patches by 2005 and up to 100 patches by 2010.

*Rationale:* Both the Fish and Wildlife Service and the Refuge System identify native plant conservation in their mission statements. Plants are important elements that add diversity and stability to the ecosystem. Plants have individual floristic attributes (e.g., host plants for insects and pollinators), as well as vegetation attributes (e.g., plant communities and habitat structure) that are necessary for ecosystem function and wildlife habitat.

Native Plant Species Strategies:

- 1.8.1: Use plant materials (i.e., cuttings, acorns, seeds) for restoration projects derived from local ecotypes of indigenous plant species and populations.
- 1.8.2: Identify, locate, map, and conserve (protect and manage) important native plant areas, including trees, shrubs, forbs, and grasses (e.g., native vegetation reference sites, La BARRANCA tarweed/buckwheat association and valley oak/elderberry savanna; Ohm sandbar vegetation; Pine Creek wildflower seed source site, Llano Seco valley oaks, native grass reference site, Eddy Lake oxbow vegetation, wildflower seed source sites; Sul Norte native herbaceous understory vegetation).
- 1.8.3: Annually evaluate plant species and associated vegetation for habitat management and research needs (i.e., grazing, burning, herbicides, and other mechanical methods).

1.8.4: Update and maintain the Refuge herbarium (plant specimen) collection.

1.8.5: Restore 100 additional patches of native wildflowers on the Refuge by 2010.

1.8.6: Support botanical research of taxonomic and physiological investigations on the Refuge by university cooperators.

**Objective 1.9: Exotic, Invasive Species Control**

Locate and map exotic invasive species on five units of the Refuge (Pine Creek, Phelan Island, Capay, La BARRANCA, and Drumheller Slough) by 2010. Implement control programs (treatment and monitoring) for exotic invasive species on 7 units of the Refuge (Pine Creek, Phelan Island, Capay, La BARRANCA, Drumheller Slough, Flynn, and Rio Vista) by 2010.

*Rationale:* Invasive non-indigenous (exotic) species have become the single greatest threat to the Refuge System and the Service's wildlife conservation mission. More than 8 million acres within the Refuge System are infested with invasive weeds (Audubon 2002). Invasive species cause widespread habitat degradation, compete with native species, and contribute significantly to the decline of trust species (USFWS 2002c). The National Strategy for Management of Invasive Species (USFWS 2002c) has been developed within the context of the National Invasive Species Management Plan as called for by Presidential Executive Order 13112, and functions as the internal guidance document for invasive species management throughout the Refuge System. This Plan has four goals: 1) Increase the awareness of the invasive species issue, both internally and externally, 2) Reduce the impacts of invasive species to allow the Refuge System to more effectively meet its fish and wildlife conservation mission and purpose, 3) Reduce invasive species impacts on the Refuge System's neighbors and communities, and 4) Promote and support the development and use of safe and effective integrated management techniques to deal with invasive species.

The Great Central Valley is occupied by a diversity and abundance of exotic, invasive species that are harmful because they crowd out or replace native species that are important to wildlife natural diversity and ecosystem function. These species often dominate old agricultural fields and restoration sites. In addition, some late successional stages of native vegetation are dominated by these undesirable species. For these reasons,

vegetation must be managed to control exotic, invasive species so that species composition favors a diversity and abundance of native, indigenous plants.

Exotic, Invasive Species Control Strategies:

- 1.9.1: Manage vegetation and habitat for desired species composition and population levels of native species. Annually evaluate invasive exotic species to be controlled (Table 7). Locate, map, and monitor exotic species that may trigger a management response (i.e., grazing, burning, herbicides, and other mechanical control methods).
- 1.9.2: Conduct and support research to evaluate techniques for controlling target invasive plant species including prescribed fire, grazing, herbicide treatment, mowing, disking, and weed mat tarping.

Objective 1.10: Wildlife and Cultural Sanctuary

Provide 2,043 acres (20 percent) of long-term sanctuary for general wildlife use and nesting, sensitive breeding colonies, plant populations, and cultural resource sites by 2005.

*Rationale:* Sanctuaries are areas on the Refuge that are closed to public use. They provide places where human-caused disturbances are reduced, thereby reducing the interruption of wildlife activities, such as foraging, breeding, resting, feeding nestlings, and other maintenance activities. This may be especially important during high refuge visitor use periods. Sanctuaries also are important to wildlife avoiding predation by other wild animals because they can devote less energy to avoiding humans and more to avoiding predators. Sanctuaries may become important nesting and fawning areas, as well as important areas for feeding and roosting.

Long-term sanctuaries are areas where wildlife concentrate and reproduce, resulting in increased populations that can lead to more wildlife-dependent public use in areas near the sanctuary. As a result, sanctuaries on public land play a key role in providing increased wildlife-dependent public use opportunities on adjacent public lands. In some cases, short-term sanctuaries may be established to protect a sensitive nesting colony or site. These seasonal sanctuaries may impose public access restrictions at some, but not necessarily all nesting colonies, such as heron/egret rookeries and bank swallow colonies, and at nesting sites for species with a low

tolerance for human disturbance, such as the American bald eagle, Swainson's hawk, and osprey.

Sanctuaries also protect sensitive cultural resources. Areas of significant occupation by Native Americans and areas containing significant cultural resources warrant long-term permanent protection. Cultural resource sanctuaries strictly limit the amount of human contact and potential for accidental and intentional vandalism, and show respect for past Native American cultures and customs.

A few of the sanctuaries were designated as areas of no public use based on management issues. These units are typically small in size, surrounded by private property, have poor access and may pose a safety concern. A list of some of the factors considered when determining the level of public use to be allowed on each refuge unit can be found in Appendix L.

*Wildlife Sanctuary Strategies:*

- 1.10.1: Provide long-term sanctuaries on about 20 percent of the Refuge to provide areas for wildlife to feed and rest with relatively little human disturbance.
- 1.10.2: Provide areas of short-term sanctuary to reduce human disturbance at sensitive fish, wildlife, vegetation, and plant sites during the breeding, rearing, and growing seasons.
- 1.10.3: Provide areas of long-term sanctuary that are closed to public use to provide permanent protection of sensitive cultural resources. These areas will be of sufficient size to provide a buffer to surrounding public uses.

*Goal 2: Visitor Services*

*Encourage visitors of all ages and abilities to enjoy wildlife-dependent recreational and educational opportunities and experience, appreciate, and understand the Refuge history, riparian ecosystem, fish, and wildlife.*

Percentages described in the following objectives and strategies represent current refuge acres and do not necessarily reflect the long-term outcome for visitor use on the Refuge. The process for determining visitor use on refuge units is outlined in Appendix L.

**Objective 2.1: Hunting**

Provide high quality opportunities for 1,500 annual hunting visits on 3,356 acres by 2005 and an additional 1,967 acres within two to 10 years, to total 5,323 acres (52 percent) (Table 9, Figure 29, Appendix L).

*Rationale:* Hunting is identified in the Improvement Act as a priority public use for refuges when it is compatible with other refuge purposes. As a result, the Refuge proposes dove, waterfowl, coot, common moorhen, pheasant, quail, snipe, turkey, and deer hunting, all of which are currently hunted on public land along the Sacramento River (Table 10). The hunting program will be conducted in a safe and cost-effective manner and will be carried out consistent with State regulations. The Hunting Plan (Appendix C) was developed to provide safe hunting opportunities, while minimizing conflicts with other priority wildlife-dependent recreational uses. Some visitor uses occur at different times of the year, therefore minimizing potential conflicts with hunters and other user groups (Figure 25). The Refuge hunting program will comply with the Code of Federal Regulations Title 50, 32.1 and be managed in accordance with Refuge Manual 8 RM 5, Hunting.



**Northern Pintails**

*Photo by Steve Emmons*

*Hunting Strategies:*

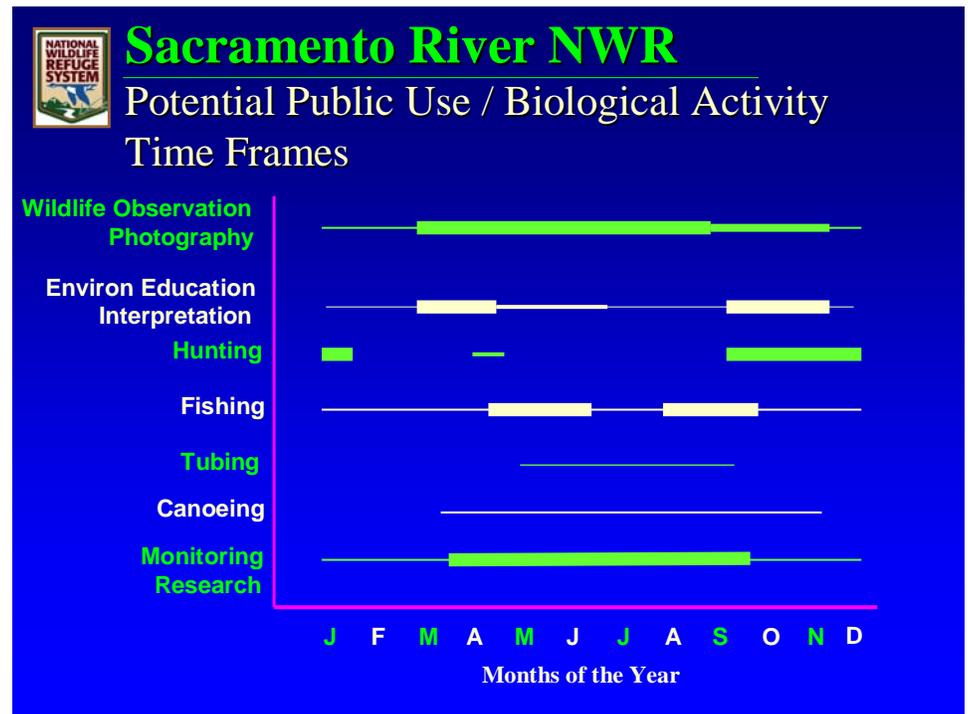
- 2.1.1: Implement the Sacramento River Refuge Hunting Plan by 2005.
- 2.1.2: Identify Refuge units open to hunting, target species, and Refuge-specific regulations through news releases, the Sacramento River Refuge general brochure, Sacramento Refuge Complex web site, and other publications by 2005.
- 2.1.3: Add the appropriate Sacramento River units to the information section of the CDFG regulations: Other Public Uses on State & Federal Areas for the 2005 hunting season.
- 2.1.4: Open Refuge hunt units to “scouting,” including pre-season scouting.
- 2.1.5: Assess the need for turkey and deer hunting by permit only.
- 2.1.6: Continue to coordinate the Llano Seco Junior Pheasant Hunt with the Llano Seco Ranch, California Waterfowl Association, and CDFG.
- 2.1.7: Complete the Sacramento River Refuge general brochure by 2005. The brochure will include descriptions of Refuge units open to hunting, Refuge-specific hunting regulations, parking areas, and vehicle/boat/foot access.
- 2.1.8: Post laminated Boating Trail Guide by the California Department of Boating & Waterways at existing kiosks at public boat ramps, and give copies of the Boating Trail Guide to local sporting good stores, partners, and public agencies by 2005.
- 2.1.9: Develop hunting map flyer and disseminate in the Refuge Complex visitor center and on the website by 2005.
- 2.1.10: Construct and set information kiosks, entrance and public use signs and auto counters at vehicle access points on Capay, Sul Norte, and Drumheller Slough as units open to the public and funding becomes available.

**Table 10. California Hunting Seasons 2003-2004**

<b>Species</b>	<b>Dates</b>
Dove	September 1-15 and from second Saturday in November for 45 days
Waterfowl <sup>1</sup> – Ducks	Third Saturday in October for 33 days and from third Friday in November for 66 days
Waterfowl <sup>1</sup> – Geese	First Saturday in November extending 86 days
American Coot and Common Moorhen	Concurrent with duck season (and during split, if it occurs)
Pheasants	Second Saturday in November extending for 44 days
Quail – General	Third Saturday in October extending through the last Sunday in January
Quail – Archery	Third Saturday in August extending through the last Sunday in September
Snipe	Third Saturday in October extending for 107 days
Turkey – Fall	Second Saturday in November extending for 16 consecutive days
Turkey – Spring	Last Saturday in March, extending for 37 consecutive days
Deer – Archery (Zone C4, all units except Drumheller Unit)	Last Saturday in August extending for 16 consecutive days
Deer – General (Zone C4, all units except Drumheller Unit)	Third Saturday in September extending for 16 consecutive days
Deer – Archery (Zone D3, Drumheller Unit)	Third Saturday in August extending for 23 consecutive days
Deer – General (Zone D3, Drumheller Unit)	Fourth Saturday in September extending for 37 consecutive days
Deer – G1 Late Season (Zone C4, all units except Drumheller Unit)	Fourth Saturday in October extending for 9 consecutive days

<sup>1</sup>See current State regulations for special closures.

**Figure 25. Potential Public Use / Biological Activity Time Frames**



- 2.1.11: Provide a parking area, gate, and portable toilet on the Capay, Sul Norte, and Drumheller units, as units open to the public and funding becomes available.
- 2.1.12: Construct an accessible one-mile walking trail on Sul Norte as funding becomes available.
- 2.1.13: Place public use signs at vehicle access points and at the approximate ordinary high water mark on all Refuge units open to the public. The signs will depict the unit name, river mile, and public uses allowed/prohibited (Figures 26 & 27).
- 2.1.14: Monitor hunting visits by personal contact by law enforcement officers, comment drop box (Capay, Sul Norte and Drumheller Slough units), Refuge web site e-mail, and vehicle counters at units with parking areas by 2005.

- 2.1.15: Complete random, weekly hunter field-checks to assess type and number of species harvested and compliance with all regulations.
- 2.1.16: Use the Sacramento Refuge Complex Refuge Hunting Program Working Group and the Disabled Access Working Group to develop and improve the Refuge hunting program.
- 2.1.17: Collect and annually report hunting visit data for the Refuge Management and Information System (RMIS), Public Education and Recreation section.
- 2.1.18: Use the CDFG deer tag data to complete the hunting sections of the RMIS annual report.
- 2.1.19: Work cooperatively with CDFG wardens to enforce State Fish and Game hunting laws and Refuge-specific regulations to provide a quality experience for all visitors.



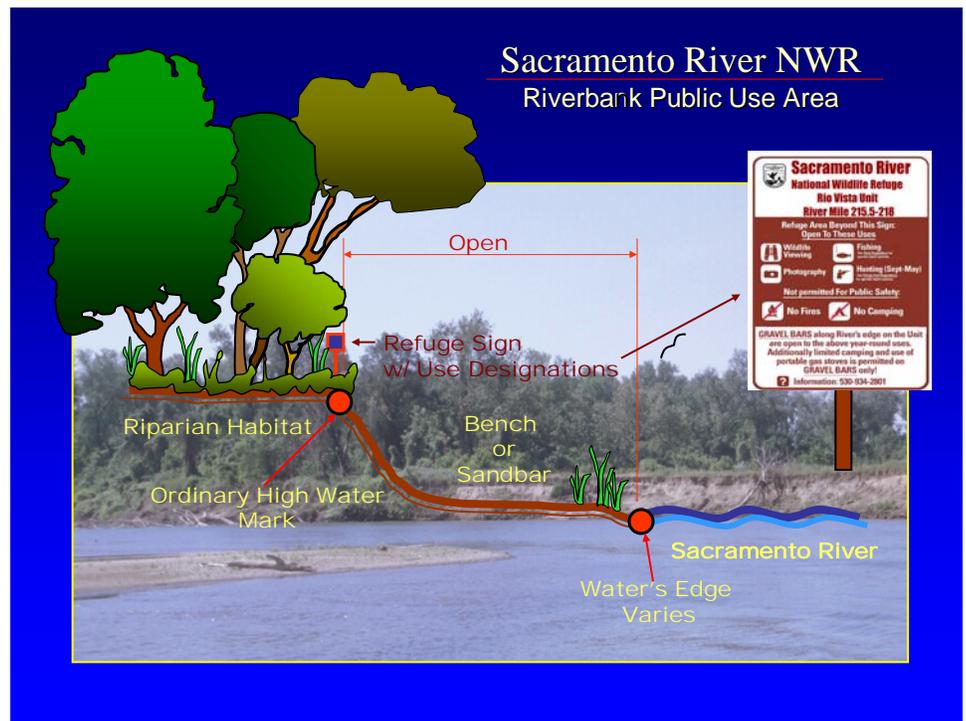
**Junior Pheasant Hunt**

*Photo by Joe Silveira*

Figure 26. Sacramento River Refuge Public Use Sign.



Figure 27. Public Use Sign Placement.



**Objective 2.2: Fishing**

Open gravel bars, sloughs, oxbow lakes, and the inundated floodplain on all Refuge units to fishing. Provide 23 river-front miles for 1,000 annual fishing visits. By 2005, open all seasonally submerged areas below the ordinary high water mark to the public for fishing (Table 9, Appendix L).

*Rationale:* Fishing is identified in the Improvement Act as a priority use for refuges when compatible with other refuge purposes. The fishing program will be conducted in a safe and cost-effective manner and, to the extent that it is feasible, carried out in accordance with State regulations. The Fishing Plan (Appendix D) was developed to provide safe fishing opportunities, while minimizing conflicts with other priority wildlife-dependent recreational uses. The fishing program will comply with 50 CFR 32.4 and will be managed in accordance with Refuge Manual 8 RM 6, Sport Fishing.

Fishing opportunities in sloughs, oxbow lakes and on the inundated floodplain of Refuge lands will be limited since these habitat features are also limited. Fishing on Refuge land or from the bank is limited by the river's dynamic meander pattern, resulting in banks with steep slopes. Bank-fishing opportunities will occur where there is reasonable access and when it is safe for anglers. New boat ramps are not proposed due to problematic siltation, channel meander change, and high year-round maintenance costs. Seasonal flooding on most Refuge lands makes ADA accessible fishing access trails cost-prohibitive. ADA fishing access will be available in other areas on the river.



**Fishing on the Sacramento River**

*Photo by Joe Silveira*

*Fishing Strategies:*

2.2.1: Implement the Sacramento River Refuge Fishing Plan by 2005.

2.2.2: Identify Refuge units open to fishing in sloughs, oxbow lakes, and from gravel bars, and the Refuge-specific regulations, through news releases, the Sacramento River Refuge general brochure, Sacramento Refuge Complex web site, and publications by 2005.

2.2.3: Use the Red Bluff Diversion Dam fish-viewing plaza to provide visitors with information about the Sacramento River fishery and salmon migration.

2.2.4: Complete the Sacramento River Refuge general brochure by 2005. The brochure will include descriptions of Refuge units open to fishing, Refuge-specific fishing regulations, parking areas, and vehicle/boat/foot access.

2.2.5: Post laminated Boating Trail Guide by the California Department of Boating & Waterways at existing kiosks at public boat ramps, and give copies of the Boating Trail Guide to local sporting good stores, partners, and public agencies by 2005.

2.2.6: Construct and set information kiosks at Rio Vista, Pine Creek, Capay, Ord Bend, Sul Norte, and Packer by 2005.

2.2.7: Maintain a one-mile bank fishing access trail on the Capay Unit and the boat launch area at Packer Unit.

2.2.8: Work with local resource agencies to provide fishing access and facilities for anglers with disabilities on adjacent compatible areas.

2.2.9: Place public use signs at vehicle access points and at the approximate ordinary high water mark on all Refuge units open to the public. The signs will depict the unit name, river mile, and public uses allowed/prohibited (Figures 26 & 27).

2.2.10: Continue to request that anglers report catch and release of the threatened Sacramento splittail in Packer Lake by maintaining current regulations and posting.

2.2.11: Work cooperatively with CDFG to obtain creel census data on the river and enforce compliance with the State fishing regulations.

2.2.12: Collect and annually report fishing visits for the RMIS, Public Education and Recreation section.

2.2.13: Work cooperatively with CDFG Wardens to enforce State Fish and Game fishing laws and Refuge-specific regulation compliance and to provide a quality experience for all visitors.

**Objective 2.3: Wildlife Observation and Photography**

Provide quality opportunities for 1,000 wildlife viewing and photographic annual visits on 5,096 acres by 2005 and an additional 3,165 acres by 2015 to total 8,261 acres (80 percent).

*Rationale:* Wildlife viewing and photography are identified in the Improvement Act as a priority uses for refuges when they are compatible with other refuge purposes. As a result, the Refuge encourages first-hand opportunities to observe and photograph wildlife in their habitats. These activities will be managed to ensure that people have opportunities to observe wildlife in ways that do not disrupt wildlife or damage refuge habitats. Wildlife viewing and photography will be managed to foster a connection between visitors and natural resources.



**Wildlife Observation on the Sacramento River**

*Photo by Joe Silveira*

*Wildlife Observation and Photography Strategies:*

- 2.3.1: Use the Red Bluff Diversion Dam salmon-viewing plaza to provide visitors with information about the Sacramento River fishery and close up viewing and photographic opportunities of salmon during August-October.
- 2.3.2: Post laminated Boating Trail Guide by the California Department of Boating & Waterways at existing kiosks at public boat ramps, and give copies of the Boating Trail Guide to local sporting good stores, partners, and public agencies by 2005.
- 2.3.3: As units open to the public, develop and maintain a one-two mile walking trail on Rio Vista, Pine Creek, Capay, Ord Bend, Sul Norte, Codora and Packer units to provide wildlife viewing and photographic opportunities and to promote awareness about the value of riparian habitat, management efforts, and plant/wildlife identification tips.
- 2.3.4: Construct a wildlife viewing/photography blind on the Codora Unit, when it opens to the public.
- 2.3.5: Place public use signs at vehicle access points and at the approximate ordinary high water mark on all Refuge units open to the public. The signs will depict the unit name, river mile, and public uses allowed/prohibited (Figures 26 & 27).
- 2.3.6: Collect and annually report wildlife observation and photography visits for the RMIS, Public Education and Recreation section.
- 2.3.7: Provide an entrance sign, parking area, information kiosk, public use signs, gate, auto counter, and portable toilet on the Rio Vista, Pine Creek, Capay, Ord Bend, Sul Norte, Codora, Packer, and Drumheller units, as units open to the public and funding becomes available.

### Objective 2.4: Environmental Education

Develop an environmental education program by 2005 to service about 1,000 students annually. Develop an environmental education program that promotes in-depth study of the ecological principles that are associated with the Sacramento River watershed, riparian ecosystem, and the Refuge's natural, cultural, and historical resources. The education activities will be designed to develop awareness and understanding for Refuge resources and management activities.

*Rationale:* Environmental education is identified in the Improvement Act as a priority use for refuges when it is compatible with other refuge purposes. As a result, the Refuge encourages environmental education as a process of building knowledge in students. The Refuge staff will work with schools (K-12) to integrate environmental concepts and concerns into structured educational activities. These Refuge-lead or educator-conducted activities are intended to actively involve students or others in first-hand activities that promote discovery and fact-finding, develop problem-solving skills, and lead to personal involvement and action. Refuge staff will promote environmental education that: is aligned to the current Federal, State and local standards; is curriculum based that meets the goals of school districts adopted instructional standards; and provides interdisciplinary opportunities that link the natural world with all subject areas. The environmental education program will be managed in accordance of Refuge Manual 8 RM 3, Outdoor Classroom and Educational Assistance.



### **Environmental Education**

*Photo by Joe Silveira*

*Environmental Education Strategies:*

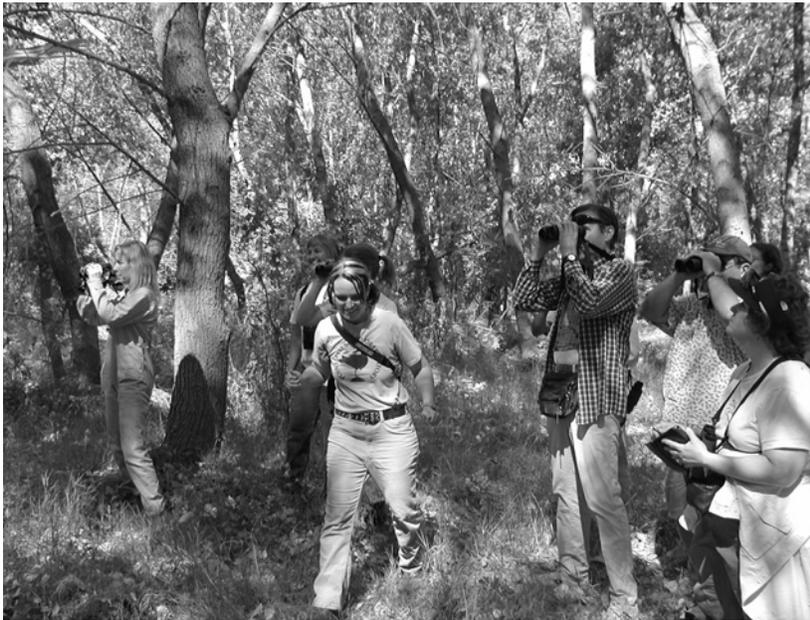
- 2.4.1: Use the Sacramento Refuge Complex visitor center and its Discovery Room to provide presentations and exhibits about the Sacramento River Refuge purposes and management.
- 2.4.2: Develop a Discovery Pack with environmental education activities and on-site information for use by scheduled groups on walking trails.
- 2.4.3: Use California Waterfowl Association's wetland kits and the Songbird Blues and Bird of Two Worlds trunks to further educate students about wetlands and Neotropical migrants.
- 2.4.4: Continue to work cooperatively with PRBO and TNC to provide tours to school groups and develop an awareness of the purpose of the Refuge.
- 2.4.5: Continue assisting Chico Junior High School in implementing their Wetlands Unit, an in-depth study of wetlands and riparian habitats.
- 2.4.6: Develop educational materials that interpret the Sacramento River fishery and utilize Coleman National Fish Hatchery and the Northern Sacramento Valley Fisheries Office expertise.
- 2.4.7: Conduct or host at least 50 school groups each year utilizing the Rio Vista, Pine Creek, Phelan Island, Ord Bend, and Packer units.
- 2.4.8: Facilitate one annual resource-training workshop to provide educators and tour guides consistent and current information about the Refuge and management.
- 2.4.9: Coordinate one meeting each year with local groups that are involved with leading school groups. The goals of the meeting would be to update agencies on new issues and confirm education guidelines.
- 2.4.10: Continue to require all groups to complete the Environmental Education Program Reservation or the Event Notification Forms to schedule and record visitor use.

2.4.11: Continue to collect and report environmental education use data for the RMIS, Public Education and Recreation section annually.

**Objective 2.5: Interpretation**

Refuge staff will develop an interpretive program to service about 1,000 annual visits. The program will promote public awareness and support of the Refuge resources and management activities by 2005.

*Rationale:* Interpretation is identified in the Improvement Act as a priority use for refuges when it is compatible with other refuge purposes. As a result, the Refuge encourages interpretation as both an educational and recreational opportunity that is aimed at revealing relationships, examining systems, and exploring how the natural world and human activities are interconnected. Participants of all ages can voluntarily engage in stimulating and enjoyable activities as they learn about the refuge issues confronting fish and wildlife resource management. First-hand experiences with the environment will be emphasized, although presentations, audiovisual media, and exhibits will be necessary components of the Refuge interpretive program. The interpretive program will be managed in accordance of Refuge Manual 8RM 4, Interpretation.



**Riparian Discovery Walk**

*Photo by Joe Silveira*

Interpretation Strategies:

- 2.5.1: Use the Sacramento Refuge Complex visitor center to provide presentations and exhibits about the Refuge purposes and management.
- 2.5.2: Use the Woodson Bridge State Recreation Area's amphitheater and evening campfire program, during the summer, to promote the Refuge's goals and purposes (i.e., wildlife viewing opportunities, restoration, fisheries, etc.).
- 2.5.3: Promote awareness about the value of riparian habitat, management efforts, and plant/wildlife identification by utilizing the walking trails for public tours.
- 2.5.4: Develop a conceptual plan for a reservation-only group campsite at Deadman's Reach Unit, when the unit is opened to the public.
- 2.5.5: Conduct or host at least 50 tour groups each year utilizing the Rio Vista, Pine Creek, Phelan, Ord Bend, and Packer units.
- 2.5.6: Continue to collect and annually report public use data for the RMIS, Public Education and Recreation section.

Objective 2.6: Public Outreach

Develop an outreach program to attract about 5,500 total annual visits. The program will promote public awareness and understanding of the Refuge resources and management activities by 2005.

*Rationale:* The Refuge will develop an effective outreach program that will provide two-way communication between the Refuge and the public to establish a mutual understanding and promote involvement with the goal of improving joint stewardship of our natural resources. The outreach program will be designed to identify and understand the issues and target audiences, craft messages, select the most effective delivery techniques, and evaluate effectiveness. It will include education, interpretation, news media, information products and relations with nearby communities and local, State, Federal agencies. The refuge outreach program will follow the guidance of the National Outreach Strategy: A Master Plan for Communicating in the U.S. Fish and Wildlife Service, and

America's National Wildlife Refuge System: 100 on 100  
Outreach Campaign.

Public Outreach Strategies:

- 2.6.1: Maintain the Sacramento Refuge Complex web site to promote current recreational and educational opportunities.
- 2.6.2: Continue to participate or provide information to local events, such as International Migratory Bird Day, Snow Goose Festival, Endangered Species Fair, and State of the Sacramento River Conference.
- 2.6.3: Provide a web site link to a composite Sacramento River map of multi-agency public uses and access when completed by California State University/Chico.
- 2.6.4: Host one annual workday/barbecue to clean up the river properties, promote awareness of Refuge management, and network with community members.
- 2.6.5: Provide interpretive boat tours of the Refuge for partners or scheduled groups annually.
- 2.6.6: Continue to collect and report public use data for the RMIS, Public Education and Recreation section.
- 2.6.7: Participate in fire prevention education efforts to reduce fire incidence and fire damage. Provide outreach about the role of fire and management uses of fire.
- 2.6.8: Write news releases for local and state newspapers and articles for magazines, when appropriate. Conduct television and radio interviews upon request.

Objective 2.7: Volunteers

Develop a volunteer program that consists of up to 12 volunteers that support and help implement the Refuges special events, restoration, and maintenance programs by 2005.

*Rationale:* The National Wildlife Refuge System Volunteer and Partnership Enhancement Act of 1998 (P.L. 105-242) strengthens the Refuge System's role in developing relationships with volunteers. Volunteers possess knowledge, skills, and abilities that can enhance the scope of refuge operations. Volunteers enrich Refuge staff with their gift of

time, skills, and energy. Refuge staff will initiate, support, and nurture relationships with volunteers so that they may continue to be an integral part of Refuge programs and management. The volunteer program will be managed in accordance with the Fish and Wildlife Service Manual, Part 150, Chapters 1-3, “Volunteer Services Program”, and Part 240 Chapter 9 “Occupational Safety and Health, Volunteer and Youth Program”.

Currently the Sacramento Refuge Complex volunteer program consists of 20 individuals that assist with biological, environmental education, interpretive, wildlife observation, hunting, and maintenance events and activities. Additional individuals are signed up for one-time events such as Brush Up Day of the hunting areas and trail maintenance by Audubon Society. The Refuge supports and participates in annual Eagle Scout projects.

Volunteer Strategies:

- 2.7.1: Use the Sacramento Refuge Complex volunteer coordinator to increase efforts of recruitment and training of volunteers.
- 2.7.2: Promote the Refuge through the Sacramento Refuge Complex bookstore, Altacal Audubon, Sacramento River Preservation Trust, and other informal partners.
- 2.7.3: Recruit volunteers through the Student Conservation Association, California Waterfowl Association Visitor Service Assistants, California State University Chico internship program, and other universities.
- 2.7.4: Recruit a variety of community groups and individuals (i.e. CSU/Chico, Butte College, Boy Scouts, Girl Scouts, Audubon, etc.) with diverse expertise and experiences to complete a variety of Refuge projects.
- 2.7.5: Host an annual volunteer recognition dinner for volunteers, local community leaders, and Refuge staff.
- 2.7.6: Facilitate volunteer training workshops to develop skills in: field equipment use (i.e. tractors and mowers); computer data entry software programs; teaching methods to assist with environmental education program; and other skills to facilitate Refuge-specific programs.

2.7.7: Continue to collect and annually report volunteer hours and projects for the Service's regional volunteer program report.

*Goal 3: Partnerships*

*Promote partnerships to preserve, restore, and enhance a diverse, healthy, and productive riparian ecosystem in which the Sacramento River Refuge plays a key role.*

Objective 3.1: Partnerships

Create opportunities for 25 new and maintain existing partnerships among Federal, State, local agencies, organizations, schools, corporations, and private landowners to promote the understanding and conservation of the Sacramento River Refuge resources, activities, and management by 2015.

*Rationale:* The Refuge System recognizes that strong citizen support benefits the System. These benefits include the involvement and insight of citizen groups in Refuge resource and management issues and decisions, a process that helps managers gain an understanding of public concerns. Partners support Refuge activities and programs, raise funds for projects, are advocates on behalf of wildlife and the Refuge System, and provide support on important wildlife and natural resource issues. In "Fulfilling the Promise" the Service identified the need to forge new and non-traditional alliances and strengthen existing partnerships with States, Tribes, non-profit organizations and academia to broaden citizen and community understanding and support for the National Wildlife Refuge System.

A variety of people including, but not limited to, scientists, birders, anglers, hunters, farmers, outdoor enthusiasts and students have a great deal of interest in Sacramento River Refuge's management, fish and wildlife species, and habitats. The number of visitors to the Refuge and the partnerships that have already been developed (CCP, Chapter 1) are evidence of this growing interest. New partnerships will be formed with organizations, local civic groups, community schools, Federal and State governments, and other civic organizations, as funding and staff are available.

*Partnership Strategies:*

- 3.1.1: Maintain the Memorandum of Understanding (MOU) with CDFG and California Department of Parks and Recreation to mutually manage, monitor, restore and enhance lands for fish, wildlife, and plants along the Sacramento River.
- 3.1.2: Continue to work with TNC and River Partners through the use of the Cooperative Land Management Agreements.
- 3.1.3: Continue to coordinate Refuge activities with the Sacramento River Conservation Area Forum.
- 3.1.4: Work closely with California Department of Water Resources and State Reclamation Board staff on floodplain management issues. Provide each agency with copies of annual habitat management plans.
- 3.1.5: Maintain good relations and open communication with partners.
- 3.1.6: Actively look for partnering opportunities with local and regional hunting and fishing groups (e.g., California Waterfowl Association, United Sportsmen for Habitat and Access, Chico Fly Fishers).
- 3.1.7: Pursue opportunities to cost-share projects with other organizations.
- 3.1.8: Identify and promote new partnerships to support restoration, enhancement, and management of riparian habitat and its flora and fauna.
- 3.1.9: Expand opportunities with local Chambers of Commerce to participate in local events and improve dissemination of public recreation literature about the Refuge.
- 3.1.10: Stay actively involved in other neighboring Federal, State, and local planning processes to protect Refuge resources and foster cooperative management of those resources in the Sacramento River watershed.
- 3.3.11: Continue coordination with the American Bird Conservancy (ABC) to publicize the Refuge's designation as a Globally Important Bird Area.

3.3.12: Maintain agreements with CDF and local fire departments about fire suppression, and coordinate with them in prevention and hazard reduction work.

3.3.13: Host a Refuge open house or tour each year that will promote the Service and Refuge.

Objective 3.2: Cooperation with Adjacent Landowners:

By 2015, create opportunities for new and maintain existing partnerships with private landowners to promote cooperation and address mutual concerns.

*Rationale:* It is important to communicate with our neighbors to help identify any issues at an early stage and attempt to resolve any conflicts that may exist. The Refuge will continue to participate in the Sacramento River Conservation Area Forum (SRCAF). The SRCAF is a multi-organization effort to restore the ecosystem along the river. In order to ensure that the actions of the various agencies are compatible and consistent and to maximize the effectiveness of individual actions, there is a need for ongoing management coordination. This coordination includes both public agencies and private landowners and interests.

Private Landowner Cooperation Strategies:

3.2.1: Maintain contact with adjacent neighbors to discuss mutual concerns and opportunities.

3.2.2: Implement improvements and operational revisions to resolve issues with adjacent landowners that are compatible with the mission of the Service and purpose of the Refuge as well as consistent with the funding available to the Refuge.

3.2.3: Design habitat restoration projects to address considerations of adjoining landowners including but not limited to:

- Provision of access controls and access for emergency and utility services
- Consideration of appropriate fire access and breaks
- Consideration of appropriate buffers where new planting directly adjoins agricultural crops.
- Use of natural predation control strategies

- 3.2.4: Continue to consult with adjoining landowners as part of the development of plans for proposed restoration projects and other physical changes to the Refuge.
- 3.2.5: Continue to participate in the activities of the SRCAF including information presentations and solicitation of input regarding proposed restoration projects and other physical changes to the Refuge.
- 3.2.6: Commission field surveys as needed to identify specific property boundaries where uncertainty has contributed to substantive violations of Refuge regulations.

*Goal 4: Resource Protection*

*Adequately protect all natural and cultural resources, staff and visitors, equipment, facilities, and other property on the Refuge from those of malicious intent, in an effective, professional manner.*

Objective 4.1: Law Enforcement

Provide visitor safety, protect resources, and ensure compliance with regulations through law enforcement. Increase the number of law enforcement officers (from 1 to 2) and increase the monitoring of significant resource sites from quarterly to monthly by 2010.

*Rationale:* A common belief among neighboring landowners is that public ownership, easements, or access could result in increased vandalism and theft of agricultural equipment, poaching, and disregard of private property rights. A well-planned and coordinated program will be necessary to successfully address these concerns. The elongated and fragmented layout of the Refuge, which crosses through four counties, requires law enforcement coordination on the Federal, State, county, and local levels. Enforcement is further complicated because many units are accessible only by water.

Law Enforcement Strategies:

- 4.1.1: Develop MOUs with various law enforcement agencies to improve coordination, improve safety, and coordinate efforts in areas of special concern.
- 4.1.2: Conduct periodic patrols of the Refuge by boat.

- 4.1.3: Develop MOUs with state and local law enforcement agencies to implement river boat patrols to enforce State and Refuge regulations.
- 4.1.4: Allow only public use that is compatible with the primary objective of habitat management plans and is strictly controlled.
- 4.1.5: Permit boat access through Refuge lands that are open to the public during high water events; close to public entry and post all sensitive areas.
- 4.1.6: Establish public access near State parks and State wildlife areas where public use is a primary purpose.
- 4.1.7: Provide public education and signage as part of law enforcement programs and provide a sufficient level of law enforcement from various agencies to address these issues.
- 4.1.8: Employ two full-time park rangers (refuge law enforcement officers) and supplement their duty schedule with dual-function officers. The officers would also support the other refuges within the Sacramento Refuge Complex and coordinate their activities with other local, State, and Federal law enforcement agencies.
- 4.1.9: Ensure all officers are fully trained, equipped, and prepared to perform preventive refuge law enforcement duties.
- 4.1.10: Maintain a daily law enforcement presence to ensure that violations are deterred or successfully detected and violators are apprehended, charged, and prosecuted.
- 4.1.11: Encourage refuge officers to work closely with the game wardens from CDFG and deputy sheriffs from Tehama, Glenn, Butte, and Colusa counties.
- 4.1.12: Develop a Law Enforcement Plan for the Sacramento River Refuge.
- 4.1.13: Annually maintain boundary, closed area, and public use signs.

4.1.14: Conduct law enforcement patrols at all known archaeological sites on a regular basis to inspect for disturbance and illegal digging and looting.

4.1.15: Investigate fire causes and pursue fire trespass cases.

Objective 4.2: Safety

By 2005, provide Refuge facilities and lands that are safe for public use and management activities through annual inspections and routine maintenance.

*Rationale:* Visitor and staff safety is a high priority for the Refuge. Refuge lands stretch over 77-miles of the Sacramento River, so it is extremely important to have comprehensive safety strategies. Illegal activities, such as drug cultivation, poaching, vandalism, and vehicle stripping, are present on Refuge lands where there will be public activities. Strict law enforcement and the support of partners will be necessary to provide a safe environment for visitors and staff. The Refuge is committed to training staff in the most current safety standards and practices, maintaining facilities, coordinating with law enforcement partners, and providing an effective monitoring program to provide the safest environment possible.

Safety Strategies:

4.2.1: Administer and monitor required permits, licenses, and inspections on a repetitive basis under the Federal Facility Compliance Act and Service policy.

4.2.2: Promptly replace, upgrade, or temporarily close any facility that comprises public safety.

4.2.3: Minimize injuries to staff and visitors through preventive measures and be prepared to respond to injuries if they occur.

4.2.4: Ensure that safety procedures, designated personnel, and equipment and supplies (e.g., first aid kits and fire extinguishers) are in place and kept current.

4.2.5: Conduct monthly staff safety meetings covering pertinent topics and conduct annual safety inspections to ensure that Refuge facilities and lands are safe for public and staff use.

4.2.6: Train and refresh staff in CPR and basic first aid.

- 4.2.7: Maintain existing access roads and parking areas by grading, mowing, and replacing culverts, as needed, for public vehicle access, law enforcement, and habitat management activities.
- 4.2.8: Work with the State of California, Department of Boating & Waterways to modify the boat launch area at the Packer Unit to improve safety for anglers and other visitors.
- 4.2.9: Investigate the need for turn lanes on Highway 45 for the Packer unit, Highway 32 for the Pine Creek unit, South Avenue for the Rio Vista unit, and Ord Ferry Road for the Ord Bend unit.
- 4.2.10: Maintain secondary roads and pathways for public pedestrian traffic by grading, mowing and replacing culverts, as needed.
- 4.2.11 Help protect refuge visitors, neighbors, and employees through fire prevention, hazard reduction, and fire trespass programs.



**Lesser goldfinch**

*Photo by Steve Emmons*